BULLYING BY PEERS AND IN THE FAMILY: PRECURSORS, CONSEQUENCES AND INTERVENTION

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BULLYING BY PEERS AND IN THE FAMILY: PRECURSORS, CONSEQUENCES AND INTERVENTION

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Frequent Bullying Involvement and Brain Morphology in Children

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Background: Over the past few decades, bullying has been recognized as a considerable public health concern. Involvement in bullying is associated with poor long-term social and psychiatric outcomes for both perpetrators and targets of bullying. Despite this concerning prognosis, few studies have investigated possible neurobiological correlates of bullying involvement that may explain the long-term impact of bullying. Cortical thickness is ideally suited for examining deviations in typical brain development, as it has been shown to detect subtle differences in children with psychopathology. We tested associations between bullying involvement and cortical thickness using a large, population-based cohort.

Methods: The study sample consisted of 2,602 participants from the Generation R Study. When children were 8 years old, parents and teachers reported on common forms of child bullying involvement (physical, verbal, and relational). Questions ascertained whether a child was involved as a perpetrator (n = 82), a target of bullying (n = 92), as a combined perpetrator and target of bullying (n = 47), or uninvolved in frequent bullying (n = 2,381). High-resolution structural MRI was conducted when children were 10 years of age. Cortical thickness estimates across the cortical mantle were compared among groups.

Results: Children classified as frequent targets of bullying showed thicker cortex in the fusiform gyrus compared to those uninvolved in bullying ($B = 0.108$, $p_{corrected} < 0.001$). Results remained consistent when adjusted for socioeconomic factors, general intelligence, and psychiatric symptoms. Children classified as frequent perpetrators showed thinner cortex in the cuneus region; however, this association did not survive stringent correction for multiple testing. Lastly, no differences in cortical thickness were observed in perpetrator–targets.

Discussion: Bullying involvement in young children was associated with differential cortical morphology. Specifically, the fusiform gyrus, often involved in facial processing, showed thicker cortex in targets of frequent bullying. Longitudinal data are necessary to demonstrate the temporality of the underlying neurobiology associated with bullying involvement.

Keywords: cortical thickness, victimization, vertex-wise analysis, population based, fusiform

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INTRODUCTION

The past decades have witnessed bullying during childhood emerge as a considerable public health concern. Prevalence estimates are relatively high, although vary considerably by age, gender, frequency of involvement, and country (1). In addition to the immediate burden on the child, poor long-term outcomes have been consistently reported in those involved once they reach adulthood, including increased rates of psychiatric disorders, substance abuse, problems with social functioning, and suicidality (2–7). The persistence of these problems into adulthood suggests that a potential underlying neurobiological substrate may be linked to bullying involvement.

Bullying in children is formally characterized as unwanted, repeated, and aggressive behavior among peers which occurs in the context of an actual or perceived power imbalance (8). Involvement takes place in multiple forms, including physical (e.g., hitting, fighting), verbal (e.g., name calling, inappropriate comments), relational (e.g., social exclusion), and more. Those involved in bullying are often classified as being a bully (perpetrator), a victim (target of bullying), or involved in both forms as a perpetrator–target (9). Against the background of high prevalence estimates and the advent of cyber bullying, it is crucial to better understand bullying in the context of neural correlates, as such features could eventually help to predict and even explain the persistent psychosocial outcomes of bullying involvement (10).

In vivo structural brain imaging methods have proven effective in examining typical (11) and atypical morphological brain development (12) and are a promising tool for ascertaining any neural correlates of bullying involvement. Previous work has already shown how early-life adversities, such as abuse, early life stress, quality of maternal care, and growing up in institutional care, impact cortical and subcortical development in children (13–15). Despite this work demonstrating the sensitivity of structural neuroimaging to detect subtle morphological features of typical and atypical brain development, few studies have explored to what extent bullying involvement is associated with brain morphology and brain structure (16, 17). More substantial focus has been given to aspects of peer and social interaction using functional MRI (18) where, for example, anterior cingulate and prefrontal cortices have been implicated with differential functional activity in the context of exposure to social exclusion (19, 20). Recently, a large study of adolescents examined how structural brain volumes were related to peer victimization and psychopathology; changes in brain volumes which were related to peer victimization (specifically portions of the basal ganglia) were also predictive of internalizing problems later in life (21).

We aimed to study the association between bullying involvement and brain morphology in a large population-based setting. Parent- and teacher-rated bullying involvement was used to classify children as perpetrators, targets of bullying, or combined perpetrator–targets. We performed structural MRI to quantitatively assess the thickness of the cortical mantle, as well as hippocampal and amygdala volume; metrics shown to be associated with psychopathology and symptomatology in children. We hypothesized that targets of bullying involvement would display differences in cortical thickness in brain areas related to threat perception and sensitivity, fear, anxiety, emotional face processing, and emotional regulation (e.g., prefrontal cortex, cingulate gyrus, fusiform face area, and insula). We also hypothesized that perpetrators would differ in cortical thickness in areas related to emotional (dys)regulation (e.g., prefrontal cortex). Lastly, we hypothesized that those involved as perpetrator–targets would display the largest differences in cortical thickness in regions observed in both perpetrators and targets of bullying.

METHODS AND MATERIALS

Participants

Participants in this study were part of the Generation R Study, a prospective prenatal birth cohort in Rotterdam, The Netherlands (22). When children were between the ages of 7 and 8, parents and teachers completed a questionnaire on children's bullying involvement. At the age of 10, children visited our research-dedicated facility for a detailed behavioral assessment (23) and also underwent MRI (24). Of the 3,992 children who visited our MRI facility, 807 datasets were excluded due missing complete T_1 scan ($n = 114$; 3%), a different T_1 acquisition ($n = 22$, 0.6%), poor/insufficient data quality ($n = 644$; 16%), or incidental findings ($n = 27$; 0.7%, **Supplemental Table S1**). Of the remaining 3,185 children who had MRI data, 2,602 also had parent or teacher report information on bullying involvement and comprised the final study population. The flow chart depicted in **Figure 1** illustrates these exclusions in detail. The Medical Ethics Committee of the Erasmus Medical Center approved all study procedures, and all parents and children provided written informed consent and assent, respectively.

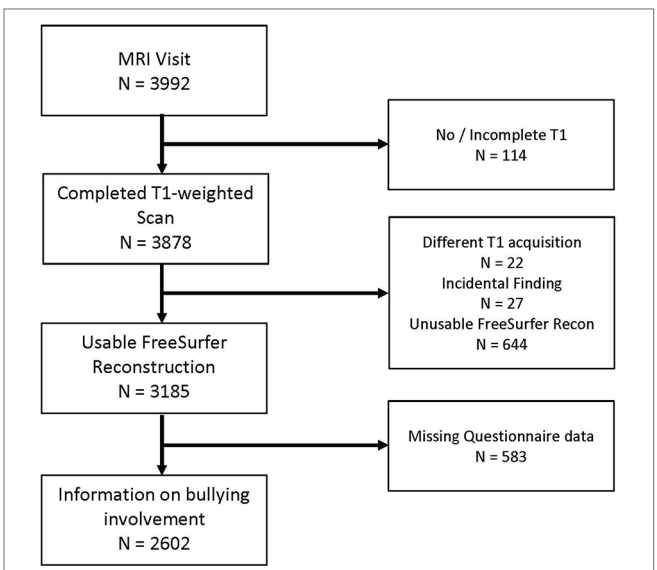

FIGURE 1 | Flow chart indicating participant inclusion/exclusion from study population.

Bullying Involvement Assessment

Three common forms of bullying involvement (9) were assessed using two separate informants: Physical, verbal, and relational bullying involvement were assessed by asking the child's primary caregiver (most often the mother) and/or the child's teacher. Separate questions ascertained whether the child was involved as a perpetrator or a target of bullying for each type of involvement (physical, verbal, relational involvement, for a total of six items). For example, parents and teachers were asked, "In the past few months, how often has your child been bullied by insults, being called names or being laughed at?" Full questions are presented in the Supplemental Material. Teachers were additionally asked whether a child was involved in material bullying. However, this item was not administered in the parent version of the questionnaire given the low endorsement rates by teachers and, therefore, was not used in the current analyses. Each item was rated on a 4-point scale ranging from "Never or less than once per month" to "More than twice per week" by the teachers and on a 5-point scale ranging from "Never" to "Several times per week" by the parents. Children were classified as perpetrators if their parent or their teacher indicated they physically, verbally, or relationally bullied other children once per week or more, which represents frequent involvement. In the event of disagreement between informants, children were classified as perpetrators if one informant indicated involvement (3, 25). Similarly, children were classified as targets of bullying if their parent or teacher indicated they were bullied by another child once per week or more. If a child was classified as both a perpetrator and as a target of bullying based on these criteria, they were reclassified as being involved as both, referred to as a perpetrator–target. Ratings from multiple informants were not available for all children, with roughly 33% receiving information from both informants, 53% receiving information from mothers only, and 14% receiving information from the teacher only. Cohen's Kappa was in line with previous work, $\kappa = 0.11$, $p < 0.05$ (25–28). Although this agreement is relatively low, as highlighted by previous work (25), it is also consistent with agreement between informants in the context of behavioral and emotional problems (29).

Image Acquisition

Neuroimaging data were collected on a study-dedicated, 3-Tesla MRI system (MR-750W, General Electric, Milwaukee, WI, US) using an eight-channel, receive-only head coil (24). Before scanning, children underwent a mock scanning session in order to familiarize them with the procedure and scanning environment. High-resolution, T_1-weigthed structural MRI data were acquired using a coronal inversion recovery fast spoiled gradient recalled sequence with the following parameters: GE option BRAVO, T_R = 8.77 ms, T_E = 3.4 ms, T_I = 600 ms, flip angle = 10°, matrix size = 220 × 220, field of view = 220 mm × 220 mm, slice thickness = 1 mm, number of slices = 230, ARC acceleration factor = 2.

Image Processing

Images were processed using the FreeSurfer version 6.0 analysis suite (30). First, DICOM data were converted to "MGZ" file format using the FreeSurfer "mri_convert" tool. The standard reconstruction was then conducted, where nonbrain tissue was removed, voxel intensities were corrected for B_1 field inhomogeneities, voxels were segmented into white matter, gray matter, and cerebral spinal fluid, and surface-based models of white matter and gray matter were generated. Subcortical structures were automatically labeled, and volumes in cubic millimeter were extracted for the hippocampus and amygdala for this study. Cortical thickness was estimated at each point (vertex) along the cortical ribbon, and each point was also automatically assigned an anatomical label according to a predefined atlas (31). Thickness data for each participant were coregistered to a standard stereotaxic space and smoothed with a 10-mm full-width half-maximum Gaussian kernel. Cortical surface reconstructions were visually inspected for inaccuracies (32), and 16% of the scans were labeled as inadequate for data analyses.

Covariates

Date of birth and sex were determined from medical records obtained at birth, and child ethnicity was defined based on the birth country of the parents. Maternal education level, a proxy for socioeconomic status, was assessed by questionnaire. Child nonverbal IQ was estimated using subtests from the Snijders–Oomen nonverbal intelligence test at the age-6 assessment (33). Lastly, child psychiatric symptoms were assessed using the parent-report Child Behavior Checklist (CBCL) administered at the age-10 assessment. The CBCL is a 100-item parental report of child behavioral and emotional problems which uses a Likert response format. The CBCL assesses a variety of domains, including internalizing (e.g., depressive/anxiety symptoms) and externalizing (e.g., attention problems). The square root transformed sum of all items (Total Problem Score) was utilized (34). For supplemental analyses (see statistical section below), additional covariates were tested for their impact on model estimates. First, for analyses involving targets of bullying, the CBCL Broadband Internalizing scale was used, as it focuses on emotional problems more common in this group. With the same rationale, the CBCL Broadband Externalizing scale was added in analyses of perpetrators of bullying. In order to rule out that childhood trauma explained any observed associations, exposure to physical and sexual abuse, derived from a retrospective parental-report of life events, was included. Briefly, a dichotomous (exposed/unexposed) variable was created if any of four items related to physical and sexual abuse were endorsed (35). Lastly, body mass index, estimated from height and weight measured at the age-6 assessment and normalized in accordance to Dutch growth curves for age and sex, was also included as a covariate in supplemental analyses.

Statistical Analysis

Analyses were run using the R statistical software [version 3.4.3 (36)]. Multiple linear regression was used for analyses of hippocampal and amygdala volume. A custom in-house package was developed to run multiple linear regression at each cortical vertex ("QDECR," https://github.com/slamballais/QDECR). A dichotomous variable for each of the three groups (perpetrator, target of bullying, and perpetrator–target) was created and reference coded to the individuals uninvolved in bullying. Regression analyses were run in three steps to adjust for potential

confounding factors. All three models are presented in order to show the impact different confounding factors have on regression coefficients, with large changes in estimates indicative of the potential for residual confounding (remaining bias in estimates). Furthermore, as different neuroimaging studies often have limited data on various confounding factors, presenting analyses in this way allows for maximal comparison with existing/new literature, for example in the frequent case when only age and sex are available. Primary analyses were adjusted for age at MRI scan, sex, and child ethnicity (model 1). Additional analyses were run by further adjusting model 1 for maternal education and child nonverbal IQ (model 2). Lastly, to determine whether results were explained by child behavior problems, model 2 was additionally adjusted for child behavior problems (model 3).

In order to ascertain to what extent the perpetrator–target classification influenced results, sensitivity analyses were run where the perpetrator–target category was not considered. These children were dichotomously classified as targets of bullying or perpetrators. In further sensitivity analyses, continuous sum scores of bullying involvement were entered into regression models in order to complement categorical analyses. In order to determine whether observed associations were different between boys and girls, models were also run with a perpetrator group-by-sex interaction term. As internalizing problems are more often related to victimization and externalizing problems are more often related to perpetrator behavior, sensitivity analyses were run for model 3 where the CBCL total problems score was replaced with either the broadband internalizing score (targets of bullying) or the broadband externalizing score (perpetrators). Lastly, in order to rule out other potential confounding factors, exposure to traumatic events as well as body mass index were added to model 3 to ensure these factors did not account for any observed associations.

Given the large number of statistical tests, analyses were adjusted for multiple comparisons using Gaussian Monte Carlo simulations (37). Clusterwise p values were Bonferroni corrected for two hemispheres ($p < 0.025$), and, as it has shown high correspondence with actual permutation testing at the smoothing kernel used, a cluster-forming threshold (CFT) of $p = 0.001$ was selected for significance testing (38). As this threshold may be conservative, in line with genome-wide association studies, a "suggestive" yet still strict CFT was also employed ($p = 0.005$ CFT). For illustrative purposes, different CFTs are also displayed in figures and tables when a cluster was significant at the suggestive CFT 0.005 or below.

Missing Data

Data were missing on covariates in a subset of participants for ethnicity, maternal education, nonverbal IQ and behavioral problems. In all cases, missingness was <11%. In order to retain the largest possible sample for linear regression analyses, these missing data were imputed utilizing the "mice" (multiple imputation by chained equations) package for multiple imputation (39). A number of variables that are correlated with these covariates were used in the imputation process. With 100 iterations, a total of 30 imputed datasets were generated, and results were pooled at each vertex using established methods (40).

Nonresponse

Nonresponse was described with two sets of analyses: first, a comparison with children who participated in the age-6 assessment (roughly the age when the bullying assessment was conducted) but do not have MRI data at age 10 and, second, a comparison with children who participated in the MRI study but were excluded from analyses (e.g., due to poor data quality). Children who participated in the age-6 assessment but not in the current study had lower IQ ($M_{MRI} = 104$, $M_{nonresponder} = 99$, $p < 0.05$), higher total behavioral problem scores ($M_{MRI} = 16.7$, $M_{nonresponder} = 18.5$, $p < 0.05$), were less likely to be Dutch ($P_{MRI} = 64\%$, $P_{nonresponder} = 53\%$, $p < 0.05$), and their mothers were less likely to have acquired higher education ($P_{MRI} = 63\%$, $P_{nonresponder} = 52\%$, $p < 0.05$). Similarly, children who were excluded from the present study (e.g., because of motion artifact or missing a bullying assessment) tended to also have lower IQ ($M_{MRI} = 104$, $M_{excluded} = 100$, $p < 0.05$), higher total CBCL problem scores ($M_{MRI} = 16.7$, $M_{excluded} = 18.3$, $p < 0.05$), less likely to be Dutch ($P_{MRI} = 64\%$, $P_{excluded} = 52\%$, $p < 0.05$), and their mothers were less likely to have acquired higher education ($P_{MRI} = 63\%$, $P_{excluded} = 54\%$, $p < 0.05$).

RESULTS

Girls represented 51% of the sample, and children were on average 10.1 years (range, 8.5–11.9) old at the MRI visit. Based on parent report (mean age of child, 8.1 years; range, 7.5–9.9 years) and/or teacher report (mean age of child, 6.6 years; range, 4.6–9.6 years), 92 children (3.5%) were frequently involved as targets of bullying, 82 as perpetrators (3.2%), 47 as perpetrator–targets (1.8%), and 2,382 (91.5%) were uninvolved in frequent bullying. **Table 1** provides a detailed overview of the sample characteristics.

Targets of Bullying

Whole-brain vertex-wise analyses of cortical thickness showed that children identified as targets of bullying had thicker cortex in the left fusiform gyrus compared to those uninvolved in frequent bullying (**Figure 2**, **Table 2**). Results remained highly consistent across model 1 ($B = 0.107$, SE = 0.027, size = 312 mm^2, $p_{CFT} = 0.001$, adjusted for age, sex, and ethnicity), model 2 ($B = 0.108$, SE = 0.027, size = 312 mm^2, $p_{CFT} = 0.001$, additionally adjusted for child IQ and maternal education level), and model 3 ($B = 0.110$, size = 290 mm^2, $p_{CFT} = 0.001$, additionally adjusted for child behavioral problems), suggesting minimal residual confounding through various categories of covariates (**Table 2**). Results remained highly consistent when additionally adjusting model 3 using the broadband internalizing scale rather than the total problems scale ($B = 0.107$, SE = 0.027, size = 307 mm^2, $p_{CFT} = 0.001$). In addition, adjusting model 3 for exposure to traumatic life events ($B = 0.107$, SE = 0.027, size = 295 mm^2, $p_{CFT} = 0.001$) or for body mass index ($B = 0.108$, SE = 0.027, size = 279 mm^2, $p_{CFT} = 0.001$) did not change the results (**Supplemental Table S2**). A sex-by-target of bullying interaction term showed no significant clusters, suggesting the association is similar in boys and girls.

In additional analyses utilizing a two-group (perpetrator or target of bullying) classification, results remained unchanged,

TABLE 1 | Sample Characteristics.

	All	Target	Perpetrator	Perpetrator–target
	***N* = 2,602**	***N* = 92**	***N* = 82**	***N* = 47**
Age MRI	10.096 ± 0.57	10.052 ± 0.51	10.115 ± 0.61	10.098 ± 0.63
Girl, *N* (%)	1,325 (51)	39 (42)	22 (27)	19 (40)
IQ	103.66 ± 14.64	104.716 ± 16.41	100.706 ± 15.33	103.049 ± 15.88
Ethnicity, *N* (%)*				
Dutch	1,655 (64)	59 (64)	39 (49)	27 (59)
Other Western	232 (9)	12 (13)	2 (2)	3 (6)
Non-Western	693 (27)	21 (23)	39 (49)	16 (35)
Maternal Education, *N* (%)*				
Primary/Secondary	879 (37)	29 (33)	38 (55)	15 (36)
Higher	1,524 (63)	58 (67)	31 (45)	27 (64)

*Note: Values represent mean ± standard deviation unless otherwise noted. *Owing to missing data, some cells do not sum to complete sample size.*

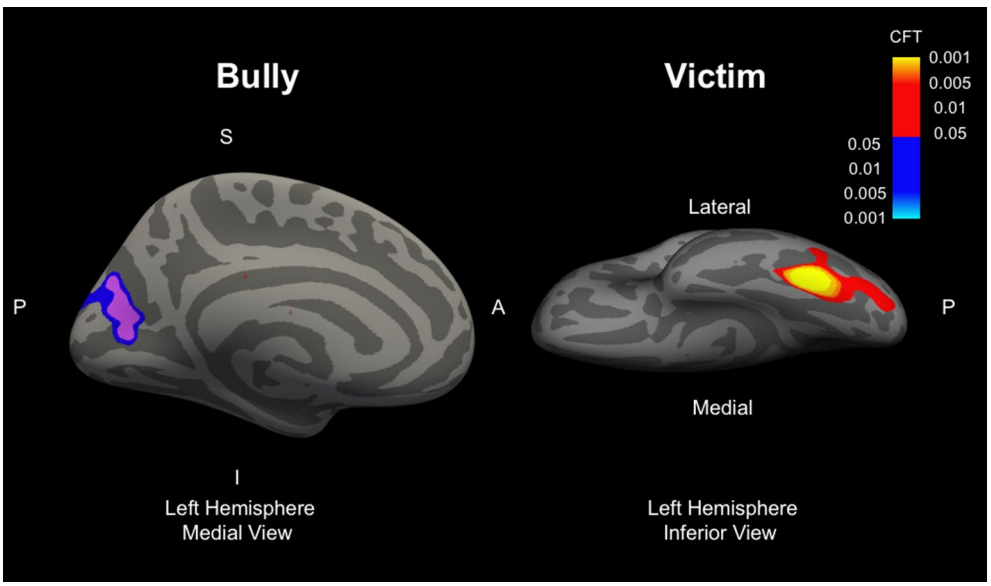

FIGURE 2 | Images represent the left hemisphere clusters for perpetrators (left panel, view from medial side of the brain) and targets of bullying (right panel, view from inferior side of brain). Clusters represent areas which are different from children uninvolved in bullying (reference group). Models included one term for each of the three groups (perpetrators, targets, perpetrator–targets) all in the same model, and all reference coded to those uninvolved in bullying. S, superior, P, posterior, A, anterior, I, inferior, CFT, cluster-forming threshold. Red–yellow colors refer to thicker cortex, blue–light blue colors refer to thinner cortex.

suggesting the smaller perpetrator–target category did not influence results. When using a continuous sum score of victimization rather than categorical groupings, a similar cluster appeared in the fusiform gyrus, where high scores on victimization were related to thicker cortex ($p_{\text{uncorrected}} = 0.0001$, **Supplementary Figure S1**). However, this result did not remain after correction for the stringent multiple comparisons threshold. Lastly, no difference was observed in hippocampal or amygdala volume.

Perpetrators

Children classified as perpetrators showed a thinner cortex in the cuneus at the "suggestive" threshold after correcting for multiple comparisons ($p_{\text{CFT}} = 0.005$) but not at the more stringent threshold ($p_{\text{CFT}} = 0.001$) and not fully adjusted for all covariates (i.e., model 3). Results remained consistent across the basic (model 1, $B = -0.077$, size = 501 mm^2, $p_{\text{CFT}} = 0.005$) and adjusted model (model 2, $B = -0.084$, size = 435 mm^2, $p_{\text{CFT}} = 0.005$), although disappeared when adjusting for child behavioral problems (**Table 2**). Additional analyses using a two-group classification (i.e., omitting the perpetrator–target category) showed consistent results. However, the cuneus cluster was not present when bullying involvement was examined continuously. Lastly, no difference was observed in hippocampal or amygdala volume.

Perpetrator–Targets

No differences in cortical thickness were observed between perpetrator–targets and those uninvolved in bullying after correcting for multiple comparisons. Furthermore, no difference was observed in hippocampal or amygdala volume.

TABLE 2 | Results from whole-brain cortical thickness analyses.

Group	Model	MNI_X	MNI_Y	MNI_Z	CFT	B	SE	*N* Vertices	Area (mm^2)
Target	1	−40.5	−54.8	−20.3	0.05	0.076	0.027	2,073	1,404
					0.01	0.093	0.026	839	550
					0.005	0.098	0.027	696	451
					0.001	0.107	0.027	488	312
	2	−40.5	−54.8	−20.3	0.05	0.076	0.027	2,083	1,412
					0.01	0.093	0.026	848	556
					0.005	0.099	0.026	702	456
					0.001	0.108	0.027	488	312
	3	−40.7	−53.9	−20.2	0.05	0.076	0.027	2091	1423
					0.01	0.094	0.026	823	539
					0.005	0.100	0.027	677	439
					0.001	0.110	0.027	455	290
Perpetrator	1	−14.8	−69.5	15.3	0.05	−0.067	0.027	2,206	1,418
					0.01	−0.074	0.026	1,139	689
					0.005	−0.077	0.027	840	501
	2	−14.8	−70	15.6	0.05	−0.072	0.027	2,158	1,389
					0.01	−0.081	0.026	1,030	615
					0.005	−0.084	0.027	735	435
	3	−14.8	−70	15.6	0.05	−0.072	0.027	2,004	1,292
					0.01	−0.081	0.027	839	496

Model 1 is adjusted for age at MRI, sex, and ethnicity. Model 2 is additionally adjusted for child IQ and maternal educational level. Model 3 is additionally adjusted for child psychiatric symptoms. MNI, Montreal Neurological Institute Coordinates, CFT, cluster-forming threshold for correction for multiple comparisons, B, unstandardized regression coefficient, N Vertices, number of vertices in cluster, Area, surface area of cluster.

DISCUSSION

This large population-based study demonstrates differences in cortical morphology in children involved in bullying. Specifically, children identified as targets of bullying showed thicker cortex in the fusiform region compared to children uninvolved in bullying. The results demonstrate a new link between bullying involvement and structural brain morphology. Importantly, the results also provide an integral starting point for future work examining how cortical brain morphology relates to the persistent social and mental health problems that accompany those involved in bullying.

Children who were frequently victimized by perpetrators showed thicker cortex in the fusiform gyrus. This area, also part of Brodmann area 37, has been implicated in a wide array of functions, including facial and emotion processing, language, and theory of mind. Thicker cortex in this region could therefore be related to how targets of bullying perceive or recognize the faces of their aggressors. Interestingly, individuals with social anxiety disorder have been shown to exhibit differential neural activity to fearful as well as threatening faces (41, 42). A similar extension could be drawn to targets of bullying, where a sensitivity to certain facial expressions (e.g., angry/aggressive) could develop as a consequence of bullying. Alternatively, language ability has previously been proposed as a potential risk factor for targets of bullying, where children with underdeveloped language skills have been shown to be bullied more often (43, 44). As the fusiform gyrus has been implicated in aspects of verbal fluency (45), it is also possible that thicker cortex here represents a delayed development of language ability, which could in turn translate into a risk factor for bullying. Importantly, classification of targets of bullying was defined as being bullied once per week or more, which denotes frequent bullying involvement. When victimization was treated continuously rather than categorically, a similar cluster was observed, which suggests that such features of the fusiform may track into less frequently bullied children. Although the fusiform gyrus has been implicated in psychopathology (41), the current study was not able to determine whether it plays a mediating role in the development of psychopathology, as recent work has shown with other brain regions (21). Importantly, brain morphology linked to involvement in bullying may later manifest in other, more distant brain regions through atypical development of functional connectivity; such a downstream pathway may instead explain the persistent mental health and social problems experienced later in life.

At a conservative threshold for multiple testing correction, no differences were observed in cortical thickness in those classified as perpetrators. However, at a "suggestive" *p* value threshold and in models not adjusted for total psychiatric problems, a thinner cortex in the cuneus area was observed in those identified as perpetrators compared to those uninvolved in bullying. Part of the occipital lobe, the cuneus, is involved in various aspects of visual processing. A section of the cuneus has also often been implicated in the default mode network, one of the most commonly derived networks in resting-state functional MRI. Thus, future efforts should explore to what extent the default mode network is implicated in those involved in bullying. However, importantly, as this association was not significant in analyses where bullying was quantified continuously and was only observed at a relaxed correction for multiple testing, these results should be interpreted cautiously in the absence of external replication.

Interestingly, in children identified to be involved as perpetrator–targets, no differences were observed in cortical thickness. Given this group of children has the overall poorest prognosis, with higher rates of psychopathology and other

problems later in life (25, 46, 47), this lack of difference in brain morphology is contrary to our *a prior* hypothesis. One potential explanation may lie in the sample size of this subgroup; it was the smallest group, with only 47 children, potentially limiting our ability to detect any differences. Conversely, there is likely considerable heterogeneity in any underlying morphological features in this group, suggesting that subtypes of bullying involvement may be important for brain development, or that other analytical methods may be necessary to detect differences (48).

Brain morphology has also been studied in the context of early life stress, trauma, maltreatment, and other experiences (49–53). Differences across studies in terms of findings, methods used, and populations examined make summarizing the literature a challenge, although some interesting patterns emerge. Associations with the amygdala and hippocampus are certainly a common theme, although findings have been inconclusive (50, 54–56). One central theory that aims to explain such deviations in brain development revolves around chronic stress exposure (57), and given the density of stress hormone receptors in the hippocampus, it may be particularly sensitive. Interestingly, no differences were found in this study in children who were targets of bullying. Timing of early-life exposures may be of particular relevance (14), which could explain why no association was found. Specifically, children may have been exposed to bullying behavior at varying times and durations, leading to heterogenous changes limbic brain structures that are difficult to detect, or may emerge later in life.

One important consideration of this study is the temporality of the brain–behavior relationship. As this study is based on a single neuroimaging assessment, it is not possible to delineate whether differences observed in cortical thickness develop before or after children become involved in bullying. In the context of targets of bullying, both scenarios are plausible. Targets of bullying could show differential fusiform development over time, either as an adverse consequence of bullying or even as a compensatory mechanism resulting from exposure to such behavior. Alternatively, such features of the fusiform gyrus could be present before the exposure to bullying, potentially acting as a predisposing factor. An example of such a mechanism can be found in the preceding paragraph discussing language ability; children with poor language abilities may be more prone to exposure to bullying. Future studies with longitudinal designs will allow for the determination of where on the neurodevelopmental trajectory they lie.

The established link between bullying involvement and persistent social and psychiatric problems later in life suggests the potential for a related and underlying neurobiological substrate. A similar construct has been proposed in the context of child maltreatment (10). Recent work has shown evidence for such a link *via* the basal ganglia (21). Alterations in the fusiform that potentially result from bullying could explain some facets of a given psychiatric disorder, for example altered cortical activity in individuals with anxiety disorder in response to emotional face processing (41) or emotionally valent images in individuals with depression (58). Importantly, brain alterations related to bullying involvement during childhood, which eventually co-occur with psychiatric sequela later in life, may require special consideration in future brain imaging research; the underlying neurobiology may be unique to bullying involvement and not necessarily common or etiological to the psychiatric symptomatology or overarching disorder. Such a phenomenon of an early life adversity leading to a particular brain alteration which co-occurs with psychiatric symptoms could explain some of the heterogeneity in the psychiatric neuroimaging literature and thus the lack of robust imaging biomarkers (59, 60).

Utilizing one of the world's largest pediatric neuroimaging cohorts, we were able to examine the structural neural correlates of bullying involvement. Accompanying the power from this large sample size is the improved generalizability of the findings resulting from the population-based sampling, both in the reference group (those not involved in bullying) as well as in the groups exposed to bullying. Given the prospective and broad nature of the cohort, crucial information on potential confounding factors was also available. However, despite these clear strengths, some limitations warrant discussion. First, as described above, this study lacks repeated measurements of both bullying and brain imaging, and the assessment of bullying involvement takes place at a different age (i.e., before) than the MRI assessment. Longitudinal data will be crucial in delineating the precise temporal sequence of events and offer a crucial developmental perspective. Also of important note is the nonresponse analysis, which showed that the subsample children included in this study on average had slightly different characteristics compared with the full sample (e.g., 4 IQ points higher), suggesting some selection effects. Another broad issue in research on bullying involvement is related to how the data are characterized (e.g., continuous vs. categorically, frequency of involvement, etc.), which may impact results. Future work may also continue to explore latent constructs or latent classes of bullying involvement, which may offer additional insight by data-driven incorporation information (21). Lastly, this study relied on parent- and teacher-reported measures of bullying involvement, rather than child self-reports. Although parents and teachers have been shown to be reliable informants of bullying involvement, other strategies, such as peer nomination (61) and self-reporting, likely provide information with added value on bullying involvement, as victimization has been shown to be underreported in the absence of self-report (62).

This study demonstrates a link between bullying involvement and brain morphology in school-age children. In particular, children who are victimized by perpetrators have thicker cortex when compared to those uninvolved in bullying. These data offer evidence of disrupted cortical morphology in those involved in bullying and may offer cues to future work investigating the neurobiological underpinnings of associated and persistent problems later in life. Future work should utilize longitudinal neuroimaging data to concretely ascertain the different developmental trajectories involved.

DATA AVAILABILITY

The datasets generated and/or analyzed during the current study are not publicly available due to legal and ethical regulations, but may be made available upon request to the Director of the Generation

R Study, Vincent Jaddoe (v.jaddoe@erasmusmc.nl), in accordance with the local, national, and European Union regulations.

ETHICS STATEMENT

The Medical Ethics Committee of the Erasmus Medical Center approved all study procedures, and all parents and children provided written informed consent and assent, respectively.

AUTHOR CONTRIBUTIONS

RLM and HT developed the project and drafted the manuscript. RHM and SL collected data. RLM, RHM, SL, AC, TW, and HM conducted quality assurance of the data. RLM and SL conducted statistical analyses and developed software. RHM, SL, AC, PJ, BG, MV, MH, TW, and HM interpreted results and helped to draft and critically revise the manuscript. HT oversaw all aspects of the project.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyt.2019.00696/full#supplementary-material

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The Independent and Cumulative Effects of Sibling and Peer Bullying in Childhood on Depression, Anxiety, Suicidal Ideation, and Self-Harm in Adulthood

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Sibling and peer bullying are reported as the most frequent forms of violence experienced across childhood. There is now ample evidence indicating an association between sibling and peer bullying, with those reporting sibling bullying at an increased risk of peer bullying. While there is convincing evidence of a causative association between peer bullying and a range of mental health outcomes, sibling bullying continues to receive far less attention. The aim of this study was to explore whether sibling bullying roles (non-involved, victim, bully-victim, bully) in middle childhood were independently associated with clinical diagnoses of depression and anxiety and reports of suicidal ideation and self-harm in early adulthood. We further tested whether there was a cumulative relationship between involvement in sibling and peer bullying victimization. This study was based on up to 3,881 youth from the Avon Longitudinal Study of Parents and Children, a prospective birth-cohort based in the United Kingdom. Sibling and peer bullying was assessed *via* self-report when youth were 12 years of age, while depression, anxiety, suicidal ideation, and self-harm were assessed *via* self-administered computerized interviews at 24 years of age. Involvement as a sibling bully-victim was associated with clinical diagnosis of depression (OR = 1.91, 95% CI: 1.33–2.72), while sibling victims were at increased odds of both suicidal ideation (OR = 1.52; 95% CI, 1.16–1.98) as well as suicidal self-harm (OR = 2.20, 95% CI, 1.36–3.58) in early adulthood, even after accounting for concurrent peer bullying and a range of other pre-existing childhood confounders. Sibling and peer bullying were further associated in a homotypic manner. A dose–response relationship of bullying in the home and school across mental health outcomes was found. Youth victimized by both their siblings and peers displayed the highest odds of developing clinical depression, suicidal ideation, and self-harm. Children bullied at home and at school had no safe place to escape the bullying and torment. Our findings highlight the

need for intervention studies tailored toward reducing sibling bullying, as these may hold large promise for alleviating a range of adverse outcomes, including the prevention of peer bullying, which may be contingent on early bullying experiences in the home environment.

Keywords: siblings, bullying, depression, anxiety, self-harm, ALSPAC

INTRODUCTION

Bullying occurs in social situations where a person cannot choose the peers they are interacting with and are instead "caged" together in an environment such as a school classroom or the work place. The prime example in which a child becomes "caged" together with others and is unable to leave or escape this environment is with siblings, in the family. Thus, repeated unwanted aggressive behavior by a sibling that intends to inflict harm either physically, psychologically, or socially and involves an imbalance of power is called sibling bullying (1). Peer and sibling violence have been reported as the most frequent forms of violence experienced across childhood exceeding any violence by adults (2, 3). While there is increased recognition of the adverse effects of peer bullying, sibling bullying is still largely perceived as normative behavior across development (4, 5) and continues to receive far less attention as opposed to peer bullying (6).

In the peer literature, there is now convincing evidence of a causative association between peer bullying and depression, anxiety and self-harm (7–11). The general consensus from the literature suggests that peer victims are at increased risk of internalizing disorders, whereas peer bullies are at increased risk of externalizing disorders, with peer bully-victims suffering the greatest adult consequences, including both more internalizing and externalizing disorders (12). Findings from meta-analyses indicate that involvement in any peer bullying increases the risk of suicidal ideation and behavior (13), whereas peer victimization, in contrast to peer bullying perpetration, has specifically been associated with an elevated risk of anxiety disorders, depression, self-harm, suicidal ideation, and attempts (10, 11), even after accounting for other major childhood risk factors, trauma and genetic liability (14). In contrast, research on the adverse outcomes of sibling bullying is still in its infancy. There is an emerging body of research linking sibling bullying in childhood to a range of internalizing and mental health problems both concurrently and prospectively (6, 15–22).

To the best of our knowledge there has only been one previous prospective study exploring the relationship between sibling bullying and the risk of depression, anxiety, and self-harm. Using a sample of over 6,900 children from the Avon Longitudinal Sample of Parents and Children (ALSPAC) in the UK, Bowes et al. (16) found that sibling bullying victimization increased the risk of depression, anxiety, and self-harm two-fold, with results remaining similar in strength for depression and self-harm even after accounting for a range of childhood confounders. Replications of such findings have been limited to cross-sectional designs. For instance, Coyle et al. (6) found that sibling bullying victimization was associated with increased risk for anxiety and depressive symptoms, over and beyond the experience of peer bullying in a sample of 372 US students. Similarly, Bar-Zomer and Klomek (15) reported an association between involvement in any kind of sibling bullying (victimization and perpetration) and greater risk for depression and suicidal ideation, using a sample of 279 Israeli students. In order to consolidate these findings, future replications are needed using prospective studies in large samples.

A further caveat of the literature is the lack of studies exploring the differential outcomes according to sibling bullying status groups. Children are typically classified into one of four bullying groups: non-involved, victims, bully-victims or bullies. These classifications are important, as children have been found to experience differential mental health and behavioral outcomes depending on their role in sibling bullying (17, 18, 23). In the peer literature, bully-victims have been reported to be at a particular risk of developing mental health problems, especially in relation to depression, anxiety and suicidality (7, 9, 24, 25). Research exploring differential outcomes in relation to sibling bullying roles is scant. Only a handful of studies suggest a similar trend for sibling bully-victims for internalizing problems (18), psychotic disorders (23) as well as high-risk behavior (17). There are however, no previous studies that have tested whether sibling bullying involvement is differentially associated with depression, anxiety, suicidal ideation or self-harm depending on the sibling bullying role. Previous research has either focused solely on sibling bullying victimization (6, 16) or has combined victimization and perpetration into the same underlying construct, without teasing out the mutually independent groups (15). Hence, there is a pressing need for prospective studies to explore the relationship between involvement in different sibling bullying roles and depression, anxiety, suicidal ideation, and self-harm.

Finally, there is now robust evidence indicating an association between bullying across the home and school context, with those children reporting sibling bullying found at an increased risk of peer bullying involvement (26–29). The association has been, where investigated, found to be homotypic with victims of sibling bullying also more likely to be victims in peer bullying and bullies and bully/victims more often perpetrators or bully/victims in peer relationships (27). Furthermore, experimental research indicates that those involved in sibling aggression in toddlerhood are more likely to also use aggressive strategies with peers 18 months later (30). Thus, sibling bullying appears to precede peer bullying involvement. In other words, those children who are victims at home are more likely to be victims at school and may therefore have no safe space to escape the bullying. Hence, the negative effects of trauma have been reported

to be additive (14). Indeed, there is some evidence suggesting a cumulative risk of involvement in both sibling and peer bullying with a range of adverse outcomes including clinically significant behavioral outcomes and mental health distress (19, 20, 26, 29). Findings using longitudinal data have furthermore found that children involved in bullying across the sibling and peer context are at increased risk of psychotic disorder (23) as well as high-risk behavior (17) lasting until early adulthood. It is unknown, whether the there is a similar longitudinal dose-effect relationship between involvement in both sibling and peer bullying in childhood with depression, anxiety, suicidal ideation or self-harm into early adulthood.

In summary, there is an urgent need for prospective longitudinal studies that investigate both sibling and peer bullying and that distinguish the differential effects of involvement in sibling bullying as victims, bully-victims, or bullies compared to non-involved children. Such prospective designs may further help determine the individual and joint additive or moderating effects of sibling versus peer bullying on depression, anxiety, suicidal ideation, and self-harm, while controlling for pre-existing mental health problems and other confounders at the same time.

This study builds on previous work conducted by Bowes et al. (16) incorporating a new wave of data collection on clinical diagnosis of depression and anxiety disorder, suicidal ideation, and self-harm a further 6 years on at 24 years of age. We addressed the following research question: (1) Are sibling bullying roles (non-involved, victim, bully-victim, bully) differentially associated with depression, anxiety, suicidal ideation, and self-harm in late adolescence (at 18 years) and early adulthood (at 24 years)? (2) Does sibling bullying predict depression, anxiety, suicidal ideation, and self-harm in early adulthood over and above peer bullying? (3) Is there a cumulative relationship between sibling and peer bullying in middle childhood and depression, anxiety, suicidal ideation, and self-harm in early adulthood?

METHOD

Study Design

This study draws on data from the Avon Longitudinal Study of Parents and Children (ALSPAC). Pregnant women residing in Avon, UK with expected dates of delivery from 1st April 1991 to 31st December 1992 were invited to take part in the study. The initial number of pregnancies enrolled in the study was 14,541, which included all women who had completed and returned at least one questionnaire or attended one of the 'Children in Focus' clinic sessions. There were a total of 14,062 live births and 13,988 children were alive at 1 year of age. Participant data has been collected on the mothers, fathers and children from early pregnancy and has been measured *via* questionnaires and regular clinic visits. Children have been invited to attend a total of 10 assessment clinics, including face-to-face interviews and psychological and physical tests, from age 7 years onward. Detailed reports on the recruitment and enrollment processes of the mother and child cohort are available in the cohort profiles (31–33). Part of this data was collected using REDCap (https://projectredcap.org/resources/citations/). Please note that the study website contains details of all the data that is available through a fully searchable data dictionary and variable search tool (http://www.bristol.ac.uk/alspac/researchers/our-data/).

Ethical approval for the study was obtained from the ALSPAC Ethics and Law Committee (IRB No. 00003312) and the local research ethics committees (Bristol and Weston Health Authority, Southmead Health Authority and Frenchay Health Authority). Informed consent for the use of data collected *via* questionnaires and clinics was obtained from participants following the recommendations of the ALSPAC Ethics and Law Committee at the time.

Sample

At the 12-year assessment questionnaires were sent out to 11,132 eligible families of which 7,505 (67.4%) were completed and returned. Children without siblings (N = 477; 6.4%) were excluded, resulting in a starting sample of 6,928 youth who completed detailed questions on sibling bullying when they were on average 12.1 years old. Outcome data was available for up to 3,881 adolescents at 24 years. We further omitted participants who presented any psychiatric diagnosis (DSM-IV Axis I diagnoses; N = 475) prior to our measure of exposure (sibling bullying) throughout our all analysis. An illustration of our complete data sample across each outcome measure is provided in **Figure 1**.

Assessment of Sibling Bullying

Sibling bullying was assessed *via* an adapted version of the Olweus Bullying Questionnaire (18, 34) when children were approximately 12 years of age. Youth were first told that they would be asked a series of questions about sibling bullying explaining that this meant when a brother or sister 'tries to upset [them] by saying nasty and hurtful things, or completely ignores [them] from their group of friends, hits, kicks, pushed, or shoves [them] around, tells lies or makes up false rumors about [them]'. Youth were asked to report whether they had ever been bullied by a sibling at home in the past 6 months *via* a 5-point Likert-scale (0 = never; 1 = only ever once or twice; 2 = 2 or 3 times a month; 3 = about once a week; 4 = several times a week). Youth were then asked to report on their experience of specific types of sibling bullying *via* 6 items, including physical (hitting, kicking or shoving), psychological (being called nasty names; making fun of), property-based (having belongings damaged or taken) and social (excluding; telling lies or spreading rumors), using the same 5-point Likert scale. In order to determine the frequency of sibling bullying victimization, the highest reported frequency across all items was used. Youth were also asked about sibling bullying perpetration, using the same method described above. The internal consistency (Cronbach's alpha) across victimization (a = .80) and perpetration items (a = .74) was found to be high.

Youth were also classified into one of four sibling bullying roles (non-involved, victim, bully-victim, bully) using a cut-off of frequent sibling bullying (at least once a week). Youth reporting no bullying at all *or* bullying experiences less than once a week were categorized as 'non-involved'. Youth reporting frequent victimization only were categorized as 'victims'. Youth reporting frequent perpetration only were categorized as 'bullies.

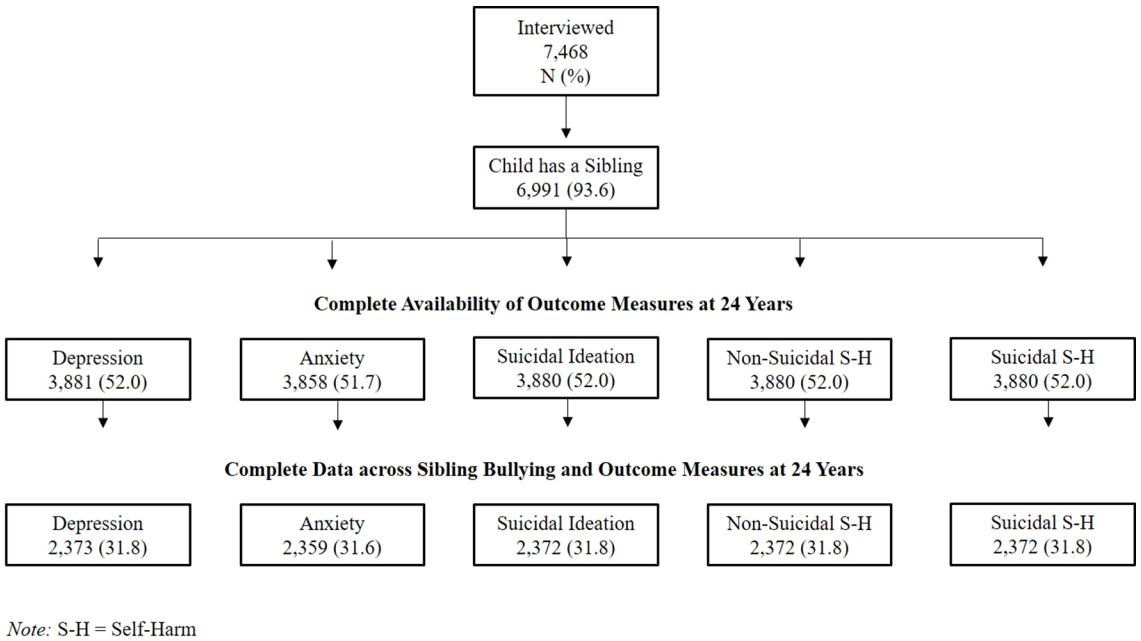

FIGURE 1 | Flowchart of sample size distribution across outcome measures at 24 years.

Youth reporting *both* frequent victimization and perpetration were categorized as 'bully-victims'.

Assessment of Peer Bullying

Peer bullying was assessed *via* a modified version of the Bullying and Friendship Interview Schedule (35) when children were 12 years of age. Youth were told that they would be asked a few questions about school, explaining that some 'children are sometimes picked on, threatened, hit or beaten by other children' and that 'these children can be in [their] class or [they] can meet them in the school playground or on [their] way to school'. Youth were asked to report on their experience of direct and indirect victimization in the past 6 months *via* a 4-point Likert-scale (0 = never; 1 = 1-3 times; 2 = 4 or more times; 3 = at least once per week). Direct victimization was assessed *via* 5 items (hitting or beating; threatening or blackmailing; taking personal belongings; tricking in a nasty way; calling bad/nasty names), while indirect victimization was assessed *via* 4 items (telling lies or nasty things about them; spoiling games; excluding to upset them; pressuring them to do things they don't want to). Victimization was coded present if youth reported any of the bullying behavior occurring at least four or more times in the past 6 months. Youth were also asked about peer bullying perpetration, using the same method described above. Peer bullying groups (victims, bully-victims, bullies) were constructed using a cut-off of frequent peer bullying experiences (>4 times in the last 6 months) using the algorithm as described above for sibling bullying (9).

Outcomes

Outcome measures were collected during two focus clinic sessions. Depression and anxiety were derived *via* the Computerized Interview Schedule — Revised (CIS-R), a self-administered computerized interview which derives a diagnoses based on algorithms according to the International Classification of Diseases, 10th Revision (ICD-10) criteria for depression and anxiety disorder within the time frame of the past 2 weeks. The computerized version of the CIS-R has been found to show close agreement with the interviewer administered version (36, 37). Questions on suicidal ideation and self-harm were based on items used in the Child and Adolescent Self-Harm in Europe (CASE) study (38).

Depression

Depression at 18 and 24 years was assessed according to the severity (frequency, duration and unpleasantness) of the core symptoms of depressive disorders (depression, depressive thoughts, fatigue, sleep and concentration problems) experienced in the last 2 weeks, using algorithms based on ICD-10 criteria, classifying individuals as presenting a mild, moderate or severe diagnosis of depression. A binary variable was constructed (0 = no depression; 1 = mild, moderate or severe depression).

Anxiety

Anxiety at 18 years was assessed according to presence of either one of the following anxiety disorders: generalized anxiety disorder, social phobia, specific/isolated phobia, panic disorder or agoraphobia as derived by algorithms based on ICD-10 criteria of symptoms of anxiety disorders in the last 2 weeks. Anxiety at 24 years was assessed in the same way, with the exception of agoraphobia which was excluded due to the small number of those diagnosed (<5). Positive responses were collapsed into a binary variable (0 = no anxiety; 1 = at least one anxiety disorder), one for anxiety disorder at 18 years and one for anxiety disorder at 24 years.

Suicidal Ideation

Suicidal ideation was assessed at 24 years only *via* 1 item asking participants whether they had ever had thoughts about killing themselves at some point during their lifetime (39). Responses were coded as a binary variable (0 = not present; 1 = present).

Self-Harm

Lifetime history of self-harm was assessed at 18 years and 24 years. At 18 years self-harm was assessed using a binary variable (0 = no self-harm; 1 = self-harm) coded from responses to the following question: "Have you ever hurt yourself on purpose in any way (e.g., by taking an overdose of pills, or by cutting yourself)?" (16). Self-harm at 24 years was assessed *via* 3 items. Participants were first asked whether they had ever hurt themselves on purpose in any way. Those who responded positively to that question were classified as presenting a history of self-harm. Two additional questions were then asked in order to differentiate between those who had self-harmed with suicidal intent from those who had self-harmed without suicidal intent at some point during their lifetime (39, 40). Epidemiological studies have found that there are differences in prevalence, frequency as well as contributing risk factors between self-harm that occurs with an intention to die and self-harm that occurs without an intention to die (40, 41). In order to differentiate between these two forms of self-harm we constructed two binary variables: one reflecting suicidal self-harm (0 = not present; 1 = present) and one reflecting non-suicidal self-harm (0 = not present; 1 = present).

Potential Confounders

Precursors were included as potential confounders if they were assessed prior 8 years of age (self-reported onset of sibling bullying victimization and perpetration).

Maternal depression was assessed at 32 weeks' gestation in pregnancy *via* the Edinburgh Postnatal Depression Scale (42). Birth order was assessed at 7 years and used as a binary variable (0 = later born; 1 = first-born). Internalizing and externalizing problems were assessed *via* the Strengths and Difficulties Questionnaire (SDQ; 43) according to maternal reports when the study child was 7 years. The emotional subscale was used in order to assess internalizing problems, whereas the conduct problems and hyperactivity scales were used in order to assess externalizing problems. Previous mental health was assessed *via* the Development and Well-being Assessment (DAWBA; 44) based on parental reports when children were 7 years old. Children were coded as presenting no DSM-IV Axis I diagnoses (N = 5,697, 90.4%) or one or more DSM-IV Axis I diagnoses of attention deficit hyperactivity disorder, conduct disorder, oppositional defiant disorder, depression, or anxiety (45). Peer bullying at 8 years was assessed *via* the Bullying and Friendship Interview Schedule (35) using the same cut-off criteria as described for peer bullying at 12 years above. Maltreatment was assessed *via* maternal reports and coded as present if mothers reported children's experience of physical or sexual abuse, or if their child had been put into care across three timepoints (18, 30 or 42 months) (16). Domestic violence was assessed *via* maternal reports and coded as present if mothers reported any physical or emotional cruelty from their partner across four timepoints (8, 21, 33 or 47 months) (46).

Statistical Analysis

All analysis was conducted using STATA version 14.0. χ^2 analysis were first performed in order to examine whether there were any sex differences across sibling bullying victimization and perpetration. Further χ^2 tests were then performed in order to test for dependency between sibling and peer bullying involvement across the different roles (**Table 3**).

A set of binary logistic regression analyses were carried out in order to assess whether sibling bullying roles (non-involved, victim, bully-victim, bully) were associated with mental health outcomes. In order to assess the crude associations between sibling bullying roles and depression, anxiety and self-harm at 18 years (late adolescence) a set of three binary logistic regression models were run (see **Table 4**). In order to assess the crude associations between sibling bullying roles and depression, anxiety, suicidal ideation, and self-harm (with and without suicidal intention) at 24 years (early adulthood) a set of five binary logistic regression models were run (see **Table 5**). Odds ratios (OR) and 95% confidence intervals (CI) are reported.

Next, we tested whether bullying victimization across multiple contexts (home and school) would result in a cumulative risk of a diagnosis of depression, anxiety disorders, suicidal ideation or self-harm in early adulthood (see **Table 5**). Sibling or peer bullying victimization was considered present if children qualified as either a victim or a bully-victim. An ordinal variable was created for sibling and peer bullying victimization (non-involved, either or both). Separate binary logistic regression models were run for each one of the outcome measures, reflecting the crude associations.

Bonferroni corrections were applied across our models in order to account for multiple testing and guard against type I error (47).

In order to account for missing data by attrition, we applied fully conditional specification equations as implemented in Multiple Imputations by Chained Equations algorithm (MICE) in STATA 14 ("mi impute" command). An averaged parameter estimate of 60 imputed datasets was used according to Rubin's rule (48). In order to improve our model, we included sociodemographic variables as auxiliary variables, as these have been associated with missingness in ALSPAC. We then re-ran our initial binary logistic regression models using the imputed dataset, this time including all confounding variables. We further omitted participants who presented any psychiatric diagnosis (DSM-IV Axis I diagnoses according to DAWBA) prior to our measure of exposure (sibling bullying) throughout our regression models in order to additionally guard for reverse causality. Adjusted analyses are found within the same tables as the unadjusted analyses, in order to allow for direct comparisons (**Tables 5** and **6**). We were able to impute up to the same starting sample as seen in our crude logistic regression models.

RESULTS

Prevalence and Characteristics of Sibling and Peer Bullying

Children reported the onset of sibling bullying victimization (M = 8.3, SD = 2.51) and perpetration (M = 8.7, SD = 2.51) around 8 years of age. Females were more often victimized (55.84%), $\chi^2(1) = 6.32$, $p = 0.012$, whereas males were more often the perpetrators of sibling bullying (51.2), $\chi^2(1) = 13.31$, $p < 0.001$. The most frequent types of sibling bullying behavior were either physical (hitting, kicking, pushing or shoving) or psychological (name calling or making fun of). Property-based and social forms of sibling bullying were less common (see **Table 1**).

Sibling bullying (31.2%) was overall reported more frequently compared to peer bullying (27.6%). Most children involved in sibling bullying were bully-victims (N = 914, 13.4%) or victims (N = 878, 12.8%), with bullies making up the smallest group (N = 342, 5%). In contrast, most children involved in peer bullying were victims (N = 1,166, 17.7%), followed by bully-victims (N = 459, 7%) and bullies (N = 192, 2.9%).

Table 2 provides an overview of the prevalence of our mental health outcomes across our overall sample as well as specific to the sibling bullying and peer bullying groups.

TABLE 1 | Frequencies of different types of sibling bullying victimization and perpetration behaviors.

Type of bullying[a]	Victimization N (% of total sample)	Perpetration N (% of total sample)
Hit, kicked, pushed, or shoved	1,015 (31.0)	760 (27.4)
Possessions damaged or taken	210 (6.4)	65 (2.4)
Called names	1,357 (41.3)	945 (33.9)
Made fun of	1,021 (31.3)	562 (20.5)
Ignored or left out of games or social groups	357 (11.0)	227 (8.2)
Told lies or spread rumors	270 (8.3)	54 (2.0)
Bullied in another way	126 (4.3)	42 (1.7)

[a]*All types of sibling bullying are considered present if reported at least once a week.*

Association Between Sibling and Peer Bullying

Sibling and peer bullying were significantly associated ($\chi^2(1) = 179.27$, $p < 0.001$). Multinomial logistic regression analyses revealed a homotypic relationship between sibling and peer bullying. Sibling victim and bully-victim status predicted peer victim status; Sibling bully and bully-victim status was associated with peer bully status; Involvement in any kind of sibling bullying role predicted peer bully-victim status (see **Table 3**).

Associations With Depression, Anxiety, Suicidal Ideation, and Self-Harm

Youth involved as sibling bully-victims in middle childhood were at increased risk for clinical depression (OR = 2.23; 95% CI, 1.54–3.22) and anxiety (OR = 1.72; 95% CI, 1.22–2.41), as well as self-harm (OR = 2.06; 95% CI, 1.7–2.89) in late adolescence at 18 years. Moreover, youth involved as sibling bully-victims in middle childhood were nearly twice the odds of being diagnosed with depression in early adulthood at 24 years (OR = 1.91; 95% CI, 1.33–2.72). Youth experiencing sibling victimization, either as a victim or a bully-victim were further at an increased risk of suicidal ideation (victims: OR = 1.52; 95% CI, 1.16–1.98; bully-victims: OR = 1.54; 95% CI, 1.19–1.99) as well as suicidal self-harm (OR = 2.20, 95% CI, 1.36–3.58) in early adulthood. Associations remained and similar in strength once all childhood confounders were included into the imputed and adjusted model (see **Tables 4** and **5**).

Youth who were victimized by their siblings as well as their peers were at a two-fold increased risk of depression (OR = 1.97; 95% CI, 1.21-3.21) and suicidal ideation (OR = 2.37, 95% CI, 1.69-3.33) as well suicidal self-harm (OR = 3.46, 95% CI, 1.92-6.25). The odds of depression, suicidal ideation, and self-harm behavior were only slightly attenuated once all confounders were included in the imputed and adjusted model (see **Table 6**). A linear trend was observed for depression, suicidal ideation, and suicidal self-harm, suggestive of a cumulative relationship between multiple victimization (home and school environment) and increased likelihood of clinical depression or engagement in suicidal ideations self-harm.

TABLE 2 | Prevalence of mental health outcomes at 24 years according to sibling and peer bullying roles at 12 years (in percentage).

		Depression	Anxiety	Suicidal ideation	Non-suicidal self-harm	Suicidal self-harm
Siblings	Non-involved	8.5	8.9	26.6	15.1	3.9
	Victim	10.0	8.7	35.4	16.2	8.3
	Bully-victim	15.1	12.5	35.7	16.1	4.9
	Bully	9.0	7.1	31.0	14.0	2.0
	Overall sample	9.6	9.3	29.0	15.3	4.5
Peers	Non-involved	8.5	8.0	24.7	13.8	3.7
	Victim	10.8	11.6	35.9	20.2	8.0
	Bully-victim	14.2	16.0	44.7	19.4	11.2
	Bully	16.9	10.2	44.1	25.4	8.5
	Overall sample	9.5	9.2	28.5	15.6	5.1

Non-Involved, Youth reporting no frequent victimization or perpetration; Victims, Youth reporting frequent victimization only; Bully-Victims, Youth reporting both frequent victimization and perpetration; Bullies, Youth reporting frequent perpetration only.*
**Frequent, At least once a week in the past 6 months.*

TABLE 3 | Associations between sibling and peer bullying at 12 years.

RR (95% CI)	Sibling bullying status					
Peer bullying status	**Victim**	***p* Value**	**Bully-Victim**	***p* Value**	**Bully**	***p* Value**
Victims	**1.43 (1.14–1.78)**	**0.002**	**1.85 (1.49–2.28)**	0.000	1.39 (0.99–1.95)	0.056
Bully-victim	**2.14 (1.52–3.02)**	**0.000**	**4.78 (3.62–6.32)**	0.000	**3.32 (2.16–1.63)**	**0.000**
Bully	1.47 (0.87–2.48)	0.149	**2.41 (1.54–3.79)**	0.000	**3.14 (1.77–5.58)**	**0.000**

RR, Relative risk ratios; CI, Confidence intervals.
Victims, Youth reporting victimization only; Bully-Victims, Youth reporting both victimization and perpetration; Bullies, Youth reporting perpetration only.
Bold = p < .05.

TABLE 4 | Associations between sibling bullying status groups at 12 years and depression, anxiety and self-harm at 18 years.

		Sibling bullying status					
Outcome OR (95% CI)	**Non-involved**	**Victim**	***p* value**	**Bully-victim**	***p* value**	**Bully**	***p* value**
N = 2,802							
Depression							
Unadjusted	Reference	1.62 (1.07–2.45)	0.022	**2.23 (1.54–3.22)**	**0.000**	0.77 (0.33–1.78)	0.539
Imputed adjusted	Reference	1.56 (1.03–2.37)	0.038	**2.06 (1.41–3.01)**	**0.000**	0.92 (0.39–2.16)	0.854
Anxiety							
Unadjusted	Reference	1.04 (0.69–1.56)	0.853	**1.72 (1.22–2.41)**	**0.002**	0.60 (0.28–1.31)	0.198
Imputed adjusted	Reference	0.99 (0.66–1.49)	0.959	**1.57 (1.11–2.23)**	**0.011**	0.71 (0.32–1.56)	0.389
Self-Harm							
Unadjusted	Reference	1.38 (0.94–2.03)	0.103	**2.06 (1.47–2.89)**	**0.000**	0.88 (0.44–1.76)	0.713
Imputed adjusted	Reference	1.29 (0. 87–1.91)	0.201	**1.85 (1.31–2.61)**	**0.001**	1.08 (0.53–2.20)	0.834

OR, Odds ratio; CI, Confidence intervals.
Bold = p < 0.017 (Bonferroni correction).
Confounders included in imputed adjusted analysis: sex, maternal depression, internalizing and externalizing problems, peer bullying victimization and perpetration, maltreatment, domestic violence.
Children presenting any psychiatric diagnosis at 7 years were excluded.
Non-Involved, Youth reporting no frequent victimization or perpetration; Victims, Youth reporting frequent victimization only; Bully-Victims, Youth reporting both frequent victimization and perpetration. Bullies, Youth reporting frequent perpetration only.*
**Frequent, At least once a week in the past 6 months.*

DISCUSSION

This study finds that youth involved in sibling victimization were associated with an increased risk of clinical depression, anxiety and self-harm behavior in late adolescence, as well as clinical depression, suicidal ideation, and suicidal self-harm in early adulthood, even after accounting for a range of potential confounders. Moreover, concurrent sibling and peer bullying are found to overlap in a homotypic role specific manner. The effects of sibling and peer bullying were found to be cumulative for depression, suicidal ideation, and suicidal self-harm. Those bullied at home and by peers had double the odds of developing clinical depression and consider suicide and triple the odds to have self-harmed with a suicidal intention by early adulthood. In contrast, anxiety disorder appeared to be particularly associated with peer rather than sibling bullying.

Previous studies investigating the relationship between sibling bullying and depression, anxiety, suicidal ideation, or self-harm have been limited to exploring just victimization or looked at involvement in sibling bullying in any role (6, 15, 16). This study extends prior work and adds to the literature by presenting for the first time evidence for a role specific relationship between sibling bullying involvement and depression, anxiety and self-harm related behavior. Our findings show that the strength of association is stronger for some roles than others, suggesting role specific effects for sibling victims and bully-victims in relation to depression, anxiety, suicidal ideation, and self-harm. It was found that youth involved as sibling bully-victims are associated with an increased risk of clinical anxiety and self-harm behavior in late adolescence and clinical depression in both late adolescence as well as early adulthood. On the other hand, youth involved as sibling victims only were associated with an increased risk of suicidal ideation and suicidal self-harm in early adulthood. These findings are partially in line with work by Bar-Zomer and Klomek (15) who reported involvement in any sibling bullying as a correlate of both clinical depression and suicidal ideation. It is however not possible to parcel out whether our results match those of Bar-Zomer and Klomek (15) in a role specific manner, as they did not tease out sibling victimization and perpetration from one another. Similarly, Coyle et al. (6) report a concurrent relationship between sibling victimization with depression and anxiety, while Bowes et al. (16) identified a prospective link between frequent sibling victimization with clinical depression and as self-harm.

Our results suggest that the link between sibling bullying in middle childhood with depression and self-harm related behavior may persist into early adulthood. Contrary to this, the association between sibling bullying and anxiety appears to be limited to late adolescence. In our adjusted models we found that pre-existing internalizing problems explained some of the

TABLE 5 | Associations between sibling bullying status groups at 12 years and depression, anxiety suicidal ideation and self-harm at 24 years.

		Sibling bullying status					
Outcome OR (95% CI)	**Uninvolved**	**Victim**	***p* value**	**Bully-victim**	***p* value**	**Bully**	***p* value**
Depression							
N = 2,373							
Unadjusted	Reference	1.19 (0.78–1.81)	0.423	**1.91 (1.33–2.72)**	**0.000**	1.06 (0.52–2.15)	0.870
Imputed adjusted	Reference	1.19 (0.78–1.83)	0.421	**1.78 (1.23–2.58)**	**0.002**	1.14 (.55–2.36	0.719
Anxiety							
N = 2,359							
Unadjusted	Reference	0.97 (0.62–1.50)	0.874	1.46 (1.00–2.13)	0.052	0.78 (0.35–1.50)	0.526
Imputed adjusted	Reference	0.92 (0.59–1.45)	0.732	1.33 (.90–1.96)	0.152	0.86 (9.38–1.92)	0.712
Suicidal ideation							
N = 2, 372							
Unadjusted	Reference	**1.52 (1.16–1.98)**	**0.002**	**1.54 (1.19–1.99)**	**0.001**	1.24 (0.80–1.92)	0.331
Imputed adjusted	Reference	**1.47 (1.12–1.92)**	**0.005**	1.40 (1.07–1.82)	0.013	1.20 (0.76–1.88)	0.432
Non-suicidal self-harm							
N = 2,372							
Unadjusted	Reference	1.09 (0.78–1.53)	0.621	1.08 (0.78–1.51)	0.642	0.92 (0.51–1.64)	0.770
Imputed adjusted	Reference	1.05 (0.74–1.59)	0.774	0.99 (0.70–1.40)	0.960	1.13 (0.62–2.06)	0.690
Suicidal self-harm							
N = 2, 372							
Unadjusted	Reference	**2.20 (1.36–3.58)**	**0.001**	1.27 (0.71–2.25)	0.418	0.50 (0.12–2.07)	0.337
Imputed adjusted	Reference	**2.19 (1.34–3.59)**	**0.002**	1.22 (0.68–2.19)	0.498	0.57 (0.14–2.39)	0.441

OR, Odds ratio; CI, Confidence intervals.
Bold = p < 0.010 (Bonferroni correction).
Confounders included in imputed adjusted analysis: sex, birth order, maternal depression, internalizing and externalizing problems, peer bullying victimization and perpetration, maltreatment, domestic violence.
Children presenting any psychiatric diagnosis at 7 years were excluded.
Non-Involved, Youth reporting no frequent victimization or perpetration; Victims, Youth reporting frequent victimization only; Bully-Victims, Youth reporting both frequent victimization and perpetration; Bullies, Youth reporting frequent perpetration only.*
**Frequent, At least once a week in the past 6 months.*

TABLE 6 | Individual and cumulative effects of sibling and peer bullying at 12 years and depression, anxiety suicidal ideation and self-harm at 24 years.

		Sibling and peer bullying status					
Outcome OR (95% CI)	**Uninvolved**	**Either**	***p* value**	**Both**	***p* value**	**Linear trend**	***p* value**
Depression							
N = 2,117							
Unadjusted	Reference	**1.50 (1.09–2.05)**	**0.012**	**1.97 (1.21–3.21)**	**0.006**	**1.43 (1.16–1.78)**	**0.001**
Imputed adjusted	Reference	**1.45 (1.05–1.99)**	0.024	1.90 (1.15–3.13)	0.012	**1.40 (1.12–1.75)**	**0.003**
Anxiety							
N = 2,105							
Unadjusted	Reference	**1.85 (1.35–2.53)**	**0.000**	1.78 (1.05–3.01)	0.032	**1.49 (1.20–1.85)**	**0.000**
Imputed adjusted	Reference	**1.73 (1.26–2.39)**	**0.001**	1.60 (0.94–2.75)	0.085	**1.41 (1.13–1.76)**	**0.003**
Suicidal ideation							
N = 2,118							
Unadjusted	Reference	**1.61 (1.31–1.97)**	**0.000**	**2.37 (1.69–3.33)**	**0.000**	**1.57 (1.36–1.81)**	**0.000**
Imputed adjusted	Reference	**1.54 (1.25–1.90)**	**0.000**	**2.18 (1.54–3.07)**	**0.000**	**1.50 (1.30–1.74)**	**0.000**
Non-suicidal self-harm							
N = 2,117							
Unadjusted	Reference	1.36 (1.06–1.75)	0.016	1.32 (0.85–2.05)	0.211	1.23 (1.03–1.47)	0.024
Imputed adjusted	Reference	1.31 (1.01–1.69)	0.041	1.27 (0.81–1.98)	0.303	1.19 (0.99–1.44)	0.060
Suicidal self-harm							
N = 2,117							
Unadjusted	Reference	**1.79 (1.15–2.79)**	**0.010**	3.46 (1.92–6.25)	**0.000**	**1.85 (1.39–2.45)**	**0.000**
Imputed adjusted	Reference	1.77 (1.13–2.78)	0.012	3.47 (1.90–6.34)	**0.000**	**1.84 (1.38–2.46)**	**0.000**

OR, Odds ratio; CI, Confidence intervals.
Bold = p < 0.010 (Bonferroni correction).
Confounders included in imputed adjusted analysis: sex, birth order, maternal depression, internalizing and externalizing problems, psychiatric diagnosis, peer bullying victimization and perpetration, maltreatment, domestic violence.
Children presenting any psychiatric diagnosis at 7 years were excluded.
Non-Involved, Youth reporting no frequent victimization or perpetration; Victims, Youth reporting frequent victimization only; Bully-Victims, Youth reporting both frequent victimization and perpetration; Bullies, Youth reporting frequent perpetration only.*
**Frequent, At least once a week in the past 6 months.*

observed variance, suggesting that the association between bullying and anxiety disorders may rather be understood as a function of pre-existing internalizing problems as opposed to a causal effect of sibling victimization per se. Anxiety disorders are furthermore reported as an early onset disorder (48), hence it may be that the exclusion of children with a psychiatric diagnosis in early childhood resulted in the desisting association between sibling bullying and clinical anxiety in early adulthood.

Nevertheless, our overall findings in relation to differential sibling bullying group outcomes resonate well within the peer literature. Peer victimization has been proposed as a robust contributing factor towards the development of internalizing problems (12), with those children falling into the bully-victim group at the greatest risk for poor mental health outcomes (7, 9, 24, 25), as mirrored by our results.

In contrast, prospective studies have previously reported for peer bullying (7, 49) that those who are bullies were at no increased risk for emotional disorders, self-harm or suicidal ideation. This is consistent with an evolutionary model of bullying that suggests bullying perpetration as an evolutionarily adaptive behavior (50). Recent evidence from ALSPAC has shown that sibling bullying perpetration was best predicted by structural family characteristics (51) including larger households with more children, being older and male, all of which are factors contributing towards a heightened competition of resource availability within the family system. These findings underline that aggression or fighting may be utilized as a mechanism for children to secure resources and restore social dominance (52) within their social group (family or peer group), thereby gaining desired outcomes including affection, attention or material goods within the family system or social status and mating opportunities within the peer context (53, 54). Along these lines, bullying perpetration may even act protective against adverse health outcomes, as mirrored by our results in which youth who acted as bullies were no more likely than non-involved youth to develop depression, anxiety, suicidal ideations, or self-harm behavior.

Findings from this study further demonstrate that sibling bullying victimization in middle childhood is an independent risk factor towards the development of clinical depression, suicidal ideation, and suicidal self-harm in early adulthood above and beyond the influence of peer bullying as well as other early childhood predictors of poor mental health, parallel to previous work on the link between sibling victimization and internalizing problems (6, 16). This evidence strongly suggests that sibling bullying should not be normalized as a harmless rite of passage. It further stresses that sibling bullying should be considered as a unique contributing factor towards adverse mental health and wellbeing, beyond peer bullying and must therefore be appropriately addressed by families and practitioners. These unique effects were found despite a significant association between sibling and peer bullying. The cross-over between sibling and peer bullying was found to be homotypic, i.e. role specific consistent with previous reports (21, 26, 27, 29). In other words, children who were sibling victims or bully-victims at home were more likely peer victims in school, while sibling bullies and bully-victims at home were more often peer bullies at school.

Finally, a dose–response effect relationship of exposure to victimization across multiple contexts and mental health outcomes was found. Youth who were victimized by their siblings and their peers displayed higher odds of adult mental health problems across the domains of clinical depression, suicidal ideation, and suicidal self-harm, as opposed to youth involved in either sibling or peer victimization alone. Unlike previous work from the peer literature, suggesting bullying victimization as a common risk factor of both suicidal and non-suicidal self-harm (40), our findings suggest sibling bullying as well as poly-victimization across the sibling and peer context as specific risk factors more strongly associated with suicidal self-harm. These findings extend findings from cross-sectional studies of sibling and peer bullying and emotional problems (19, 20, 29) that this cumulative effect is confirmed using clinical diagnosis and longitudinal data, affecting depression suicidal ideation, and self-harm up to 12 years later. These findings further indicate that bullying as a trauma is most harmful when youths experience this at home as well as at school. For the affected youth it means that they have no safe place to escape to and this increases the risk of serious mental health problems such as suicidal ideation, self-harming, and depression. Peer and sibling bullying are traumas that should be considered at par with traumas such as physical or sexual abuse (14). However, as both peer and sibling bullying are more frequent than abuse and maltreatment by adults (2, 3, 14), their impact on population health may exceed those of adult maltreatment (9).

While we did find some evidence of a linear trend between poly-victimization and clinical anxiety in early adulthood, we did not find a cumulative effect of sibling and peer victimization when explored as an ordinal term. One reason for this may be that child individual differences may have accounted for a large proportion of the observed variance, as illustrated for child internalizing problems in our adjusted imputed model. In the peer literature, there is indeed evidence suggesting that children who suffer from internalizing disorders are more likely to become victimized (8). Alternatively, it may also be that peer bullying plays a more substantial role in the development of anxiety disorders (9, 55) compared to sibling bullying, as reflected in our findings. Lastly, it is possible that anxiety may not persist beyond late adolescence.

Strengths and Weaknesses

This study has a number of strengths. First, the longitudinal nature of our study design allowed us to prospectively assess a large number of potential confounding variables from pregnancy until childhood, thereby decreasing measurement error and bias and increasing the confidence in a causal relationship between our exposure and outcome measures. Additionally, excluding children who were classified as presenting a psychiatric disorder in early childhood, prior to our measure of exposure (sibling bullying), minimized reverse causation and thereby increases confidence in our findings. Moreover, we were able to prospectively explore mental health outcomes up to 12 years after the assessment of sibling bullying, allowing us to test whether the experience of sibling bullying could predict depression, anxiety and self-harm related thoughts and behaviors into early adulthood. This study also utilized Bonferroni correction across our regression models in order to guard against type I error, thereby making our analysis more conservative and in turn increasing the confidence in our findings.

There are also limitations to this study. Longitudinal data like ALSPAC is naturally prone to missing data over a 24 year study period, allowing for the possibility of attrition bias. However, there has been evidence demonstrating that accurate predictions are not compromised even in the face of selective dropout (56). Nonetheless, we additionally addressed the possibility of attrition bias by performing multiple imputations, thereby accounting for missing data and allowing us to impute up to our initial sample size. Another weakness of our study is that sibling bullying was measured at a single time point. Future work should strive to include multiple measures of sibling bullying in order to allow for the exploration of dose–response effect of chronicity, as it is often done within the peer literature (57). Nevertheless, our study shows that even a single measure of sibling bullying was sufficient to predict clinical depression and suicidal ideation, stressing the importance of considering sibling bullying as an additional specific risk factor towards the development of mental health problems. Finally, it should be noted that our exposure and outcome measures were assessed *via* self-report only, which may have biased our results. In the sibling literature, sibling bullying has been found to occur behind closed doors with parents often unaware of this behavior (1). Thus, self-reported sibling bullying may provide more accurate measures as opposed to parental reports. The use of the self-administered computerized CIS-R has further been shown to be a valid and unbiased measure of psychiatric disorder when compared to assessments administered through a human interviewer (58). Nonetheless, future studies should aim to include multi-rater reports of bullying and mental health outcomes in order to test whether associations will persist in a similar strength and to further reduce any bias that may result from youth's perception of bullying on mental health outcomes.

Conclusion

Our results have important practical and clinical implications. Firstly, it is essential for parents and health care professionals to be made aware that sibling victimization in childhood may result in lasting mental health consequences. Secondly, the effects of sibling bullying are at par with those of peer bullying where there is now convincing evidence for the detrimental effect on mental health (1, 10). Thirdly, those bullied at home by siblings are more likely to be involved in bullying at school. For the victims this means that they have no safe place to escape bullying and torment. Parents in particular may benefit from psychoeducational programs that help them recognize early warning signs of sibling bullying and support them towards intervening effectively in order to improve and foster long-lasting positive sibling relationships (59). Health professionals working with children and families on the other hand, should be encouraged to regularly enquire about sibling and peer bullying experiences, as these may be early warning signs of poor mental health and wellbeing (60). Finally, there is a need for the development, implementation and assessment of intervention studies that are specifically tailored towards reducing sibling bullying, as there are currently no well tested programs available (61, 62). Such interventions hold promise for alleviating a range of consequent negative outcomes, including the prevention of peer bullying, which appears to be contingent on early bullying experiences in the home environment.

DATA AVAILABILITY

The datasets analyzed for this study can be requested from ALSPAC. Please note that the study website contains details of all the data; this is available through a fully searchable data dictionary and variable search tool (http://www.bristol.ac.uk/alspac/researchers/our-data/).

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by ALSPAC Ethics and Law Committee (IRB No. 00003312) and the local research ethics committees (Bristol and Weston Health Authority, Southmead Health Authority, and Frenchay Health Authority). Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

SD and DW contributed towards the design and interpretation of the data. SD was responsible for the analysis of the data and drafting of the work. DW provided a critical review and revisions of the work. SZ, MH, and JH contributed toward the acquisition of the data and contributed toward the final revisions.

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Parents' Feelings, Coping Strategies and Sense of Parental Self-Efficacy When Dealing With Children's Victimization Experiences

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Background: Accumulating evidence strongly suggests that bullying victimization poses a major risk for children's and adolescents' socioemotional development. Despite the key role parents play in their child's ability to cope with bullying, very few studies have focused on parents' reactions to their children's victimization. The current study examined parents' feelings, coping strategies, and sense of parental self-efficacy subsequent to their children's victimization.

Methods: The sample was composed of 217 parents of children aged 7 to 18 years who had been victims of bullying. Parents were requested to fill in a self-report survey measuring their responses to their child's bullying victimization in the last 12 months, the feelings they experienced, the coping strategies they implemented, and their sense of parental self-efficacy in dealing with the situation.

Results: Parents of victimized children experienced notable emotional distress and an array of complex emotions. A unique pattern of associations was revealed between feelings and coping tactics. Specifically, feelings of guilt were predictive of parents adopting avoidance and self-blame strategies and negatively associated with providing support to the child. Parents' feelings of sadness positively predicted coping by providing child support and negatively linked to avoidance coping. Anger was predictive of retaliative coping, whereas worry contributed to child restrictions. Providing support to the child and retaliation positively contributed to parental self-efficacy in dealing with the victimization events, whereas seeking social support was negatively associated with parents' sense of efficacy.

Discussion: It is suggested that bullying prevention efforts should include parents and address the complex feelings they experience, especially feelings of guilt and anger, which were found to contribute to a maladaptive coping reaction.

Keywords: parental self-efficacy, bullying, coping, victimization, emotions

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COPING WITH BULLYING

A recent national poll conducted in the United States revealed that parents' top health concern is bullying/cyberbullying (1). This is understandable in light of accumulating evidence indicating that bullying victimization is a major risk to children's and adolescents' socioemotional development [e.g., (2)]. Being bullied is an intense interpersonal stressor that serves as a catalyst for the emergence of psychosocial difficulties (3). Parental support can buffer the adverse effects of bullying to some extent (4). However, children's bullying experiences are a major source of stress for parents as well and have a negative impact on parents' well-being (5, 6). This underscores the crucial need to better understand parents' psychological processes when coping with their child's peer-victimization events.

The transactional model of stress and coping (7) suggests that when people experience an event, they evaluate whether it is threatening to their well-being (primary appraisal) and whether they have the resources to cope with it (secondary appraisal). The model points to the importance of emotion in the coping process (7, 8). Primary appraisal generates an emotional response that can vary in intensity and valence. Thereafter, coping strategies are engaged to alter the person-environment relationship by adopting strategies to either regulate distressing emotions or impact the problem causing the distress (9). Coping strategies are diverse and context-dependent (for a review, see 10). In the context of bullying victimization, the best documented children's coping strategies include turning to an adult or peer for help, avoiding the bully or ignoring the situation as a whole, retaliating, or fighting back (11). Hunter and Boyle (12) and Hunter and Borg (13) found supporting evidence that emotions are linked to the coping strategy implemented by school-aged children victims of bullying. For example, they found that feelings of anger and self-pity predicted seeking support from peers and adults, whereas feeling helpless or indifferent predicted doing nothing as a coping tactic (13).

Despite the key role played by parents in children's ability to cope with bullying, relatively few studies have focused on the parents' emotional well-being or ability to cope (14). Rather, most works on bullying that have included the parents' perspective have dealt with the parents' definitions of bullying (6, 15), parental awareness of their child's involvement in bullying (16, 17, 6, 18) or parents' attitudes toward bullying and intervention efforts (19). A few qualitative studies have explored parents' emotional experiences when their children were bullied and have revealed that parents experience worry, concern, anger, guilt, frustration, disappointment, and a sense of powerlessness (5, 6, 20).

The coping strategies parents recommend to bullied children include first turning to an adult for help, followed by ignoring the child who bullied them, or either retaliating or promoting prosocial behaviors (21, 6, 22). The coping reactions parents themselves implemented include obtaining antibullying information, consulting with others, contacting the school, and (rarely) contacting the parents of the bully (6, 21, 22). Interestingly, one study found that parents' experiences of being bullied during childhood were associated with parents' current views and concerns about their children's school bullying (21).

PARENTAL SELF-EFFICACY

Parental self-efficacy refers to caregivers' beliefs about their ability to parent successfully (23). It is an extension of the more general cognitive construct of personal self-efficacy first defined by Bandura (24). Self-efficacy is a higher-order construct that can have reciprocal associations with experiences of stress and coping efforts (25). A national poll conducted in Australia in 2018 indicated that half of all parents felt they needed more information and skills on how to deal effectively with bullying. Many parents often felt helpless when their children were bullied (26). These parental disclosures are suggestive that some parents feel their parental self-efficacy is limited when it comes to dealing with bullying. In order for parents to effectively support their child during a crisis involving bullying, they need to feel able to do so. Parental self-efficacy has been related to parental competence, parental psychological functioning, and child socioemotional adjustment (for a review, see 23). A recent study found that parental self-efficacy specifically with regard to bullying, but not general parental self-efficacy, was associated with children's bullying and victimization behaviors (27). This points to the need to explore the precursors contributing to parental self-efficacy when dealing with bullying.

THE CURRENT STUDY

The current study explored how parents' emotional reactions contribute to their preferential coping strategies when dealing with their children's victimization incidents and the extent to which parents' emotions and coping strategies are associated with parental self-efficacy in the context of bullying victimization. We hypothesized that children's bullying experiences are likely to elicit diverse feelings in parents that differ in intensity and valence. Specifically, we predicted that parents would report feelings of anger, worry, guilt, and sadness to varying extents.

Different feelings would predict different parental coping strategies. Specifically, it was posited that anger would contribute to the extent to which parents adopted retaliative coping tactics, whereas feeling worried and sad would predict utilizing child support and seeking social support and information. Feelings of guilt were expected to predict adopting a self-blame stance.

It was further assumed that the feelings parents experience and coping strategies they adopt would significantly contribute to parental self-efficacy when dealing with children's peer victimization. Furthermore, adaptive coping strategies (child support, seeking social support and information) should positively contribute to parents' sense of self-efficacy in

dealing with bullying incidents, whereas maladaptive coping strategies (retaliation, avoidance, self-blame, child restriction) should be linked to lower parental self-efficacy. No specific predictions were made with regard to the contribution of parents' feelings to parental self-efficacy because this is a new area of inquiry.

METHODS

Participants

The sample was composed of 217 parents aged 24 to 59 years (mean = 39.83, SD = 6.63 years), of whom most were mothers (n = 170 [78.3%]). Their children ranged in age from 7 to 18 years (mean = 11.02, SD = 2.57 years); 59% (n = 128) were boys, and 37.4% (n = 80) were the eldest. Parents reported having on average three children; 85% of these parents lived together. Most parents, 59% (n = 128), were Jewish, 24% (n = 52) were Muslim, 24% (n = 29) were Druze, 3.7% (n = 8) were Christian, and 13.4% (n = 29) indicated other religious-ethnic origins.

Procedure

After approval by the ethics committee at the University of Haifa, several schools in the northern district of Israel were approached. The aim of the study was presented, and permission from the schools' administration was requested to present the study to the students' parents. Five schools were willing to engage in the study. Parents were approached before or after school events (PTA meetings, school ceremonies) and filled in the questionnaire manually or if they preferred by email. Two hundred seventeen parents reported that their child had been victimized to some extent in the last 12 months.

Prior to running the study, a small-scale pilot study, which included semistructured interviews with eight parents whose children had been victimized in the past year, was conducted. Parents' age was between 40 and 52 years; they volunteered for the study *via* announcements about the study posted in different online forums. In the interviews, parents talked about their ordeal, and if they did not bring it up, they were asked as to their feelings and how they dealt with the events. Afterward, they completed the questioners and provided feedback on them. The results from the pilot study were not published and only served the purpose of gaining a better understanding of the researched phenomena.

Measures

Bullying Victimization

Bullying victimization was measured using six questions from the Global School-Based Student Health Survey (28) on various types of victimization (physical, verbal, relational, cyber) that occurred in the last 12 months. Parents were asked to rate each question on a 1 (never) to 4 (most days) scale indicating the frequency of the victimization. The Cronbach alpha in the current sample was.82.

Parents' Emotional Experience

The feelings parents experienced after their children were bullied were measured using parents' self-reports of their subjective emotional experience. Parents were asked to what extent (1 [not at all] to 5 [very much]) words listed in the questionnaire described the emotions they experienced when finding out about the victimization incidents. The following words were presented: frustrated, preoccupied, indifferent, embarrassed, offended, angry, guilty, sad, worried, proud, and irritated. The words were based on previous findings (5, 6, 20) on the emotions parents felt after hearing about bullying incidents indifferent and proud were added as irrelevant feelings to verify authentic responses. A similar questionnaire has been used in studies on children's emotions when bullied (29).

Parents' Strategies to Cope With Bullying Victimization

This scale was constructed for this study based on the Questionnaire of Parental Coping Strategies for Bullied Children (22) but was extended to include additional coping strategies. The expansion of this measure was theoretically based on the literature of coping and empirically on scales for victimized children's coping and teacher's management of

TABLE 1 | Principal component analysis for Parents Copying Strategies with Victimization Questionnaire.

Parents Copying Strategies items	Factor					
	I	II	III	IV	V	VI
Provide Support & Advise to Child (α = .94)						
I offered my child possible solutions.	.92					
I offered my child support and encouragement.	.89					
I heard out my child's side of the story.	.88					
I proposed to my child ways to prevent such situations in the future.	.88					
Social support & Infornation (α = .79)						
I turned to professional held for advice or support.		.82				
I turned to a friend for advice or support.		.79				
I consulted with the school staff (e.g. school counselor, homeroom teacher).		.66				
I read and learn about bullying.		.63				
Retaliation (α = .71)						
I threatened the school.			.83			
I complained about the school to authorities outside the school.			.86			
I threatened the other children involved.			.77			
Avoidance (α = .74)						
I told myself this is how kids are.				.88		
I told myself it's no big deal.				.86		
I ignored the matter.				.64		
Self-blame (α = .93)						
I blamed myself.					.92	
I was angry with myself.					.90	
Child Restriction (α = .68)						
I laid sanctions or prohibitions on my child.						.81
I prevented my child from further meeting with the other children involved.						.77

bullying developed by Kochenderfer-Ladd & Skinner (30), Kochenderfer-Ladd (29), and . Two additional coping strategies (self-blame, child restriction) parents discussed in qualitative studies were included as well (5, 6, 20). Prior to running the study, the scale was used in a small-scale pilot study. In total, the scale was composed of 18 items. Parents rated on a 1-point (not at all) to 5-point (very much) scale the extent to which they had implemented the described actions after finding out about their child's victimization experiences in the past year. Factor analysis using varimax rotation identified six factors as follows: (1) providing support and advice to the child included four items (e.g., I offered my child support and encouragement); (2) parents' search for social support and information about bullying included four items (e.g., I turned to a friend for advice or support); (3) retaliation included three items (e.g., I threatened the other children involved); (4) avoidance included three items (e.g., I ignored the matter); (5) self-blame included two items (e.g., I blamed myself); (6) child restriction included two items (e.g., I imposed sanctions or prohibitions on my child). **Table 1** presents the factor loading values from the principal component analysis for this questionnaire. The Cronbach α's were .94, .79, .71, .94, .93, and .68 for each subscale, respectively.

Parental Efficacy

Parents were asked to rate how confident they were in their ability to deal with their child's victimization. Responses were made on a 1- (not at all) to 5-point (very much) scale. This item was adapted to the context of victimization from a more general parental-efficacy scale (31).

Parents' Victimization History

Parents' victimization history was assessed using a single item "Were you a victim of bullying during childhood?" Responses were made on a 1- (never) to 5-point (very frequently) scale.

Data Analysis

Descriptive statistics were calculated for all variables. Then, hierarchical linear regression models were conducted to predict each of the coping strategies parents used. Demographic variables, parents' victimization history, child's victimization levels, and the different feelings parents experienced when finding out about their child's victimization were entered as predicting variables. Family-wise Bonferroni correction was applied, and significance level was set at .008. Finally, a hierarchical linear regression model predicting sense of parental efficacy in dealing with victimization was conducted. In this model, demographic variables, parents' victimization history, child's victimization levels, parents' feelings, and coping strategies were included as predictive variables.

TABLE 2 | Victimization levels and types as reported by the parents (N = 217).

Type of bullying victimization	M	(SE)	Percentage of victims experiencing victimization more than once a week
Verbal (0-3)	.84	(.60)	33.3%
Physical (0-3)	.48	(.61)	16.6%
Relational (0-3)	.57	(.70)	9.7%
Cyber (0-3)	.39	(.62)	4.2%

RESULTS

Feelings Parents Experienced Following Bullying Victimization of Their Child

Parents reported feeling preoccupied (mean = 3.43, SD = 1.22), frustrated (mean = 3.12, SD = 1.28), and irritated (mean = 3.01, SD = 1.37) to a high to medium extent after finding out about their child's victimization experiences. They reported feeling a medium to low degree of anger (mean = 2.96, SD = 1.28), offense (mean = 2.60, SD = 1.29), worry (mean = 2.74, SD = 1.27), and sadness (mean = 2.74, SD = 1.26). A very low extent of feelings of guilt (mean = 1.90, SD = 1.12) or embarrassment (mean = 1.80, SD = 1.10) was reported Victimization type and degree as reported by parents is presented in **Table 2**.

Coping Strategies Implemented by Parents Following Bullying Victimization of Their Child

The most common coping strategy used by parents was providing support to their child (mean = 4.07, SD = 0.89), in that 85% of the parents reported applying this tactic to a medium to high extent. The second coping strategy was seeking social support and information (mean = 2.63, SD = 1.02); 48% of the parents reported applying this tactic to a medium to

TABLE 3 | Hierarchical regression model predicting parents' adaptive coping strategies following bullying victimization incidents.

Variable	Child Support			Social Support		
	B	SE	β	B	SE	β
Parent's age	−.01	.01	−.08	−.01	.01	−.09
Parent's gender	−.06	.15	−.03	−.01	.15	−.01
Parent's religiosity	−.01	.08	−.01	.07	.08	.05
Parents living together	−.18	.17	−.07	.03	.17	.01
Parents victimization	−.12	.08	−.10	−.06	.08	−.04
Child's age	.02	.03	.04	.01	.03	.03
Child's gender	.10	.12	.05	.02	.12	.01
Child birth order	−.06	.06	−.08	−.13	.06	−.16^{+}
Child's victimization	−.09	.02	**−.30****	.01	.02	.03
Frustrated	.03	.08	.05	.19	.07	.23^{+}
Preoccupied	.17	.08	.24^{+}	.06	.08	.07
Offended	−.06	.06	−.09	.12	.06	.15^{+}
Worried	.05	.06	.07	−.02	.06	−.03
Irritated	.11	.07	.17	.01	.06	.01
Angry	.05	.06	.07	.06	.06	.07
Sad	.15	.06	.21^{+}	.12	.06	.15
Guilty	−.18	.07	**−.23**	.13	.07	.14
	$F_{17,210} = 5.23^{**}$ Adj $R^2 = .26$			$F = _{17,210} 10.52^{**}$ Adj $R^2 = .44$		

$^{+}p < .05$ * $p < .008$ ** $p < .001$

TABLE 4 | Hierarchical regression model predicting parents' adaptive coping strategies following bullying victimization incidents.

Variable	Retaliation			Avoidance			Self-blame			Child Restriction		
	B	SE	β	B	SE	β	B	SE	β	B	SE	β
Parent's age	–.07	.01	–.07	–.01	.01	–.07	–.00	.01	–.02	–.01	.01	–.02
Parent's gender	–.12	.12	–.08	–.07	.12	–.04	–.20	.12	–.09	.21	.15	.09
Parent's religiosity	–.03	.06	–.04	–.03	.07	–.03	.16	.06	.12+	.10	.08	.08
Parents living together	.11	.13	.06	.43	.14	**.21***	.02	.12	.01	.30	.15	.12+
Parents victimization	–.08	.07	–.10	.13	.07	.14	–.02	.07	–.01	.13	.09	.10
Child's age	.01	.02	.05	.01	.02	.04	.01	.02	.03	–.02	.03	–.06
Child's gender	.03	.10	.02	–.16	.10	–.12	.16	.10	.08	–.54	.13	**–.28****
Child birth order	.01	.04	.02	.04	.05	.07	–.05	.05	–.07	–.14	.06	–.17*
Child's victimization	.06	.02	**.29****	.06	.02	**.24***	.05	.02	.14+	.01	.02	.04
Frustrated	.01	.06	.02	–.04	.06	–.07	–.08	.06	–.10	.06	.08	.07
Preoccupied	–.02	.06	–.03	–.06	.06	–.11	.10	.07	.12	–.16	.08	–.15
Offended	–.07	.04	–.14	.05	.05	.10	–.03	.05	–.04	–.03	.06	–.05
Worried	.01	.04	.01	.03	.05	.06	.01	.05	.01	.23	.05	**.31****
Irritated	.05	.05	.11	–.07	.05	–.13	.10	.05	.14	.01	.07	.01
Angry	.14	.05	**.29****	–.01	.05	–.01	–.02	.05	–.03	.12	.07	.16
Sad	–.08	.05	–.16	–.15	.05	**–.28***	–.05	.05	–.06	–.05	.07	–.07
Guilty	–.01	.05	–.02	.14	.05	**.23***	.62	.05	**.70****	.10	.07	.12
	$F = _{17,210}$ 2.54** Adj R^2 = .11			$F_{17,210}$ = 3.23** Adj R^2 = .15			$F = _{17,210}$ 17.91*** Adj R^2 = .58			$F_{17,210}$ = 5.65*** Adj R^2 = .27		

+*p < .05 * p < .008 ** p < .001 *** p < 0.001.*

high extent. The remaining of the coping strategies were less frequently used. On average parents, enforced a low degree of child restrictions (mean = 1.89, SD = 0.94), although 64% imposed some after victimization incidents. Fifty percent of the parents reported feeling self-blame to some extent, but on average self-blame was low (mean = 1.74, SD = 0.97). Parents tended not to avoid or ignore bullying (mean = 1.59, SD = 0.69). Finally, parental retaliation strategies were infrequent (mean = 1.30, SD = 0.67); only 27% stated they adopted such tactics.

Hierarchical regression models predicting parents' coping strategies revealed parents' feelings to be clearly associated with the coping strategies they tended to use (**Tables 3** and **4**). Specifically, parents' feelings of guilt were negatively associated with providing support to their child, whereas sadness and preoccupation, although not significant, tended to be positively associated to child support. Surprisingly, the child's victimization level was negatively associated with child support. Overall, the model predicting child support tactics was significant (F = 5.23; df = 17,210; $p < .001$) and predicted 26% of the variance.

In terms of seeking out social support and information, the prediction model was significant (F = 10.52; df = 17,210; $p < .001$) and accounted for 44% of the variance. However, none of the predicting variables reached the Bonfferoni adjusted significance level individually. Parents' feelings of frustration and offense tended to be positively associated with seeking social support, but this trend did not reach the required significance level.

Parents' feelings of anger and child's level of victimization were positively associated with retaliation. Overall, the model predicting retaliation was significant (F = 2.54; df = 17,210; $p < .001$) and predicted 11% of the variance.

Avoidance was significantly predicted by parents' feelings of guilt and child's victimization levels. Feelings of sadness were negatively associated with avoidant tactics. Overall, the model predicting avoidant coping was significant (F = 3.23; df = 17,210; $p < .001$) and predicted 15% of the variance.

Not surprisingly, feelings of guilt predicted parents' self-blame. Feelings of guilt alone accounted for 58% of the variance and were the sole significant predictor (F = 3.06; df = 17,210; $p < .001$) in this model.

Parents' worry was predictive of child restriction strategies. Boy victims also positively predicted child restriction strategies. Overall, this model was significant (F = 5.62; df = 17,210; $p < .001$) and accounted for 27% of the variance.

Parental Self-Efficacy in Dealing With Bullying Victimization Incidents

The parental coping strategies of child support and retaliation positively contributed to parental self-efficacy in dealing with

TABLE 5 | Hierarchical regression model predicting parental self-efficacy following bullying victimization incidents.

	Parental self-efficacy		
Variable	**B**	**SE**	**β**
Parent's age	–.01	.01	–.01
Parent's gender	.29	.17	.11
Parent's religiosity	–.07	.09	–.05
Parents living together	–.08	.19	–.03
Parents victimization history	.15	.09	.11
Child's age	.02	.03	.06
Child's gender	–.13	.15	–.06
Child birth order	–.04	.07	–.06
Child's victimization	–.04	.03	–.11
Frustrated	–.01	.09	–.01
Preoccupied	–.01	.09	–.02
Offended	.10	.07	.13
Worried	.07	.07	.09
Irritated	–.10	.07	–.14
Angry	.08	.07	.11
Sad	.10	.08	.12
Guilty	–.01	.10	–.01
Child support	.55	.08	**.48*** **
Social support	–.22	.08	**–.21***
Retaliation	.37	.10	**.23****
Avoidance	.01	.10	.01
Self-blame	–.04	.10	–.04
Child restriction	–.08	.08	–.09
	$F_{23,210} = 4.73$*** Adj $R^2 = .29$		

*$p < .05$ ** $p < .01$ *** $p < .001$

victimization incidents (**Table 5**). By contrast, social support seeking was negatively associated with parental self-efficacy. The predictive model was significant ($F = 4.43$; $df = 23,210$; $p < .001$) and accounted for 29% of the variance. Parents' feelings did not significantly contribute to parental efficacy above and beyond coping tactics.

DISCUSSION

The main goal of the present study was to explore how parents' feelings subsequent to child victimization contributed to their preference for coping strategies and how these feelings and strategies contributed to parents' sense of efficacy in dealing with bullying victimization.

The hypotheses were partially confirmed. The findings showed that parents experience a diverse array of feelings after learning that their child has been victimized. These included a substantial amount of preoccupation, frustration, irritation, anger, sadness, and offense. This is consistent with previous qualitative studies in which parents expressed feelings such as being powerless, angry, and worried (6, 14, 32). The current study constitutes the first quantitative attempt to measure parents' feelings and explore their contribution to parents' coping choices and sense of efficacy in bullying situations. An important finding in this regard was the role of guilt. A recent study by Hale et al. (32) found guilt to be a main theme expressed by parents of bullying victims. Parents tend to take on the role of protector of their child, and assessment of their actions often led to self-blame. In some cases, parents felt responsible for their child's situation; as one mother said, "What have I done wrong or what haven't I done? …we should have stayed in London … what if I hadn't got divorced?" (32). The current findings go a step further and show that parents' feelings of guilt may play a maladaptive role in parents' coping choices since these feelings were predictive of adopting avoidance and self-blame strategies and negatively associated with providing support to the child. This may reflect a somewhat freeze response. Guilt has been shown to contribute to a maladaptive response to traumatic events (33). In the current study, feelings of guilt did not significantly contribute to the prediction of parental self-efficacy. Parents' feelings of sadness as compared to guilt appeared to contribute to a more adaptive coping response, since they tended to be positively linked to providing child support and negatively linked to avoidance. These feelings may be closer to the mental pain experienced by the child after being bullied, thus enabling a more adaptive response. As predicted, anger was linked to retaliative coping. By contrast, and contrary to the hypothesis, worry contributed to child restrictions. This finding may suggest that when parents worry they are more likely to exercise control and restrictions, probably in an attempt to protect their child.

Overall, parents applied adaptive coping strategies (providing support to their child, turning to social support) more frequently than maladaptive coping strategies (retaliation, avoidance self-blame, inflicting child restrictions). Interestingly, retaliation, which is considered by professionals to be a maladaptive coping strategy because it escalates violence (34), reinforced parents' sense of efficacy when dealing with bullying victimization. This was evident in one of the interviews conducted as part of the pilot for this study. A mother of a 12-year-old girl who had been victimized at school commented, "I was angry as hell and worried, worried for my child. I went to the school and talked to the teacher, but nothing helped until I went into the class and screamed at the kids that if anyone comes near my kid I don't know what I'll do to them. I didn't threaten them that I'd beat them or anything, but they were scared … I was outraged, I threatened the principal that I would file a complaint with the Ministry of Education…." In the case of this mother and as shown in the general pattern of results, feelings of anger contributed to adopting a retaliative coping response. Some parents may resort to threatening or taking steps against the school or their child's classmates/parents because it may be the only thing they believe will be effective. High levels of victimization were found to contribute to parents adopting a retaliative tactic; because bullying is a dynamic process, it might be that parents at first turned to more mellow coping strategies, but if the bullying intensified or continued over time, they escalated to retaliation. Ranson et al. (35) dubbed parents who act aggressively toward the school as "storming parents" and suggested that such parents are actually seeking mutual understanding from school administration when engaging

in angry outbursts (34). However, these forms of parental retaliation can undermine trust and cooperation between the parents and the school staff. Thus, although retaliation contributed to parents' sense of efficacy, it might not be what their child actually needs during the crisis. Retaliation was reported by only 27% of the parents. Nevertheless, this figure is important because these parents may need guidance and assistance.

Parents tended to seek more social support and information when they felt frustrated or offended by their child's victimization. Surprisingly, seeking social support and information, which is considered an adaptive coping mechanism, was negatively associated with parents' sense of efficacy in dealing with bullying. Thus, although social support can contribute to the construction of efficacy over time, within the short period of a given crisis, it may be perceived by parents as a sign of their inability to effectively deal with the situation on their own. Interestingly, social support was a fairly common coping strategy but might not be as empowering as expected, at least in the short term. Nonetheless, parents should be encouraged to keep seeking social support and information because it can contribute to parental efficacy over time by helping them to regulate negative emotions and providing information and valuable advice.

High level of child victimization was found to contribute to a maladaptive coping pattern among parents, in that child victimization level was predictive of parents adopting retaliative and avoidant coping and was negatively associated with child support. Parallel findings in the parenting literature suggest that the severity of a child's problems may overwhelm parents emotionally such that they react less adaptively, which may undermine their sense of parental efficacy (36). For instance, Kuhn and Carter (37) showed that the severity of ADHD behaviors decreased mothers' parental self-efficacy.

As hypothesized, providing support to the child as well as adopting a retaliation strategy were predictive of parental self-efficacy in dealing with victimization events. Parents' feelings were not linked to parental self-efficacy above and beyond the coping strategies. Although the current study focused on the valence of emotions, the intensity of the emotion should also be taken into account in future studies as was suggested by Dix (36). Even though parents' childhood history of victimization was found to decrease levels of concern regarding bullying in a previous study (21), in the current study it was not a significant contributing factor in parents' coping or sense of efficacy. However, in the current study, this was measured by a single item, and more extensive qualitative and quantitative measures may be needed to better understand how parents' past experiences with bullying might impact coping with their child's victimization.

Limitations

The current study has several limitations. Data were cross-sectional; thus, causality cannot be established. Future studies should include longitudinal designs so that parental self-efficacy can be assessed over time, which can provide a broader and more accurate picture of the mechanisms contributing to the establishment of parental efficacy in dealing with bullying victimization. Furthermore, the current study focused only on the parents' perspective; it would be valuable in future studies to take into account the child's experience of the parental coping response. An additional limitation is that parental self-efficacy in dealing with bullying was measured by a single item. Although a single item is considered a valid way to evaluate a general sense of self-esteem (38), future studies could benefit from including subscales probing different aspects of parental efficacy in dealing with bullying (27). For example, parents might have different perceptions of their efficacy in dealing effectively with their child as compared to peers or school policies. Furthermore, parents' emotions were measured using self-reports, whereas emotions are multidimensional and include physiological changes in addition to the subjective experience reported in questionnaires. Future studies should include additional measures of emotions in order to better capture parents' emotional experiences.

Applications

The current findings have important bearing on antibullying prevention and intervention efforts. Making parents an integral part of interventions is vital to maximizing the effects of these interventions (for a systematic review, see 39, 40). However, most interventions that include parents only do so to a very limited extent, for example, by sending antibullying materials to parents, holding antibullying conferences, updating parents on school policies, or meeting individually with parents of children involved in bullying (41–43). Including parents to a greater extent in prevention and interventions efforts hinges on a better understanding of the psychological processes parents experience when dealing with bullying. The findings of the current study point to the complex emotions parents experience when their child is bullied. Thus, interventions should include emotion regulation training that can enable parents to recognize the different emotions they experience and learn to accept and regulate them so they can take the most productive steps forward for their child and their own well-being. In light of the findings here, it is especially important to face feelings of guilt and anger that may lead to maladaptive coping, while becoming aware of feelings of sadness, which were found to be adaptive. Interventions improving parents' general emotional regulation abilities have been found to boost parental self-efficacy (44), suggesting that similar training in the context of antibullying interventions is important. In order to further enhance parents' sense of efficacy, interventions need to provide information and guidance on the effectiveness of coping with the different dimensions of bullying. Special attention should be paid to parents who manifest aggressive reactions; professionals need to understand their position better and help them deal more constructively with bullying by utilizing prosocial coping strategies instead. Aiding parents to deal more effectively with their child's victimization can

help children gain valuable parental support during crisis of bullying victimization.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

This study was carried out in accordance with the recommendations of Department of Health and Human Services, Ministry of Health with written informed consent from all subjects. All subjects gave written informed consent in accordance with the Declaration of Helsinki. The protocol was approved by the Ethics Committee.

AUTHOR CONTRIBUTIONS

JB conducted the study and prepared all sections of the paper.

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Comparisons Between Adolescent Bullies, Victims, and Bully-Victims on Perceived Popularity, Social Impact, and Social Preference

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This study investigated the effect of bullying role, i.e., bully, victim, and bully-victim, on three measures of peer status; perceived popularity, social preference, and social impact. In addition to completing peer nominations for these measures of peer status, adolescents (n = 2,721) aged 11 to 16 years from 5 secondary schools completed an online survey that assessed bullying involvement (self- and peer-reported), self-esteem, and behavioral difficulties. Compared to uninvolved adolescents, all bullying roles had a greater social impact. Bullies scored higher than all other roles for perceived popularity, whereas victims and bully-victims were the lowest in social preference. These significant group comparisons remained when controlling for demographic variables, behavioral difficulties, self-esteem and prosocial behavior. Overall, the perceived popularity found for bullies suggests that these adolescents are socially rewarded by peers for their victimization of others. These findings highlight the need to address the whole peer system in raising the social status of those who are victimized, whilst reducing the rewards received by bullies for their behavior.

Keywords: bullying, victimization, peer status, peer relationships, adolescence

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INTRODUCTION

School bullying is a highly pervasive issue for children and adolescents world-wide, yet despite extensive efforts to identify the motivations behind bullying and ways to tackle it, interventions have been mixed in their success (1). Resource control theories propose that some aggression may be functional and can lead to potentially adaptive outcomes (2, 3) and, for some adolescents, bullying may be an effective form of aggression that is used to gain or maintain social dominance (4, 5). However other adolescents who bully are reported to be socially marginalized and rejected by their peers (6, 7). This has led to the identification of two subgroups of perpetrators: bullies and bully-victims (i.e. those who bully others but are also victimized). Bully-victims are often impulsive, high in reactive aggression, and have been reported to have poor social skills; including biases in social information processing (8, 9). Conversely, bullies are considered to be proactive and strategic in their use of aggression, and have a competent social cognition (10, 11). The differences between bullies and bully-victims in their social and behavioral characteristics may influence their status amongst the peer group in different ways. Exploring the status profiles of these perpetration groups,

compared to purely victimized or uninvolved adolescents, could highlight potential social motivations behind bullying behavior.

An individual's social standing within the peer group can be represented by two similar yet distinct constructs: social preference and perceived popularity (12). Social preference represents how accepted or 'liked' a person is (1, 13), and is typically measured by asking participants to nominate peers whom they most and least like, or most and least want to hang around with (14). Perceived popularity on the other hand reflects an individual's social prestige and dominance within the peer group, and is most commonly measured from peer-nominations of who are the most popular and least popular members of the classroom (5). Although these two aspects of peer status are often moderately correlated (15), they are distinct constructs; those who are popular are not always accepted by peers. Social preference is commonly associated with positive social attributes, such as cooperativeness (16), whereas perceived popularity may be influenced by characteristics such as attractiveness, athleticism, or having desirable possessions (17, 18). Social impact is a third aspect of peer status that refers to the prominence or visibility of an individual within the peer group (19), and has been used to determine status hierarchies in classrooms (19, 20). Thus, social impact is a measure of how visible or known a student is within the social group (e.g. classroom) however, although an individual with high social impact may have a high social presence, their overall status profiles can either be positive or negative, or indeed both.

Aggression has shown associations with perceived popularity, whereby aggressive youth are often reported to be popular, despite being largely disliked by others (13, 21). Similarly, some bullies have been found to be highly popular, but often have lower social preference than their uninvolved peers (22, 23). Low social preference however has not always been found for adolescent bullies (17), and this has led to reports that many bullies have controversial status within the peer group; i.e., they are liked by some and disliked by others (24, 25). Victims on the other hand have been reported to be low in both perceived popularity and social preference (5, 22), and may therefore be easy targets for bullies (26). Similarly peers may avoid being affiliated with victims through fear of jeopardizing their own status or being targeted themselves (27, 24). Bully-victims have been reported to be the most ostracized by peers (6, 28, 29), and therefore their bullying of others may be ineffective in achieving the same perceived popularity as the 'pure' bullies. Studies involving child and/or pre-adolescent samples have reported that bully-victims are overall less accepted and more rejected than bullies (29–31), yet despite their distinct behavioral and psychological profiles, bully-victims are not consistently assessed independently from bullies and victims (32, 33).

In addition to their involvement in bullying, adolescent bullies, victims, and bully-victims possess distinct attributes that could be either valued or considered undesirable by the peer group. Bullies are reported to be confident, have high self-esteem, and are often perceived as 'cool' amongst their peers (34, 35), while victims may often lack self-esteem (36) and show difficulties with emotion regulation (37, 38). Bully-victims are reported to be highly reactive and have been associated with the worst emotional and behavioural difficulties (39). These attributes may influence an adolescent's status amongst their peers, and therefore it is unclear whether bullying role specifically has an effect on peer status, over and above these individual characteristics.

Two widely employed methods to measure bullying involvement are self-reports and peer-nominations (40, 41). These methods typically produce different prevalence estimates of bullying and victimization, and specifically how many are identified as bullies, victims, or bully-victims. There is a risk of bias within self-reports, whereby individuals may not admit to bullying others, or have biased perceptions of their behavior. Self-report measures commonly result in an under-reporting of bullying perpetration; approximately 1–5% (28, 42), whereas peer-reports often yield higher rates of 13–14% (29, 43). Although peer-nominations reduce the risk of subjective errors, they ultimately rely on how much of the bullying or victimization is visible to the peer group (44). In particular, victimization may often not be visible to the peer group and sometimes hidden. Therefore, a combination of self- and peer-reports may be necessary for investigating differences between the groups involved in bullying, whilst retaining sufficient statistical power.

The primary aim of this study was to investigate differences between adolescent bullies, victims, bully-victims, and those not involved (using a combination of self- and peer-reports) on three measures of peer status: social impact, social preference, and perceived popularity. Secondly, the effect of bullying role on these status measures, when controlling for other individual (e.g. emotional and behavioral problems, self-esteem) and demographic factors (e.g. gender, age) was assessed. In line with previous findings, despite much of this literature pertaining to younger children (45), it was predicted that adolescent bullies would be highest in perceived popularity but lower in social preference than those not involved. Victims were hypothesized to be lower in perceived popularity than bullies and to have lower social preference than uninvolved adolescents. It is not clear how bully-victims would compare to other roles with regards to perceived popularity, yet they were expected to be lower in social preference than those not involved in bullying. Finally, all those involved in bullying were expected to have higher social impact than uninvolved adolescents; although it is unclear whether social impact would vary between bullies, victims, and bully-victims.

MATERIALS AND METHOD

Design and Sample

Data was collected during stage one of the BASE Study (Bullying, Appearance, Social Information Processing and Emotion Study; 36, 46, 47); a two-phased study that assessed a range of physical, social, and emotional attributes in relation to bullying involvement in adolescence. Pupils aged 11–16 years (N = 3,883) from five secondary schools in Central England, United Kingdom, were recruited into the study. Schools were mostly mixed-faith, mixed-gender (except for one girls' grammar school), and represented different social-economic backgrounds. Following child and/or parent refusals, dropouts (i.e., non-participation due

to, for example, pupil absence or school scheduling difficulties), and exclusions (see **Figure 1**), the final sample comprised 2,754 pupils with complete data for the bullying/victimization items (female; 56.8%, White British; 82.6%, age in years; M = 13.51, SD = 1.35).

All participants gave their informed consent and full ethical approval for the study was obtained from the University of Warwick's Ethics Committee.

Procedure

Schools were contacted and sent written details about the study. Once a school's involvement was confirmed, all pupils (aged 11–16 years) and their parents received information sheets and consent forms. Pupils could only participate if they had provided signed consent, and their parents had not returned a refusal form for their child's participation. The online assessment was completed in groups of 20–30 pupils (approximately 50 min) during the school day. At the start of each session, pupils were provided with a written overview about the study, and were given standardized instructions for completing the assessment. The survey was accessed *via* individual passwords, and could only be completed when at least one researcher and teacher were present.

Measures

Bullying Involvement

For self-reported bullying/victimization, the bullying and friendship interview schedule (48) was used. First, pupils were given 13 behavioral descriptions of victimization (36); five items related to direct victimization (e.g., "been called nasty names"), four items to relational victimization (e.g., "been made to do things you didn't want to do"), and four items related to cyber-victimization (e.g., "had rumors spread about you online"). Pupils were asked how often they had experienced each behavior in the last six months; never, sometimes, quite a lot (several times a month), or a lot (at least once a week). The same items were adapted to assess bullying perpetration. Self-reported victims were pupils who responded with "quite a lot" or "a lot" to any of the 13 victimization items; self-reported bullies were pupils who responded with "quite a lot" or "a lot" to any one of 13 bullying items; and bully-victims were those pupils who had been identified as both a self-reported victim and bully (49, 50). Good reliability was found for the victimization (α = .84) and bullying (α = .86) items.

For peer-nominated bullying involvement, pupils were given a numbered list of students in their tutor/form group (broadly equivalent to the 'homeroom' in US schools). Participants were

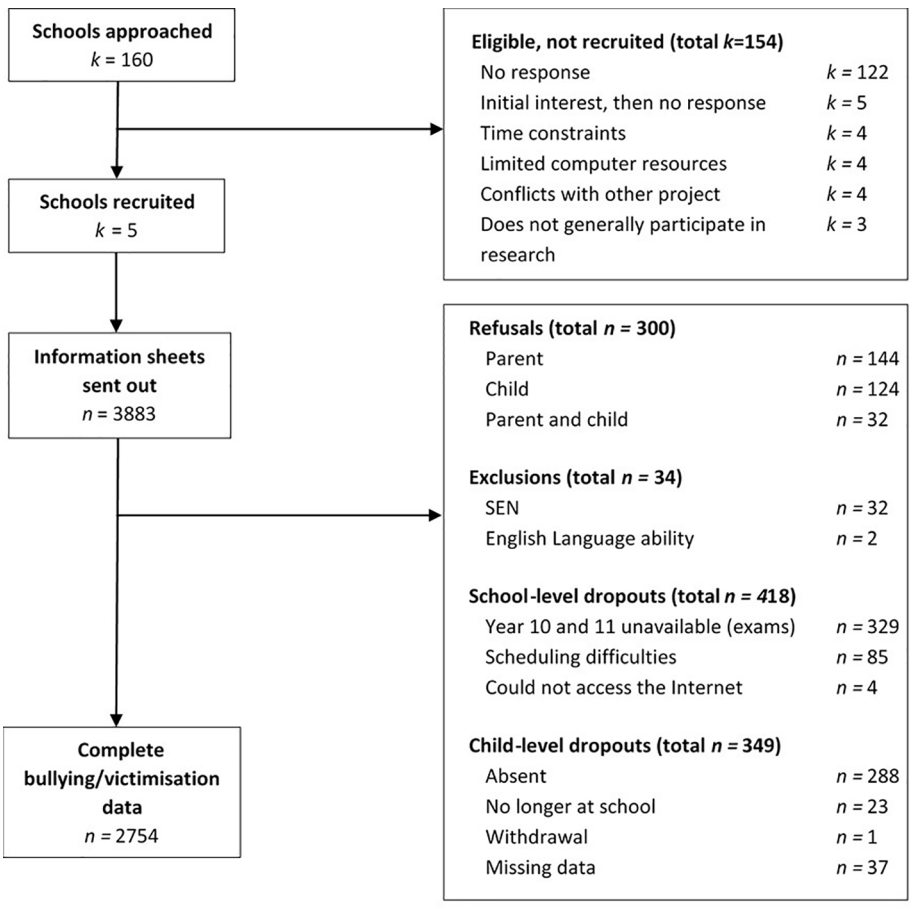

FIGURE 1 | Flow diagram of recruitment and selection of schools and participants.

asked to nominate up to three pupils (including non-participating pupils), by selecting their corresponding number on screen, who were either victims or perpetrators of the behaviors described (e.g., for relational bullying; "Some people repeatedly leave people out of get-togethers, parties, trips or groups, get others to ignore people, or spread nasty lies, rumors, or stories about people on purpose. Which people in your form/tutor do this?"). To account for the variable number of 'nominating' participants in each tutor group, the victimized and bullying nominations were standardized within tutor groups to create a 'bullying' and 'victimization' z-score for each participant. Pupils were identified as a peer-nominated bully if their z-score was greater than one for the bullying items, and peer-nominated victims were those with z-scores >1 for the victimization. Finally, pupils with z-scores >1 for both the victimization and bullying items were classified as peer-nominated bully-victims. This study limited nominations to three pupils to encourage participants to consider who best fits the descriptions, rather than simply nominating most classmates (5, 31).

Peer Status

Social impact, social preference, and perceived popularity were assessed using a standard peer-nomination procedure (5, 20 51). For social impact and social preference, pupils were asked to nominate up to three members of their tutor group who they most and least wanted to hang around with. Participants could not nominate themselves, and could respond with "Nobody," "I don't know," or "I don't want to answer." Peer-nominations were summed and standardized within tutor groups to create separate z-scores for the 'most liked' and 'least liked' nominations. Social impact was calculated by summing the most and least liked z-scores, and a social preference score was obtained by subtracting the least liked z-score from the most liked z-score (20).

Similarly, for perceived popularity, participants were asked to nominate up to three classmates who were the 'most popular' and 'least popular'. Perceived popularity was then calculated by subtracting the standardized 'most popular' z-score by the 'least popular' z-score (5).

Behavioral and Emotional Difficulties

The strengths and difficulties questionnaire (SDQ) (52) has been widely used to assess behavioral and emotional difficulties, and prosocial behavior in 11–17 year-olds (53). This self-report measure consists of 25 items grouped into five subscales: hyperactivity, emotional symptoms, peer problems, conduct problems, and prosocial behavior.

Participants responded on a three-point scale; from 0 = not true to 2 = certainly true, to indicate how much they agreed with each statement. A score for each subscale was calculated by summing responses from the corresponding items. Higher scores indicate more difficulties, except for the prosocial subscale in which higher scores reflect more prosocial behavior. The peer problems subscale addresses aspects of peer victimization and popularity, and was therefore excluded from the analyses. Additionally, one item was removed from the conduct problems subscale as it described behavior associated with bullying. A total difficulties score was obtained by summing the hyperactivity, emotional symptoms and conduct problems subscales, with higher scores indicating more difficulties. Cronbach's alpha for total difficulties was.71 and.70 for the prosocial behaviour subscale.

Self-Esteem

Participants completed Rosenberg's Self-Esteem (SE) Scale (54), which includes 10 self-report items, with responses on a four-point scale; from 0 = "disagree a lot" to 3 = "agree a lot." All items were reverse-coded, whereby higher scores indicated lower self-esteem, and responses were summed to create a total self-esteem score. Cronbach alpha for the current sample was $\alpha = .89$.

Individual Characteristics

Pupils reported their gender, ethnicity, date of birth, and their parent's highest level of education (i.e., 1–11 years; no education to basic schooling, and >11 years; further education, college or university). Ethnicity was dichotomized into 'White British' and 'Other' due to the low prevalence of individual ethnic groups (e.g., 'Asian' was the next largest group at 6.1%). Schools provided data regarding participants' attendance (%) and pupil premium status. In the UK, pupil premium refers to extra funding that schools receive for disadvantaged pupils (including pupils who have been eligible for free school meals in the past six years). Pupil premium status for each participant ('yes'/'no') was obtained as an indicator of deprivation and/or financial assistance.

Analysis

Participants with whole scales missing for the self-reported bullying and victimization measure were excluded from the final sample, along with participants with more than one missing item per scale. Missing data for a single item was replaced with the mean value for that scale (stratified by gender), and bivariate analyses found no significant differences in bullying role or any demographic variable between those with complete or missing data.

Analysis of variance (ANOVAs) or chi-square comparisons were conducted to compare scores between the bullying roles for each of the demographic variables, and participants' scores for self-esteem, total difficulties (calculated from the difficulties subscales of the strength and difficulties questionnaire; SDQ) and prosocial behavior (the prosocial subscale of the SDQ). ANOVAs and Bonferroni adjusted post-hoc comparisons were also conducted to identify differences in the mean scores for social impact, social preference, and perceived popularity between the bullying roles. Finally, analysis of covariance (ANCOVAs) and Bonferroni adjusted post-hoc comparisons were conducted to compare mean scores between the bullying roles for social impact, social preference, and perceived popularity, whilst controlling for all demographic variables, scores for self-esteem, total difficulties and prosocial behavior (which were entered as covariates).

Eta squared (η^2) and partial eta squared ($\eta\rho^2$) is reported as a measure of effect size; with values of.0099,.0588, and.1379 as indicators of small, moderate, and large effect sizes, respectively (55, 56). Statistical significance was set at $p < .05$ and all analyses were computed using SPSS version 22.

RESULTS

Final Sample

Thirty-Three Pupils Were Identified as Missing From the Tutor Group Lists or Included on the Incorrect List. These Pupils Could Therefore Not Be Nominated by Other Participants and Were Excluded From the Analyses. the Final Sample of Participants Was Therefore 2,721; Female = 56.9%; White British = 82.4%; Age in Years; M = 13.51, SD = 1.36 (**Table 1**).

Bullying Roles

For self-reported bullying involvement, the percentage of participants identified in each of the four bullying groups were; bullies 2.2%, victims 21.7%, bully-victims 6.5%, and uninvolved 69.6%. For peer-nominated bullying involvement, the percentage of participants identified within each group were; bullies 13.2%, victims 12.1%, bully-victims 5.2%, and uninvolved 69.5%. Pupils were then assigned to a final 'combined' bullying role (see **Table 1**), based on the scores obtained for both the self-reported and peer-nomination measures (36). Bullies were either a self-reported or peer-nominated bully (and not also a self-reported or peer-nominated victim), and victims were those identified as either a self-reported or peer-nominated victim (and not also a self-reported or peer-nominated bully). For the combined bully-victim role, participants were; 1) either a self-reported bully-victim or peer-nominated bully-victim, 2) either a self-reported victim and a peer-nominated bully, or 3) a self-reported bully and a peer-nominated victim. Participants who were not identified as a bully, victim, or bully-victim on the self-report or peer-nomination measures were categorized as uninvolved.

Differences Between Bullying Roles for Demographic Variables and Scores for Self-Esteem, Total Difficulties, and Prosocial Behavior

Demographic data for each bullying group is reported in **Table 1**, in addition to the mean scores for total difficulties, prosocial behavior, self-esteem, and each of the peer status variables (social impact, social preference, and perceived popularity). The results of the Bonferroni adjusted group comparisons (chi-squares, one-way ANOVAs) are also displayed.

Of the demographic variables, gender ($\chi^2(3) = 14.68$, p = .002), age ($F(3,2717) = 11.87$, $p < .001$), attendance ($F(3,2263) = 9.08$, $p < .001$), and pupil premium status ($\chi^2(3) = 46.49$, $p < .001$) showed significant differences between the bullying roles (**Table 1**). There were significantly more males identified as bully-victims than victims ($p = .002$) and those uninvolved ($p < .001$), and the perpetration groups (bullies and bully-victims) had a higher mean age than both the uninvolved and victim group ($p < .001$). Uninvolved adolescents had significantly higher attendance at school than bullies ($p = .027$), victims ($p = .001$), and bully-victims ($p < .001$), and there were significantly less uninvolved adolescents with pupil premium status compared to the other groups ($p < .001$).

There was also a significant main effect of bullying role on total difficulties ($F(3,2664) = 130.41$, $p < .001$), self-esteem

TABLE 1 | Descriptive data for final sample (split by bullying role). All numbers are percentages, unless otherwise stated.

	N (%)	Total	Bully	Victim	Bully-victim	Uninvolved	Differences between bullying roles
		2721	279 (10.3)	649 (23.9)	390 (14.3)	1403 (51.6)	
Gender	*Female %*	56.9	49.5	58.7	46.7	60.3	$\chi^2 = 14.68$, ***p* = .002**
	Male %	43.1	50.5	41.3	53.3	39.7	
Age (years)	*Mean*	13.51	13.88	13.36	13.73	13.44	$F(3,2717) = 11.87$, ***p* < .001**
	(SD)	(1.36)	(1.38)	(1.34)	(1.29)	(1.36)	
Ethnicity	*White British %*	82.4	80.7	82.2	82.7	82.8	$\chi^2(3) = 1.17$, ***p*** = .760
	Other %	17.6	19.3	17.8	17.3	17.2	
Attendance	*Mean*	95.60	95.07	95.11	95.15	96.07	$F(3,2263) = 9.08$, ***p* < .001**
	(SD)	4.64	4.52	5.40	4.78	4.17	
Parent Ed	*≤11 years %*	12.3	13.3	13.3	14.6	11.0	$\chi^2(3) = 5.92$ *p*= .116
	> 11 years %	87.7	86.7	86.7	85.4	89.0	
PP	*No %*	78.1	71.2	73.7	70.2	83.7	$\chi^2(3) = 46.49$, ***p* < .001**
	Yes %	21.9	28.8	26.3	29.8	16.3	
SDQ	*Mean*		12.87	14.77	16.63	10.67	$F(3,2664) = 130.41$, ***p* < .001**
	(SD)		(5.91)	(6.49)	(6.55)	(5.68)	
Prosocial	*Mean*		11.61	12.10	11.13	12.10	$F(3,2717) = 16.98$, ***p* < .001**
	(SD)		(2.54)	(2.26)	(2.96)	(2.53)	
SE	*Mean*		20.48	23.17	23.28	20.25	$F(3,2717) = 57.54$, ***p* < .001**
	(SD)		(5.86)	(6.12)	(6.66)	(5.08)	
Impact	*Mean*		.276	.056	.292	-.154	$F(3,2717) = 19.35$, ***p* < .001**
	(SD)		(1.244)	(1.257)	(1.360)	(1.173)	
Preference	*Mean*		-.050	-.190	-.513	.239	$F(3,2717) = 31.68$, ***p* < .001**
	(SD)		(1.411)	(1.537)	(1.812)	(1.344)	
Popularity	*Mean*		.691	-.369	-.077	.079	$F(3,2717) = 31.499$, ***p* < .001**
	(SD)		(1.553)	(1.611)	(1.854)	(1.376)	

Parent Ed, parent's education; PP, pupil premium status; SDQ, total difficulties; SE, self-esteem.

($F(3,2717) = 57.54$, $p < .001$), and prosocial behavior ($F(3,2717) = 16.98$, $p < .001$). For total difficulties, there were significant differences between all of the groups (all $p < .001$), whereby those uninvolved had the lowest scores, followed by bullies, and bully-victims overall showed the highest levels of difficulties. Bullies and uninvolved adolescents had significantly higher self-esteem than both victims and bully-victims ($p < .001$). Bullies ($p = .032$) and bully-victims ($p < .001$) had lower levels of prosocial behavior than the uninvolved group, and victims were significantly higher in prosocial behavior than bully-victims ($p < .001$)

Differences Between Bullying Roles for Peer Status

One-way ANOVAs were first conducted to compare bullying roles on social impact, social preference, and perceived popularity (**Table 1**). All demographic variables, and scores for total difficulties, self-esteem, and prosocial behavior that showed significant differences between the groups, were then entered as covariates into the model. Adjusted means for and Bonferroni comparisons (whilst controlling for gender, age, attendance, pupil premium status, total difficulties, self-esteem, and prosocial behavior), are reported for the bullying roles in **Table 2**. Finally, **Figure 2** shows the mean differences in z-scores between the 'involved' roles (bullies, victims, and bully-victims) and those not involved for social impact, social preference, and perceived popularity.

Social Impact

In the unadjusted model, bullying role had a significant main effect on social impact ($F(3,2717) = 19.35$, $p < .001$, $\eta^2 = .021$), whereby the uninvolved group were significantly lower in social impact than bullies ($p < .001$), victims ($p = .002$), and bully-victims ($p < .001$). Moreover, bully-victims were significantly higher in social impact than victims ($p = .017$). When adjusted for the inclusion of covariates, the significant main effect of bullying role remained ($F(3,2197) = 17.25$, $p < .001$, $\eta\rho^2 = .023$), whereby the uninvolved group were lower in social impact than bullies ($p < .001$), victims ($p = .007$), and bully-victims ($p < .001$). Bully-victims also remained significantly higher in social impact than victims ($p = .006$).

Social Preference

The one-way ANOVA for social preference found a significant main effect of bullying role ($F(3,2717) = 31.68$, $p < .001$, $\eta^2 = .034$). Bully-victims had significantly lower social preference than bullies ($p = .001$), victims ($p = .004$) and the uninvolved group ($p < 001$), and victims were also significantly lower in social preference compared to those uninvolved ($p < .001$). With the inclusion of covariates in the model, the main effect of bullying role remained significant ($F(3,2197) = 19.18$, $p < .001$, $\eta\rho^2 = .026$), whereby bully-victims were significantly lower in social preference than bullies ($p = .001$), victims ($p = .004$), and the uninvolved group ($p < 001$). Uninvolved adolescents also remained significantly higher in social preference than victims ($p < .001$).

Perceived Popularity

In the unadjusted model for perceived popularity, there was a significant main effect of bullying role ($F(3,2717) = 31.50$ $p < .001$, $\eta^2 = .034$); whereby bullies had significantly higher levels of perceived popularity than all other groups ($p < .001$). Moreover, victims were significantly lower in perceived popularity than bully-victims ($p = .019$) and those uninvolved ($p < .001$). When adjusted for the inclusion of the covariates, the significant main effect was maintained ($F(3,2717) = 31.50$ $p < .001$, $\eta\rho^2 = .027$); with bullies remaining higher in perceived popularity than all other groups ($p < .001$), and victims scoring significant lower than those uninvolved ($p < .001$). The difference between victims and bully-victims however was no longer significant.

DISCUSSION

The primary aim of this study was to explore the peer status of adolescents involved in bullying by making direct comparisons between those involved (i.e., bullies, victims, and bully-victims) and those uninvolved on social impact, social preference, and perceived popularity. Secondly, the influence that involvement in bullying has on peer status, above other demographic and individual characteristics, was investigated. Bullying role had a significant main effect on all aspects of peer status. Compared to uninvolved adolescents, all those involved in bullying had higher

TABLE 2 | Adjusted means and comparisons between bullying roles (Bonferroni adjusted) for social impact, social preference, and perceived popularity.

		Social Impact[1]			Social Preference[2]			Perceived Popularity[3]		
		M	SE	95% CI	M	SE	95% CI	M	SE	95% CI
Role	Uninvolved	-.170 [a]	.038	-.243, -.096	.224 [a]	.045	.135, .313	.054 [a]	.046	-.037, .145
	Bully	.292 [b c]	.085	.126, .458	.015 [a b]	.102	-.186, .215	.653 [b]	.105	.447, .858
	Victim	.047 [b]	.054	-.059, .152	-.166 [b]	.065	-.293, -.039	-.304 [c]	.066	-.434, -.174
	Bully-victim	.333 [c]	.070	.195, .471	-.481 [c]	.085	-.647, -.314	-.090 [a c]	.087	-.260, .081

Role means are adjusted for the inclusion of covariates: gender, age (in years), attendance, pupil premium status and scores for self-esteem, total difficulties and prosocial behavior.

For each model, roles that do not share the same superscript ([a b c]) are significantly different at the p < .05 level.

[1]Significant covariate(s); prosocial behavior only (F(1,2197) = 5.72, p = .017).

[2]Significant covariate(s); age (F(1,2197) = 6.75, p = .009), attendance (F(1,2197) = 9.56, p = .002), pupil premium status (F(1,2197) = 4.52, p = .034), and self-esteem (F(1,2197) = 4.33, p = .037).

[3]Significant covariate(s); age (F(1,2197) = 30.48, p < .001), self-esteem (F(1,2197) = 12.89, p =. < 001), and total difficulties (F(1,2197) = 5.76, p = .016).

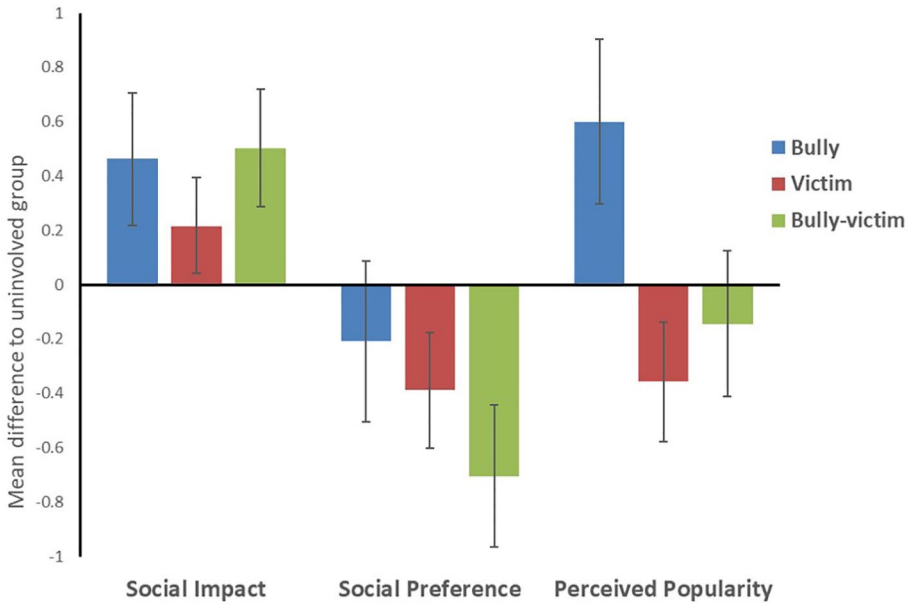

FIGURE 2 | Mean differences in social impact, social acceptance, and perceived popularity between bullying roles (bullies, victims, bully-victims) and the uninvolved group (represented at the zero line).

social impact. In comparison to all other roles, bullies had higher levels of perceived popularity, whereas bully-victims were lower in social preference. These differences remained when controlling for demographic variables, and scores for overall difficulties, self-esteem, and prosocial behavior.

These findings support previous claims that during adolescence, bullies often have a dominant position within the peer group (22, 23). In this study, bullies had higher perceived popularity than their victimized and uninvolved peers, and although it is uncertain if their perceived popularity is a direct result of bullying others, this suggests that bullies incur few social costs from their behavior (57). Moreover, bullies were not significantly lower in social preference than those uninvolved, which supports previous findings that bullies in fact have an average level of social preference (17), and overall a controversial status amongst peers (24, 58, 59).

With regards to resource control theories of aggression, bullying may be used to access resources or gain social dominance (32, 60), and for many bullies, this behavior may be successful in achieving high social status (4). Thus, the high levels of perceived popularity associated with this group could act as both a motivation and a reward for their behavior (23, 32). It is possible however that this group may possess other characteristics that contribute to their popular status (18); i.e., they may be strong, athletic, or physically attractive. Bullies have also been described as callous, strategic, and manipulative (32, 61) and therefore able to adopt more sophisticated and hidden forms of bullying (62), or coax peers into believing that the bullying is justified (26). These traits and characteristics, along with a reputation for rule-breaking that many peers see as 'cool' (23, 35), may help bullies maintain their dominant status within the peer group (63).

Conversely, victims have been associated with characteristics that may make them vulnerable for victimization and its persistence over time; i.e., being anxious, sensitive, or lacking confidence (26, 64, 65). In the adjusted model, victims were perceived as less popular compared to non-victimized adolescents (i.e., bullies and uninvolved), and this low popularity can be considered both a consequence of being bullied and a risk factor for victimization (5). Bullies may see those with lower social status as 'easy targets', and believe there is less risk of being punished by the peer group for selecting these targets (45, 66). Victims in this study also had lower social preference than uninvolved peers. Victims may avoid social situations (67), but also peers may be reluctant to be affiliated with a known victim through fear of jeopardising their own social position or becoming targets themselves (24). Positive peer relationships are reported to provide resilience against victimization (68, 69), and therefore the attitudes of the whole peer group should be addressed to provide more social support and ultimately raise the social status of victimized youth.

Bullies and bully-victims both had high levels of social impact, however they were different across the other measures of peer status. Bully-victims were significantly lower in social preference and perceived popularity than bullies, and this may reflect potential differences in the way that aggression is used between these two groups. Bully-victims may represent the coercive and socially marginalized aggressors described by resource control theories (7). These adolescents may lack efficient cognitive, social, and emotional skills (8, 38, 39), and fail to successfully use a combination of coercive and prosocial strategies in their pursuit of social dominance (2, 70). Bully-victims could therefore experience feelings of hopelessness and social defeat (71), and this could account for some of the adverse physical and psychological

outcomes reported for this group (39, 72, 73). Thus, although adolescent bullies and bully-victims appear to have a similar impact on their social worlds, their social experiences are distinct (74), and our findings show that having high social impact is not necessarily a positive attribute for overall peer status.

There are a number of limitations to this study. Firstly, the design was cross-sectional and therefore causality cannot be inferred from the associations reported. Longitudinal studies have reported a bi-directional association (17, 34), and some suggest that bullying/victimization and popularity reinforce each other over time (34, 45). Secondly, the findings relate to pupils from the five secondary schools recruited, and although these schools showed socioeconomic and ethnic diversity, they may not be representative of the UK as a whole, although prevalence and patterns match those of a recent nation-wide study (75). Thirdly, a number of potentially influential physical characteristics (i.e., attractiveness or athleticism) were not assessed. These attributes have shown associations with both popularity and bullying/victimization (23, 76), and have been reported to strengthen the relationship between bullying and popularity (77). It is, therefore, possible that having positive physical attributes, along with other peer-valued characteristics, could influence the associations reported here, and have potentially varying effects on status outcomes for males and females (18).

A major strength of this study was the combined use of self- and peer-reports to identify those involved in bullying. A low agreement between informants has been shown in research in other areas such as mental health (78); where the use of multiple informants and combining measures is recommended for more accurate assessment of pervasive mental health problems (78–80). This low agreement has also been shown previously for bullying roles between self-report and peer-nominations, with only a small number of bullies are identified by self-reports (81, 82). Studies using self-reports have reduced statistical power to systematically investigate bullies, even in large samples (83). In this study, we combined the self- and peer-reports, which reduced the risk of shared variance with the peer status measures, whilst retaining the statistical power of the comparisons. Researchers should work towards reaching a consensus in how bullying and victimization is measured in order to produce more consistent and comparable findings across studies.

In conclusion, adolescent bullies, victims, and bully-victims have a greater impact on their social worlds than those not involved in bullying. Bullies receive social rewards in the form of increased perceived popularity amongst peers, whereas those who are victimized appear to be neither the popular nor accepted members of the classroom. Changing the behavior of a popular bully is a challenging task, and thus, alternative and ultimately more prosocial means by which bullies can maintain their social status should be promoted within child and adolescent populations (1). The contribution that being a bully, victim, or bully-victim has on peer status, suggests a need to address the whole peer group in order to improve the social status of victims and bully-victims, and inhibit the social environment that allows bullies to thrive.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

This study was carried out in accordance with the recommendations of BPS ethical guidelines and the University of Warwick's ethics committee, with written informed consent from all subjects. All subjects gave written informed consent in accordance with the Declaration of Helsinki. The protocol was approved by the University of Warwick's ethics committee.

AUTHOR CONTRIBUTIONS

AG and DW conceived the study and all authors contributed to the study design. AG and KL carried out the data collection. AG produced the first draft of the manuscript and all authors revised the manuscript and approved the final version.

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Bullying History and Mental Health in University Students: The Mediator Roles of Social Support, Personal Resilience, and Self-Efficacy

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Bullying victimization by peers is highly prevalent in childhood and adolescence. There is convincing evidence that victimization is associated with adverse mental health consequences. In contrast, it has been found that perpetrators suffer no adverse mental health consequences. These findings originate from Western countries such as Germany but have rarely been investigated in collectivistic societies such as China. Furthermore, it has been rarely studied whether positive intrapersonal characteristics (e.g., personal resilience and self-efficacy) and interpersonal positive resources (e.g., social support) may mediate the impact of bullying on mental health. The current study used a path analytic model to examine, firstly, whether previous bullying experiences (both victimization and perpetration) are associated with current positive and negative mental health in university students and, secondly, whether these influences are mediated by social support, resilience, and self-efficacy. The model was tested in 5,912 Chinese and 1,935 German university students. It was found that in both countries, higher victimization frequency was associated with lower levels of social support, personal resilience, and self-efficacy, which in turn predicted poorer mental health. Moreover, and only in China, perpetration was negatively associated with social support and personal resilience but not self-efficacy. In contrast, in the German sample, perpetration experience was found to enhance one's self-efficacy, and the later was associated with better mental health. The results support a mediation model in which social support, personal resilience, and self-efficacy partially mediate the influence of victimization on mental health in both countries. For the relationship between perpetration and mental health, self-efficacy was the only full mediator in Germany, whereas in China, both social support and personal resilience were partial mediators. In conclusion, peer victimization has adverse effects on mental health in both Germany and China. Only in China, however, is perpetration also associated with adverse mental health outcomes. In contrast, getting ahead by bullying in an individualistic society such as Germany is associated with increased self-efficacy and mental health. The

differences found between an individualistic country and a collectivistic country have important implications for understanding and planning interventions to reduce bullying.

Keywords: bullying, perpetrators, social support, self-efficacy, resilience, cross-cultural differences, positive mental health, mental illness

INTRODUCTION

Peer bullying at school is highly prevalent and has become an international concern (e.g., 1, 2). Victimization has been universally found to be associated with cross-sectional and long-term adverse mental health consequences, including more severe depression and anxiety symptoms (e.g., 3–5) and lower levels of positive mental health (e.g., 4).

In contrast, the relationships between bullying perpetration and health problems are not consistent across countries (2). In some countries such as Germany, Austria, the UK, the USA, and Denmark, bullies appear to be as healthy as non-involved peers, in terms of adult mental and general health (5, 6), except for a higher risk for antisocial personality (7) and alcohol use (2). However, in other countries such as China, Greece, or Israel, perpetrators have reported worse health problems and emotional adjustment (2, 8). Furthermore, bullies may perceive less social support than non-involved students in the USA and China (8, 9). The differences between bullies in different countries indicate that the same behavior may have different consequences depending on context and societal norms. Thus, a cross-national study that applies the same measures in different cultures may help to clarify the relationship between perpetration and mental health.

Only recently has research focused on factors that may help to explain how being bullied may be associated with adverse mental health outcomes (e.g., 10, 11). An increasing amount of urecharacteristics (e.g., personal resilience and self-efficacy) can promote mental well-being (12–14). These may be protective factors that mitigate the negative impact of bullying experience on mental health, meanwhile, they may also be influenced by the bullying experiences.

As one of the most prominent protective factors, perceived social support plays an essential part in preventing mental illness (e.g., 12, 13, 15). It has a remarkably consistent positive association with positive mental health (e.g., 16, 17). Perceived social support refers to an individual's feeling or evaluation of whether the social network is supportive enough to facilitate the individual's coping with tasks and stress or to achieve personal goals (18, 19). The link between social support and bullying has been well established, with poor social support highly associated with victimization by peers (e.g. 20, 21). Stress may erode the perception or effectiveness of social support (22). For instance, longitudinal evidence has shown that "continuous victims of bullying" had worse school attendance rates, which further isolated them from peers and undermined a healthy peer relationship (23). Furthermore, social support has been shown to mediate the negative effect of workplace or school bullying on positive or negative well-being (24, 25).

While some use friendships and family as protective buffers, others may rely on their resilience to overcome the adversity of victimization (10). Resilience can manifest in several ways. Personal resilience refers to the capacity to adapt, recover, and avoid potential deleterious effects after facing overwhelming adversity (14). Children and adolescents are in a constant process of development. Thus, their resilience trait is more likely to be influenced by situational factors such as bullying involvement during primary or secondary school periods. For example, negative life events negatively predict resilience in students (26) and parental HIV longitudinally affected resilience in children (27). Indeed, research has shown that resilience trait mediates the relationships between workspace bullying and physical strain (28) and between primary school bullying and depressive symptoms (29).

Another essential positive factors in stress regulation is self-efficacy. The perception of self-efficacy is the belief that one can perform novel or challenging tasks and attain desired outcomes, indicating a self-confident view of one's own capability to deal with stressors in life [see Social Cognitive Theory, (30, 31)]. High self-efficacy is associated with higher levels of optimism and life satisfaction (32, 33) and lower anxiety and depression (34). Meanwhile, prior experience is one of the most influential factors that shape self-efficacy (35). It is likely that a negative peer experience (i.e., victimization) or a mastery experience (i.e., perpetration) influence one's self-efficacy appraisal. For instance, previous research indicates that self-efficacy mediates the effect of stressful life events or daily stressors on both positive and negative mental health in samples from different cultures (36, 37).

Unlike social support and personal resilience, results on the relationship between self-efficacy and bullying involvement are mixed. In some research, both victimization and perpetration were found to be negatively associated with overall self-efficacy [Greek elementary school children: 38; Turkish middle school students: (39)]. In some cases, it has been found that victims have lower self-efficacy than bullies and those not involved in Chinese primary and German secondary school bullying. Bullies, on the other hand, do not tend to differ from not-involved peers in self-efficacy (8). There are also studies indicating that firmer self-efficacy beliefs are positively correlated to high levels of self-reported cyberbullying behaviors (40). A possible explanation for the mixed results regarding self-efficacy may be that a substantial number of persons are involved in both bullying perpetration and victimization (i.e., so-called bully-victims). Therefore, in the current study, the correlations between perpetration and victimization were controlled.

In sum, there is some consistency in the findings when it comes to social support and personal resilience as single

mediators in the relationship between victimization and mental health. The role of self-efficacy has not yet been established. Thus social support, personal resilience, and self-efficacy may be considered potential factors that protect against being bullied and may explain the impact of previous bullying severity on mental health. Therefore, the current study aimed to explore the role of perceived social support, personal resilience, and self-efficacy in the relationship between *previous* peer bullying experience (both victimization and perpetration) and *current* mental health (both positive mental health and mental illness symptoms) in university students using a mediation model (see **Figure 1** for a hypothesized model). Bullying experience was measured with a retrospective inventory regarding victimization and perpetration frequency from primary schools to current universities. Our work aims to add insight into the relationship between school bullying and its long-term consequences during university. Both perpetration and victimization experiences were examined in one model in order to control for the correlation between them. Adding perpetration into the model was also predicted to expand our knowledge of how bullying behaviors impact one's mental health. Moreover, in order to expand on previous works that typically focused on only the mental illness, both the positive and negative aspects of mental health were outcome variables [measured by the Positive Mental Health scale, PMH; (41); and the Depression, Anxiety, and Stress Scale, DASS; (42)].

Furthermore, as reviewed above, there appear to be cultural differences in the effects of bullying perpetration on well-being and mental health. So far, our knowledge of bullying consequences is primarily based on studies carried out in western, individualistic societies. In more collectivistic cultures such as China, however, bullying and its mechanisms have rarely been investigated. There is evidence that bullies in China also suffer from concurrent or long-term problems such as poor life satisfaction, depression, suicide ideation, or psychoticism (e.g., 8, 43, 44), unlike the phenomena found in western countries where bullies typically do well (2, 5, 6). Therefore, the hypothesized model was tested within two separate samples: university students in China, a country that fosters Eastern Asian group-oriented culture (e.g., 45, 46); and students in Germany, a West European individualistic country, where the ties between individuals are relatively loose (45).

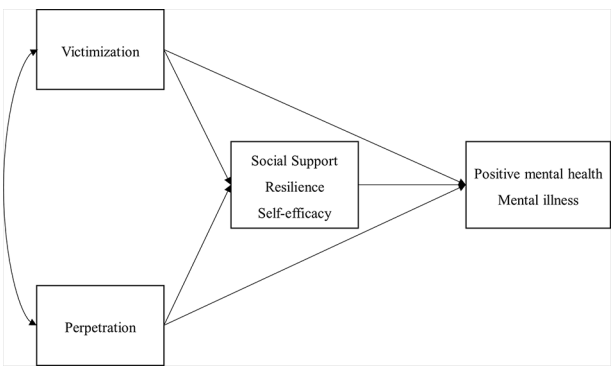

FIGURE 1 | A hypothesized mediation model for bullying and mental health.

Based on the research regarding bullying and its aversive consequences on mental health and the protective role of social support, personal resilience, and self-efficacy (e.g., 3, 4, 10, 12, 32), it is hypothesized that in both countries, (a) social support, personal resilience, and self-efficacy would be positively related to PMH and negatively related to DASS; (b) victimization experience would be positively related to DASS and negatively related to PMH and (c) social support, personal resilience, and self-efficacy would mediate the relationship between victimization and mental health. Giving that bullies reported different mental health levels across various countries (2, 5, 8), we further hypothesized cross-cultural differences regarding the paths on perpetration.

METHOD

Participants

This study is part of the Bochum Optimism and Mental Health (BOOM) research project, which is a large-scale cross-cultural longitudinal investigation in mental health. The Ethics Committee of the Faculty of Psychology at Ruhr University Bochum approved the project. Chinese data were collected either by paper-pencil survey or online questionnaires, while German data were all collected via an online survey.

In total, 5,912 Chinese students from Capital Normal University (Beijing city), Shanghai Normal University (Shanghai city), Nanjing University (Nanjing city), Hebei United University (Tangshan city), and Guizhou University of Finance and Economics (Guiyang city) participated in the 2015 survey. All participants were in the fourth year of bachelor degree studies (age: 21.54 ± 1.20). Among them, 3,301 (60.0%) were female and 2,202 (40.0%) were male; 3,403 (60.1%) came from low affluent families, 1,687 (29.8%) from medium affluent families, and 573 (10.1%) from high affluent families. Family affluence was measured and classified based on the scores on the 4-item Family Affluence Scale-II (47).

The German sample consists of 1,935 students (age: 21.73 ± 4.93) of Ruhr University Bochum (Bochum city) who took the survey at least once between 2015 and 2017. Among them, 1166 (61.7%) were female while 725 (38.3%) were male; 242 (15.7%) came from low affluent families, 812 (52.5%) from medium, and 492 (31.8%) from high affluent families; 1156 were in the freshman year, 105 in the sophomore year, 53 in the junior year, 99 in the senior year, 352 in the fifth year or higher, and 68 were in Ph.D. programs.

Questionnaires

Bullying History

Peer victimization and perpetration experiences at primary school, secondary school, and currently at university were collected with the Retrospective Bullying Questionnaire [modified from (48)]. Behaviors of direct, relational and cyberbullying were first described. Participants rated how

frequently they perpetrated or received (victimization) the described behavior during each school period (primary school, secondary school, current university) from 1 (*never*), 2 (*once or twice*), 3 (*occasionally*), 4 (*about once a week*), to 5 (*several times a week*). The three victimization questions across all periods were summed for a total victimization score, while the three perpetration questions were summed for a total perpetration score. The Retrospective Bullying Questionnaire was test-retested in 287 German students with a one-year gap. The one-year test-retest reliability was.81 for school victimization and ranged from.55 to.60 for school perpetration.

Depression, Anxiety, and Stress Scale (DASS)

The 21-item DASS (42) assesses depression, anxiety, and stress symptoms (seven items for each) from the last seven days. Participants checked agreement on a four-point Likert scale from 0 (*did not apply to me at all*) to 3 (*applied to me very much or most of the time*). A higher score indicates severer mental illness symptoms. Cronbach's alpha was.93 in the German sample and.96 in the Chinese sample.

Positive Mental Health Scale (PMH)

The 9-item PMH (41) measures positive aspects of emotional well-being and health on 4-point Likert scales ranging from 0 (*do not agree*) to 3 (*agree*). A higher score indicates better general positive mental health. Cronbach's alpha was.91 in the German sample and.96 in the Chinese sample.

Resilience Scale

The 11-item Resilience Scale (49) is a short unidimensional version of the 25-item Resilience Scale from (14), which measures psychosocial stress-resistance (e.g., personal competence and acceptance of self and life) on scales ranging from 1 (disagree) to 7 (agree). Higher scores indicate a higher level of resilience. Internal consistency was.87 in the German sample and.90 in the Chinese sample.

Brief Perceived Social Support Questionnaire (F-SozU K-6)

The 6-item F-SozU (50) assesses general support that one perceives from the social network. Participants indicated agreement on 5-point Likert scales ranging from 1 (*not true at all*) to 5 (*very true*). Higher scores indicate a higher level of perceived social support. Cronbach's alpha was.87 in the German sample and.90 in the Chinese sample.

General Self-Efficacy Scale (GSE)

The 10-item GSE (51) was used to assess a general sense of one's ability to cope when facing unexpected situations. Items are rated on a 4-point likely scale ranging from 1 (*not agree*) to 4 (*totally agree*). Higher sum scores indicate a greater sense of self-efficacy. In the German sample, Cronbach's alpha was.88, and in the Chinese sample, .93.

Data Analysis

Multivariate analysis of variance (MANOVA) was used to examine the difference in bullying frequency (victimization and perpetration) at each school period between China and Germany. In order to define the relationship between bullying experience, positive factors, and mental well-being, Mplus [version 7.4, (52)] was used to test the path analytic model. Full information maximum likelihood (FIML) estimation was used. The hypothesized model was defined with two correlated predictors (victimization and perpetration), three inter-correlated mediators (social support, personal resilience, and self-efficacy), and two correlated dependent variables (DASS and PMH). Sum scores of all the scales were entered into the model. Bias-corrected bootstrapping (5000 times) was applied for testing the significance of indirect effects (53). Then, insignificant paths were removed one by one to simplify the model. Final models contained only significant paths. An adequate model fit was determined by a nonsignificant chi-square statistic, a root mean square error of approximation (RMSEA) <.06, a comparative fit index (CFI) >.95, and a standardized root-mean-square residual (SRMR) <.08 (54). The effect size of the standardized regression coefficient was interpreted as small (.14), medium (.39), and large (.59) based on Cohen (55); while the effect size of standardized indirect effects was interpreted as small (.01), medium (.09), and large (.25) as suggested by Kenny and Judd (56). The datasets for this study can be found in the online **Supplementary Material**.

RESULTS

Bullying Frequency in Both Countries

Table 1 presents the self-reported bullying frequency at primary, secondary school, and university. Results from MANOVA showed that both countries differed significantly for all periods; however, the effect size of bullying at university was trivial ($\eta^2_{part.}$ <.01). German students reported more frequently being bullied and bullying others than Chinese students during primary and secondary school.

Correlation Table

Table 2 presents the correlations between the variables. All variables were found to be significantly correlated with each other (p <.05), except for perpetration, which was not correlated with personal resilience and self-efficacy in the German sample. As expected, in both countries, victimization was positively related to perpetration and DASS, and negatively related to social support, personal resilience, self-efficacy, and PMH. Moreover, the three positive factors were positively inter-correlated with each other and with the two outcome measures. Additionally, in China, the effect sizes between perpetration and other variables were small to modest, whereas the same correlation in Germany had only trivial to small effects.

Mediated Path Analytic Model Within the German Sample

The results of the final mediated path model in the German sample indicate an excellent fit of the data, RMSEA <.0001 (90% confidence interval from <.0001 to.027), CFI = 1, SRMR =.004. The standardized path coefficients (p <.001) of the final model are shown in **Figure 2**. Victimization experience was negatively

TABLE 1 | Means (M) and standardized deviations (SD) of bullying frequency in each school period.

Bullying	Variables	China			Germany			*F* (1, 7728)	$\eta^2_{part.}$
		M	*SD*	*N*	*M*	*SD*	*N*		
Victimization	Primary school	1.42	0.82	5910	2.12	1.18	1935	859.50***	.100
	Secondary school	1.22	0.61	5892	2.30	1.27	1935	2533.05***	.247
	University	1.11	0.46	5890	1.21	0.61	1934	52.71***	.007
Perpetration	Primary school	1.18	0.58	5852	1.45	0.70	1935	288.55***	.036
	Secondary school	1.12	0.49	5858	1.51	0.74	1934	711.74***	.084
	University	1.08	0.41	5884	1.06	0.28	1933	7.86**	.001

***: p <.001; **: p <.01.

TABLE 2 | Means (M) and standardized deviations (SD) of measures and correlation table.

Variables	*M*	*SD*	*N*	Victimization	Perpetration	Social support	Resilience	Self-efficacy	PMH
					China				
Victimization	3.74	1.46	5,912	1					
Perpetraion	3.36	1.23	5,903	.465**	1				
Social support	24.45	4.20	5,902	−.189**	−.142**	1			
Resilience	59.17	9.33	5,885	−.151**	−.118**	.553**	1		
Self-efficacy	29.41	5.00	5,904	−.161**	−.072**	.472**	.589**	1	
PMH	20.47	4.95	5,906	−.212**	−.143**	.539**	.572**	.616**	1
DASS	8.48	10.75	5,896	.293**	.244**	−.349**	−.330**	−.248**	−.443**
					Germany				
Victimization	5.63	2.34	1,935	1					
Perpertration	4.02	1.35	1,935	.262**	1				
Social support	25.38	4.61	1,889	−.253**	−.064**	1			
Resilience	58.28	9.79	1,889	−.173**	−.026	.523**	1		
Self-efficacy	28.54	4.98	1,888	−.180**	.044	.451**	.706**	1	
PMH	17.85	5.91	1,887	−.279**	−.052*	.561**	.674**	.666**	1
DASS	16.55	12.31	1,885	.276**	.057*	−.434**	−.520**	−.530**	−.708**

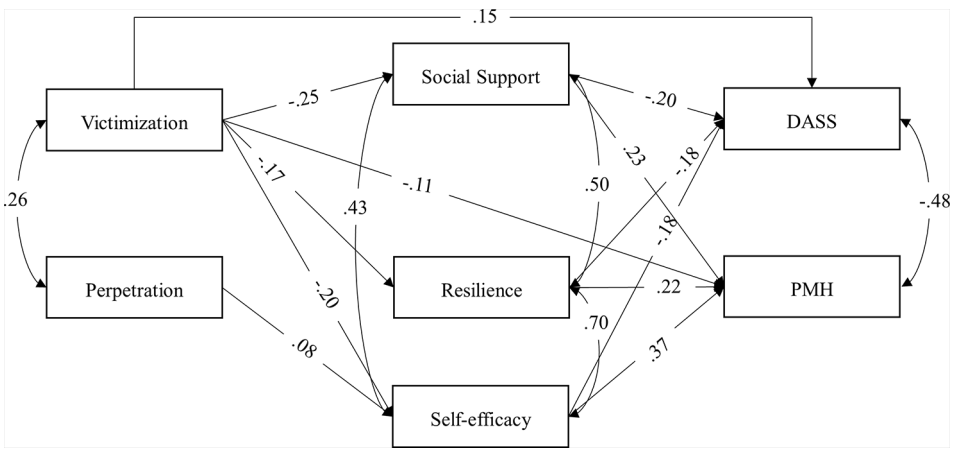

FIGURE 2 | Final path mediated model for the effects of bullying, social support, personal resilience, and self-efficacy on positive and negative well-being in the German sample. Regression paths (single-arrow) and correlation paths (curved double-arrow) were all significant on at least.05 level. Standardized coefficients are shown. DASS, Depression, Anxiety, and Stress Scale. PMH, Positive Mental Health Scale.

linked with all three mediators and the two dependent variables, and the three mediators further associated negatively with DASS and positively with PMH, suggesting that social support, personal resilience, and self-efficacy partially mediated the effect of victimization on the two mental health measures. Perpetration experience was significantly linked only with self-efficacy, the later further regressed positively on PMH and negatively on DASS, suggesting that self-efficacy fully mediated

the effect of perpetration on mental health. The correlations between the two predictors, the three mediators, and the two dependent variables were all significant at.001 level. The effect sizes of the direct and indirect effects from the bootstrapping are presented in **Table 3**. In addition, the final model explained 58.1% of the variance in PMH, 37.0% in DASS, 3.0% in personal resilience, 3.9% in self-efficacy, and 6.4% in social support.

Mediated Path Analytic Model in the Chinese Sample

The results of the final mediated path model in the Chinese sample also indicate an excellent fit of the data, RMSEA <.0001 (90% confidence interval from <.0001 to.024), CFI = 1, SRMR =.002. The standardized path coefficients are shown in **Figure 3**. Victimization experience was negatively linked with all three mediators and the two dependent variables, while perpetration frequency was negatively linked with personal resilience and social support and the two dependent variables but not with self-efficacy. All three positive factors were positively associated with PMH, while only social support and personal resilience further regressed on DASS. The results indicate that social support, personal resilience, and self-efficacy partially mediated the effect of victimization on mental health and that only social support and personal resilience partially mediated the effect of perpetration on mental health. The direct and indirect effects of the mediation are presented in **Table 3**. Moreover, all the correlations were significant at.001 level. In addition, the final model explained 49.0% of the variance in PMH, 20.8% in DASS, 2.6% in personal resilience and self-efficacy, and 3.9% in social support.

DISCUSSION

The main aim of this study was to test the mediators of previous bullying experience regarding the outcomes of both positive and

TABLE 3 | Standardized total indirect, specific indirect, and direct effects and their 95% confidence intervals (C.I.).

Predictor	Dependent variable	Total indirect effect [95% C.I.]	Specific indirect effect			Direct effect [95% C.I.]
			Social support [95% C.I.]	Resilience [95% C.I.]	Self-efficacy [95% C.I.]	
			China			
Victimization	PMH	−.12 [−.14, −.10]	−.04 [−.05, −.03]	−.03 [−.03, −.02]	−.06 [−.07, −.05]	−.06 [−.09, −.04]
Victimization	DASS	.05 [.04,.06]	.03 [.02,.04]	.02 [.02,.03]	/	.18 [.14,.21]
Perpetration	PMH	−.03 [−.04, −.02]	−.02 [−.02, −.02]	−.01 [−.02, −.01]	/	−.03 [−.05, −.01]
Perpetration	DASS	.03 [.02,.04]	.01 [.01,.02]	.01 [.01,.02]	/	.11 [.08,.14]
			Germany			
Victimization	PMH	−.18 [−.21, −.14]	−.06 [−.07, −.04]	−.05 [−.07, −.04]	−.07 [−.08, −.05]	−.11 [−.14, −.08]
Victimization	DASS	.13 [.11,.16]	.04 [.03,.06]	.04 [.02,.05]	.06 [.04,.07]	.15 [.12,.18]
Perpetration	PMH	.03 [.02,.04]	/	/	.03 [.02,.04]	/
Perpetration	DASS	−.02 [−.04, −.01]	/	/	−.02 [−.04, −.01]	/

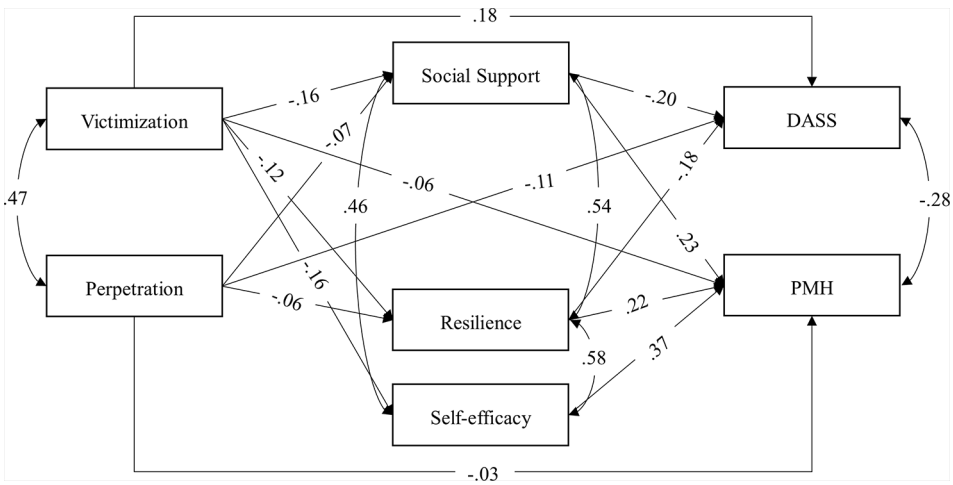

FIGURE 3 | Final path mediated model for the effects of bullying, social support, personal resilience, and self-efficacy on positive and negative well-being in the Chinese sample. Regression paths (single-arrow) and correlation paths (curved double-arrow) were all significant on at least.05 level. Standardized coefficients are shown. DASS, Depression, Anxiety, and Stress Scale. PMH, Positive Mental Health Scale.

negative mental health in university students in China and Germany. For both countries, it was found that social support, personal resilience, and self-efficacy partially mediate the effect of previous victimization experience on current well-being and mental illness. In contrast, cultural differences were observed for the relationship between perpetration and positive and mental health. For Germany, only self-efficacy fully mediated the effect of perpetration on mental health: more frequent perpetration promoted higher mental health status via a higher level of self-efficacy. Conversely, for students in China, social support and partially resilience partially mediated the effect of perpetration on mental health. More specifically, more frequent bullying perpetration was linked with a lower level of social support perception and lower personal resilience, which in turn was found to be associated with worse mental health.

In both countries, social support, personal resilience, and self-efficacy partially mediated the negative effect of victimization on mental health, with medium-sized total indirect effects. The results replicate previous findings on similar social resources and positive traits (e.g., 24, 28, 29, 38, 57) and indicate that the long-term adverse emotional consequences of being bullied are partly explained by less social support, lower personal resilience and lower self-efficacy levels. The current results further provide some initial evidence of an important role for self-efficacy, which revealed the strongest indirect mediating effect in our data. Bullying interventions may consider promoting the social resources and the self-efficacy of the victims in order to reduce the negative impact of victimization. However, there was also a direct effect of bullying victimization, indicating that even if social support, personal resilience or self-efficacy is high, a negative effect of being excluded and beaten may not be avoided.

The relationships between perpetration, positive factors, and mental well-being were different across countries. In China, bullying others more frequently, like being bullied, was associated with a lower level of personal resilience and support perception; whereas in Germany, bullying others was unrelated to the level of social support or personal resilience, but instead even weakly increased one's self-efficacy. The results indicate that bullies from two different cultures, Germany and China, face different psychological consequences of their perpetration behavior. The associations of perpetration with positive factors were different as well. Those involved in bullying in China were less personally resilient and socially supported and had more severe mental illness symptoms (8). Thus, providing social support and strengthening personal resilience may reduce bullying perpetration in China. In contrast, in Germany, bullies were as socially supported and personally resilient but even more self-efficient than those not involved in any bullying. This is consistent with previous findings that bullying is little socially sanctioned and conducted by students who are competent social manipulators with good emotional well-being (e.g., 5, 6, 58, 59).

Cultural differences were also found in the relationship between positive and negative mental health. For instance, the effect size of the correlation between PMH and DASS was smaller in China than that in Germany. Moreover, self-efficacy had a stronger association, as indicated by the path coefficient in **Figure 3**, with PMH than with DASS in Germany. This phenomenon is more pronounced in the China sample, where self-efficacy had a significant association with PMH but not with DASS. On the one hand, these results are in line with Karademas (60), who proposed that the buffering effect of self-efficacy is greater for positive than for negative mental health. On the other hand, it may be that self-efficacy may not be related to depression or anxiety in China. In China, many people believe that uncontrollable or unexpected events or "fate" (*Tianming*) may sometimes impact the outcome of ones' best endeavors. Thus, those having high self-efficacy may face greater disappointment, while having low self-efficacy may also link to a greater sense of powerlessness. In Germany, in contrast, having higher self-efficacy not only promoted PMH but also prevented mental illness at a certain level. Taken together, it appears that the difference between the latent constructs measured by PMH and DASS was greater in China than in Germany.

While the large sample size, cross-cultural design (allowing for direct comparison of bullying involvement in Germany and China), and the inclusion of mediators are major strengths of the current study, there are also limitations. The measure of bullying history was retrospective and self-reported. However, test–retest showed high reliability over one year. Nevertheless, reported associations need to be interpreted cautiously and require replication in prospective studies. The large sample size did allow us to detect small effects. Thus, when interpreting our results, not only the significance of paths but also the effect sizes should be considered, especially regarding the effects between perpetration and other variables (56). In addition, the current study chose three representative positive factors as a start of the coping/recourse model of bullying; however, there may be more critical mediators, especially for perpetration, that were not tested in our study. Further studies may consider other protective or buffering factors and expand the model upon the three mediators examined in the current study.

In sum, the current study found that social support, personal resilience, and self-efficacy play essential roles in regulating the influences of victimization on later mental well-being across countries considered as individualistic or collectivistic. Thus strengthening social support, personal resilience and self-efficacy are likely to help to mitigate the ill effects of peer victimization. In contrast, mechanisms of how bullying perpetration associates with mental health differ between individualistic and collectivistic cultures. In Germany, bullying increases self-efficacy and has even small positive effects on mental well-being. In contrast, in a collectivistic society such as China, bullying others is associated with reduced social support and decreased personal resilience and negative mental health. Bullying may be seen as breaking the social norms of caring for others. The model proposed here needs to be explored longitudinally and applied to the development of strategies that build psychological personal resilience and resource in bullying victims.

DATA AVAILABILITY STATEMENT

All datasets generated for this study are included in the article/ **Supplementary Material**.

ETHICS STATEMENT

This study is part of the Bochum Optimism and Mental Health (BOOM) research project, which is a large-scale cross-cultural longitudinal investigation in mental health. The project was approved by the Ethics Committee of the Faculty of Psychology at Ruhr University Bochum.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyt.2019.00960/full#supplementary-material

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Trends in Bullying and Emotional and Behavioral Difficulties Among Pakistani Schoolchildren: A Cross-Sectional Survey of Seven Cities

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Background: Bullying and peer victimization among adolescents are growing public health concerns that affect victims' emotional well-being, and their social and academic functioning. Despite concerns about this public health epidemic in low- and middle-income countries, most prevalence, policy and intervention studies have been conducted in developed countries and economies.

Methods: This cross-sectional study was conducted between September 2016 and July 2017 at seven public and private schools located in five districts in Pakistan: Lodhran, Rahim Yar Khan, Bahawalpur, Faisalabad, Multan, Thatta, and Nawabshah. A total of 2,315 schoolchildren were surveyed with a specially designed instrument in Urdu with items about demographics and bullying behavior, together with a strengths and difficulties questionnaire.

Results: Mean age of the respondents was 14.63 (2.87) years. More than half of the respondents were males (n = 1301, 56.2%), and a majority reported that their mothers were housewives (n = 2,100, 90.7%). A total of 615 (26.6%) respondents reported being bullied at school, and 415 (17.9%) reported being bullied away from school. Perpetration of bullying was reported by 430 (18.6%) participants at school and 376 (16.3%) away from school. Being bullied in the past was strongly associated with becoming a perpetrator of bullying in the future. Internalizing symptoms were significantly associated with male gender, older age, being a victim of bullying, and employment status of the respondent's mother. Externalizing symptoms were significantly associated with male gender, older age, being a victim and perpetrator of bullying, and mother's employment status.

Conclusion: Bullying perpetrators have a greater tendency to exhibit externalizing symptoms, whereas victims develop both externalizing and internalizing psychopathologies.

Keywords: bullying, perpetration, victimization, Pakistan, children, behavioral problems, emotional problems

INTRODUCTION

Bullying and peer victimization among adolescents are growing public health concerns because they affect victims' emotional well-being, as well as their social and academic functioning (1). Although some of its characteristics overlap with other forms of aggression such as harassment, bullying is defined as unwanted and repetitive aggressive behaviors committed by a young individual or a group of young people towards the victim, and a perceived sense of power imbalance in favor of the aggressors (2). Unfortunately, bullying has traditionally been socially accepted as a "rite of passage" and a "developmentally appropriate" behavior among children and adolescents, despite its adverse psychological and social consequences (3). This unhealthy acceptance of bullying is also prevalent in the media and literature (4, 5).

Bullying usually occurs in settings such as classrooms or among siblings at home (2, 3, 6). Siblings or dating partners, however, are not seen as pivotal pillars in most operational definitions of bullying behaviors (2). Bullies try to assert their power over individuals with an emotional response to bullying or with limited social support (6). This epidemic is prevalent across all societies, ethnicities, races, cultures and geographies (3). The world-wide prevalence of bullying is estimated to be slightly more than 1 in 3 students aged 13 to 15 years (7), and these figures are substantiated by a recent metaanalysis of 80 studies that reported the global prevalence rate of traditional bullying to be 35% (8). Similar prevalence figures have been reported from developing countries such as Pakistan, where a nationally representative school-based health survey in 2009 estimated the prevalence of bullying behavior to be around 41% (9). These rates are significantly higher than those reported in the developed world, and the difference is substantiated by the 2011 CDC Youth Risk Behavior Survey, which estimated the prevalence of bullying among adolescents in the USA to be around 27% (10).

Bullying has also been associated with adverse physical, mental and academic consequences in children and adolescents. For example, victims of bullying were more likely to have a higher risk of depression, suicidal ideation, anxiety, sleep disturbances, social isolation and feelings of loneliness (11–14). Moreover, the prevalence of substance use including alcohol, nicotine and inhalants was reportedly higher among victims of bullying than non-victims (12, 15, 16). The perpetration of bullying is also associated with externalizing symptoms such as aggression, truancy and delinquency (11–14). A recent metaanalysis of 14 studies suggested a dose-dependent relationship between bullying and the development of psychotic symptoms—a finding that highlights the debilitating consequences of bullying (17, 18).

Somatic symptomatology and academic underachievement have also been associated with bullying behavior among children (3, 19, 20). A recent study of a sample Pakistani children reported that more than 89% of the young respondents reported one or more occurrences of victimization, and more than 75% reported one or more acts of perpetration (21). A high prevalence of bullying behavior among Pakistani youth was found to correlate significantly with hunger, absences from school, witnessing fights between the father and another man, and patriarchal attitudes (22). Further to these findings, a deeper investigation into gender roles and violence against women and girls among youth also demonstrated that the aforementioned factors along with bullying behavior also account for acceptance of patriarchal attitudes in Pakistan (23). However, only a few high-quality studies exploring the public health aspects of bullying have been conducted in this country. Most of these studies explored bullying in the context of patriarchal and gender-biased aspects of Pakistani society (22, 23), and this research reported participants' gender to be a significant predictor of bullying behaviors. Compared to females, males were reported to be more involved in the perpetration of bullying, aggression and violence (22, 23). However, none of the studies compared the employment status of mothers or her availability at home as a possible correlate of bullying and emotional problems in children.

Recent years have seen improvements in our understanding of the psychosocial correlates of bullying behavior, owing to the progress made in data sciences. The psychosocial model of bullying behavior is viewed as complex due to potential overlaps in the frequency of involvement, perpetration and victimization among youth (24, 25). This approach reflects the view that psychosocial and health-related behaviors tend to cluster together, rather than acting as single factors in determining behavior (26, 27). Moreover, these complexities indicate that variable-centered approaches may be inferior to person-centered analytic approaches such as cluster analysis. In contrast to variable-centered analysis, cluster analysis uses patterns of behaviors, experiences, demographics and health to identify different subgroups, their frequencies, and heterogeneity in associations (28). This approach thus provides a better method to elucidate actual behavioral patterns among respondents, and thus sheds light on the conceptual overlaps in bullying behavior (24, 25).

There is a paucity of data exploring the relationships between bullying and its emotional and behavioral consequences in Pakistan. Moreover, no research has explored this phenomenon with person-centered analytical approaches. Therefore, the present study was designed with the following aims:

a. To explore the prevalence of bullying, victimization and bully-victimization behaviors among Pakistani schoolchildren.
b. To explore the association of mothers' employment status with bullying behaviors among children.
c. To elucidate the strength of association of different bullying behaviors with strengths and difficulties among schoolchildren.
d. To identify the mediating effects of pure victimization behavior on the association between externalizing symptomatology and pure perpetration.
e. To identify the mediating effects of pure perpetration behavior on the association between internalizing symptomatology and pure victimization.

f. To use an unsupervised machine learning technique in orde to identify clusters of emotional and behavioral difficulties associated with patterns of bullying behavior among schoolchildren.

METHODS

Study Design

This cross-sectional study was conducted between September 2016 and July 2017 at seven public and private schools located in five districts in Pakistan: Lodhran, Rahim Yar Khan, Bahawalpur, Faisalabad, Multan, Thatta, and Nawabshah (29). The districts of Lodhran, Rahim Yar Khan, Faisalabad, Bahawalpur, and Multan are located in Punjab province, where the total population of 12,388,824 represents three major ethnicities, i.e. the Saraiki, Punjabi, and Urdu-speaking populations (29). The districts of Thatta and Nawabshah are located near the Indus River in Sindh province, where a total population of 13,55,131 represents a Sindhi and Urdu-speaking majority (29). Our study sample was representative of both urban and rural populations. However, all participating schools were selected based on convenience sampling methods.

Sample Size

The total sample size was calculated with two methods. A minimum sample size of 664 was calculated with the following parameters: 5% margin of error, 99% confidence level, hypothetical population size of N = 20,000, and 50% response distribution. Previous studies have reported low to moderate effect sizes for associations between bullying behavior and emotional and behavioral difficulties in children (19, 30). Therefore, for low to moderate effect sizes, an alpha error probability of 5%, a statistical power of 99% and 5 predictors, a minimum sample size of 1,342 was found to be suitable for this study (GPower, v. 3.1).

Operational Definitions

This study focused on three different patterns of bullying behaviors: pure perpetrators, pure victims, and bully-victims. Pure perpetrators were defined as those having a history of bullying other children. Pure victims were those who had a history of being bullied by other children. Children who reported a history of both perpetration and victimization were classified as bully-victims.

Survey Procedure and Questionnaire

A team of local researchers was recruited to approach the administrative staff of the schools to seek their permission to conduct the study at their sites. Ethical approval for this study was granted by the Peoples University of Medical and Health Sciences for Women, Nawabshah, and was found to meet the ethical criteria of the Declaration of Helsinki (1964) and comparable standards. An informed consent form and detailed brochure outlining the objectives of the study were mailed to each participant's parents. They were assured that all data would be anonymous and that no individual findings would be reported.

Thereafter, children enrolled at these schools and aged 10 to 17 years were approached through a convenience sampling method by a team of interviewers including their teachers and local researchers. Only those participants were recruited whose parents provided their written consent for their child to participate in the study. The study sample was not stratified based on the number of schools or potential study participants. A universal sampling technique was preferred, in which we approached all students enrolled at each school during the study period.

No incentives were provided to the parents or children taking part in the study. The children completed a three-part survey containing items on a) demographics, b) experiences of bullying and victimization, c) help-seeking behavior, and d) a strengths and difficulties questionnaire. All surveys were self-administered in the Urdu language, the national language of Pakistan. Members of the research team distributed the survey to students in their regular classrooms in the presence of their teachers, and responded to any questions or comments from the students. They were given ample time during regular classroom hours to complete the survey. These measures ensured a high response rate and high accuracy of the responses.

Measures

The first section of the survey inquired about respondents' demographic characteristics including age, gender, mother's employment status, and background. The second section comprised 11 items regarding experiences of bullying and victimization as perceived by the participants. They were asked about the frequency of both victimization and perpetration of bullying behaviors. Four items sought details on bullying behavior at school and outside school, e.g. at private tuition centers, in the previous six months. The responses to these four items were recorded on a Likert-type scale ranging from "not at all" to "most days". These items yielded good internal consistency, with a Cronbach's alpha value of 0.820, and showed a unidimensional factor pattern that explained 66.1% of the variance according to exploratory factor analysis. Internal consistency for both the victimization (alpha = 0.74) and perpetration subscale (alpha = 0.77) was acceptable. Participants who had a positive history of both bullying victimization and perpetration were classified as bully-victims.

The next three items specified the gender of bullying perpetrators as boy, girl or group. These items were rated on a four-point Likert-like scale ranging from "not at all" to "most days". The third section consisted of four items pertaining to help-seeking behavior. Out of these four items, two dichotomous questions asked whether the respondent had talked to or sought help from anyone regarding these experiences. The next question inquired about the relationship of the help provider to the respondent, i.e., teacher, parent, friend, sibling, or other. The last question asked respondents whether they sought help from parents, teachers, relatives, siblings, friends, or others.

The fourth section comprised the Strengths and Difficulties Questionnaire (SDQ), which has undergone extensive validation

in samples of Pakistani children and adolescents. This instrument yields scores across several domains of emotional difficulties and strengths including emotional symptoms, conduct problems, hyperactivity, peer relationship problems, prosocial, externalizing, and internalizing symptoms (31). The scores were grouped into three categories based on established cut-off values for normal, borderline and abnormal. The ranges of possible scores for each section were: a) total difficulties (20–40), emotional difficulties (7–10), conduct problems (5–10), hyperactivity (7–10), peer problems (6–10), prosocial behavior (0–4), and impact score (2–10). The present study used the impact supplement of the SDQ to assess the frequency of distress among participants at home, in the context of their friendships, and during leisure and classroom activities (31).

Statistical Analyses

All data were analyzed with SPSS v. 20 (IBM, Chicago, IL, USA). Categorical variables are reported here as frequencies, and quantitative variables are reported as the mean and standard deviation. A series of t-tests for independent samples quantified the association of gender and mother's employment status with scores on the SDQ. Pearson's correlation coefficient was calculated to analyze associations between age and SDQ subscales. Subsequently, a series of linear regressions were used to evaluate the associations between demographic characteristics and bullying behaviors with total SDQ scores, impact supplement scores, and internalizing and externalizing subscale scores. Before regression analysis, multicollinearity among variables was checked with the variance inflation factor (VIF) and tolerance (TOL) values. A value ≥10 for VIF and ≤0.2 for TOL for any predictor in the regression analysis was considered significant multicollinearity. Hierarchal regression was also used to assess the mediating effect of episodes of bullying in the past on the relationship between perpetration of bullying and externalizing symptoms. The significance of this mediating relationship was further verified with Sobel, Aroian, and Goodman statistics (32, 33). Thereafter, a two-step clustering algorithm was used to identify clusters of respondents based on their bullying behavior, strengths and difficulties. A log-likelihood model-based distance measure was used in the present analysis. This approach combines the clusters and evaluates the distance between them as the corresponding decrease in log-likelihood (34). First, all cases were sorted into pre-clusters, which were then clustered according to a hierarchical algorithm. Akaike's information criterion (AIC) was then used to select the "best" cluster solution. The silhouette measure of cohesion and separation was used to assess the quality of the cluster, with a cut-off value of ≥0.5 considered as "good".

Several approaches were used to minimize missing data. For example, respondents were given educational brochures and presentations to help them understand the importance of this study. They were asked to double-check their questionnaire to ensure no items were left unanswered. Finally, if there were any missing data, continuous values were replaced with the means of the scale for a given respondent, and values for categorical variables were replaced with the mode.

RESULTS

Demographics

Out of 2,650 parents approached, a total of 2,325 provided consent for their child to participate in the survey. There was no rejection from the children and adolescents themselves, and the final overall response rate was 87.74%. Mean age of the respondents was 14.63 (2.87) years. Independent sample t-tests revealed that mean age in boys, i.e. 14.97 (3.58) years, was significantly older than in girls ($\bar{x}$ = 14.20, SD = 1.39). More than half of the respondents were males (n = 1301, 56.2%), and a majority reported that their mothers were housewives (n = 2,100, 90.7%). A high proportion of respondents reported that they had felt the need to ask for outside help in the preceding six months (n = 1,117, 48.2%), especially from their parents (n = 1,004, 43.4%).

Prevalence of Bullying Behavior

A total of 615 (26.6%) respondents reported being bullied at school, and 415 (17.9%) away from school. The perpetration of bullying was reported by 430 (18.6%) participants at school and 376 (16.3%) away from school. Approximately one fourth of the participants (n = 559, 24.4%) reported being bullied by girls, and 516 (22.3%) by boys. A smaller number (n = 413, 17.8%) reported being bullied by a group more than once a week. Further exploration of the patterns of bullying revealed a total of 735 (31.70%) bully-victims. The experience of being bullied in the past showed a strong association with bully-victim behaviors (X_2 = 1,298.19, P < 0.001, φ = 0.75). Student bullying at school showed a positive association with bullying away from school (ρ = 0.59, P < 0.001). Similar trends were noted for victimization behavior (ρ = 0.56, P < 0.001). Respondents who had been bullied in the past also scored significantly higher on the SDQ and its subscales than their counterparts who did not report any victimization experiences. Detailed demographic characteristics and patterns of bullying are presented in **Table 1**. The prevalence of history of victimization, perpetration and bully-victim experiences were significantly higher among children of mothers who were employed outside the home. Both boys and girls were more frequently bullied by other boys than by girls or groups (**Supplementary Table 1**).

Responses on the SDQ

According to these data, a total of 527 (22.8%) participants had borderline abnormal scores, and 479 (20.7%) had severe difficulties. According to SDQ subscale results, abnormal scores were seen in 600 (25.9%) participants for emotional problems, 583 (25.2%) for conduct problems, 195 (8.4%) for hyperactivity, 389 (16.8%) for peer problems, and 435 (18.8%) for poor prosocial skills. According to the results for the impact supplement scale, 299 (12.9%) participants had borderline scores and 902 participants (39.0%) had severe problems.

Bullying, Distress and Help-Seeking Behavior

Most respondents (1,646, 71.1%) had told someone about their experience of being bullied, and a high proportion indicated that

TABLE 1 | Demographic characteristics and trends in bullying among Pakistani schoolchildren.

Variables	Subcategories	Frequency (n)	Percentage (%)
Gender	Boy	1,301	56.2%
	Girl	1,014	43.8%
Mother's profession	Housewife	2,100	90.7%
	Employed	215	9.3%
Have you felt the need to ask for outside help in the past six months?	No, I have not felt the need	600	25.9%
	I have considered getting outside help	599	25.9%
	I have sought outside help	1,117	48.2%
Preference for seeking help	Parents	1,004	43.4%
	Teachers	382	16.5%
	Relatives	73	3.2%
	Siblings	162	7.0%
	Friend	573	24.7%
	Other	122	5.3%
How often have you been bullied in school in the past six months?	Not at all	1,434	61.9%
	Less than once a week	267	11.5%
	More than once a week	259	11.2%
	Most days	356	15.4%
How often have you been bullied away from school (such as in tuition centers) in the past six months?	Not at all	1,651	71.3%
	Less than once a week	250	10.8%
	More than once a week	259	11.2%
	Most days	156	6.7%
How often have you bullied others in school in the past six months?	Not at all	1470	63.5%
	Less than once a week	416	18.0%
	More than once a week	212	9.2%
	Most days	218	9.4%
How often have you bullied others away from school (such as in tuitions centers) in the past six months?	Not at all	1,708	73.7%
	Less than once a week	232	10.0%
	More than once a week	157	6.8%
	Most days	219	9.5%
How often have girls bullied you?	Not at all	1,532	66.8%
	Less than once a week	200	8.7%
	More than once a week	161	7.0%
	Most days	398	17.4%
How often have boys bullied you?	Not at all	1,574	68.0%
	Less than once a week	226	9.8%
	More than once a week	276	11.9%
	Most days	240	10.4%
How often has a group bullied you?	Not at all	1,705	73.6%
	Less than once a week	198	8.5%
	More than once a week	163	7.0%
	Most days	250	10.8%
Have you told anyone about your experience so that they can help you?	Yes	1,646	71.1%
	No	670	28.9%
If yes please indicate who you told:	Parents	1,126	48.6%
	Teachers	389	16.8%
	Siblings	303	13.1%
	Friends	386	16.7%
	School	44	1.9%
	Other	68	2.9%

they had sought help from their parents (n = 1,126, 48.6%). **Supplementary Table 2** presents the association of bullying experiences with individual items on the impact supplement scale.

Bullying and Emotional and Behavioral Difficulties

Linear regression analysis yielded a significant model predicting total scores on the SDQ scale (adj. R^2 = 15%, F = 68.88, DF_{total} = 2,314, P < 0.001). According to this model, higher SDQ scores were associated with male gender, older age, and mother's employment outside the home. Although a history of bullying correlated with higher SDQ scores, the strongest association was observed for children who reported both perpetration and victimization, followed by perpetration only and victimization only (**Table 2**). Similar trends were noted in the frequencies of distress reported by participants (adj. R^2 = 8.5%, F = 36.64, DF_{total} = 2,314, P < 0.001).

Being bullied in the past exerted significant mediation effects on the relationship between bullying others and externalizing

TABLE 2 | Patterns of bullying behaviors as predictors of SDQ scores.

Variables	B	Std. Error	Beta	t-value	P value
(Constant)	14.089	0.843		16.713	<0.001
Gender	–2.444	0.238	–0.212	–10.249	<0.001
Age	0.086	0.039	0.043	2.221	0.026
Mother's profession	1.070	0.383	0.054	2.791	0.005
Bully victims	3.245	0.275	0.264	11.813	<0.001
Pure victims	1.582	0.343	0.095	4.604	<0.001
Pure perpetrators	2.121	0.379	0.113	5.590	<0.001

symptoms (**Table 3**), as shown by hierarchal regression analysis ($F = 108.96$, $df_{total} = 2,315$, $P < 0.001$). These variables yielded significant effects in the Sobel test (test statistic = 6.32, SE = 0.07, $P < 0.001$), Aroian test (test statistic = 6.32, SE = 0.07, $P < 0.001$) and Goodman test (test statistic = 6.33, SE = 0.07, $P < 0.001$). In a similar manner (**Table 5**), being victimized in the past exerted significant mediation effects on the relationship between bullying others and internalizing symptoms (**Table 4**), as shown by hierarchal regression analysis ($F = 108.96$, $df_{total} = 2,315$, $P < 0.001$). These variables yielded significant effects in the Sobel test (test statistic = 6.74, SE = 0.06, $P < 0.001$), Aroian test (test statistic 6.73, SE = 0.06, $P < 0.001$) and Goodman test (test statistic = 6.74, SE = 0.06, $P < 0.001$).

Cluster Analysis

A two-step clustering algorithm was used to group cases into two clusters. The overall quality of the clusters was rated as good, with a silhouette measure of cohesion and separation of 0.5. The first cluster—"normal behavior"—contained lower scores on all SDQ subscales. It represented 0% of bully-victims, 100% of the pure perpetrators and 100% of the pure victims. The second cluster—"psychopathological behavior"—contained significantly higher scores on all subscales except prosocial behavior. The SDQ subscale scores clustered 100% of bully-victims and excluded respondents with a history of victimization only or perpetration only (**Table 5** and **Supplementary Figure 1**). Thereafter, cluster analysis was done by introducing variables based on pure victims, pure perpetrators, or bully-victims, with similar results (**Supplementary Figure 2**).

DISCUSSION

Our survey results show a high prevalence of bullying victimization as well as perpetration among Pakistani schoolchildren. Almost all of the students who reported being bullied in the past also reported perpetrating bullying behaviors themselves. This behavior was associated with significant distress as shown by the responses on the SDQ impact supplement, and was also associated with severe behavioral problems as identified by the main SDQ.

An especially disturbing result is that almost 45.3% of the students reported being victims of bullying, while 42.1% were perpetrators of bullying and 31.2% were both victims and perpetrators. These figures are consistent with earlier surveys in Pakistan. For example, a high prevalence of verbal (57%) and physical abuse (33.7%) was reported among schoolchildren in the cities of Karachi, Lahore and Quetta (35). Similar prevalence rates of bullying behavior were reported by Zhu and Chan among Chinese schoolchildren (36). However, lower prevalence rates of bullying behaviors were reported among children in developed countries such as Australia, where the findings were attributed to better implementation of intervention programs that targeted bullying behaviors among schoolchildren (37).

Our data thus reveal a high prevalence of behavioral problems among Pakistani schoolchildren. Interestingly, there are no systematic reviews or metaanalyses summarizing the global prevalence of behavioral problems identified with the SDQ among schoolchildren. However, a systematic review by Salmanian et al. concluded that studies based on this instrument reported higher prevalence of conduct problems than other tools such as the Kiddie Schedule for Affective Disorders and Schizophrenia or clinical interviews used in the same populations (38). These authors also concluded that the SDQ might be useful as a screening tool, and that further psychiatric research should be done to ascertain the prevalence rate of behavioral problems among children (38). Therefore, the present findings should be interpreted with caution.

In the present study, more than 43% of the children scored in the abnormal range of the SDQ. Syed et al. reported similar prevalence rates of emotional and behavioral difficulties among children 7 to 11 years old in Karachi who completed the SDQ (39). These results are consistent with findings published by Goodman et al., who reported a high prevalence of emotional difficulties (10–15%) among children and adolescents in different

TABLE 3 | Controlling effects of bullying perpetration on the association between victimizing behavior and externalizing symptomatology.

Model		B	Std. Error	Beta	t-value	P value
1	(Constant)	4.975	0.146		34.060	<0.001
	Frequency of victimization	1.016	0.077	0.266	13.274	<0.001
2	(Constant)	4.605	0.157		29.413	<0.001
	Frequency of victimization	0.628	0.098	0.165	6.402	<0.001
	Frequency of perpetration	0.642	0.103	0.160	6.232	<0.001

TABLE 4 | Controlling effects of bullying victimization on the association between victimizing behavior and externalizing symptomatology.

Model		B	Std. Error	Beta	t-value	P value
1	(Constant)	11.994	0.237		50.662	<0.001
	Frequency of perpetration	1.560	0.131	0.241	11.946	<0.001
2	(Constant)	11.247	0.253		44.386	<0.001
	Frequency of perpetration	0.750	0.167	0.116	4.501	<0.001
	Frequency of victimization	1.217	0.159	0.197	7.660	<0.001

TABLE 5 | Mean (SD) scores on SDQ subscales in the two clusters.

SDQ subscales	Clusters			
	Low psychopathology n = 1581 (68.3%)		High psychopathology n = 735 (31.7%)	
Children with history of bullying	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Bully victims	0	0%	735	100%
Perpetrators	239	15.1%	735	100%
Victims	315	19.9%	735	100%
Scores on SDQ scale	Mean	SD	Mean	SD
Emotional problems	4.08	1.93	4.58	1.94
Conduct problems	2.81	1.98	4.07	2.06
Hyperactivity	3.13	2.04	4.16	2.05
Peer problems	3.30	1.87	4.10	1.91
Prosocial behavior	6.67	1.80	5.60	2.15
Global score	13.32	5.56	16.92	5.31
Externalizing symptoms	5.94	3.41	8.23	3.33
Internalizing symptoms	7.38	2.99	8.68	2.92
Impact scores	10.04	3.63	12.31	4.00

settings such as rural Brazil and deprived British populations, and prevalence of 22% in urban Yemen and urban Brazil slum settings, 30–32% in Russia and Bangladesh, and 60% in rural Yemen (40). Our results are also consistent with those of Polanczyk et al. and Kovess-Masfety et al., who reported a significantly lower worldwide pooled prevalence of mental disorders compared to the present findings (41, 42).

The present findings show that children whose mother was employed outside the home had a higher prevalence of mental health problems and victimization by bullies at school than children from families in which the mother worked as a housewife. This highlights the patriarchal nature of Pakistani society, where working women may also be expected to shoulder a higher burden of child care than their male counterparts (43). This situation, coupled with a difficult work environment, lower wages, life stressors and the lack of day-care facilities for working women, acts as a double-edged sword that limits the ability of working mothers to provide care for their children.

Both being bullied and bullying others were associated with significant distress at school, during leisure and home activities, and in friendships, and higher SDQ scores. However, bullied victims reported more distress and more emotional and behavioral difficulties than bullies. It is usually believed that perpetrators of bullying exhibit externalizing symptoms (anger, criminality, and aggression), whereas victims of bullying exhibit internalizing symptoms (depression, anxiety, fear, and social withdrawal) (44–46). This belief is supported by Gini, who reported a higher propensity for psychosocial maladjustment and poor coping behavior among bullied schoolchildren than in their perpetrator counterparts (19). We believe that the higher prevalence of distress among victims of bullying may therefore be partly explained by two factors: a) victims experience comorbid externalizing and internalizing disorders, and b) a high proportion of these victims are bully-victims, who are themselves involved in perpetration behavior (37). This learned behavior is a consequence of the sociocognitive development of bullied children. After their experiences of being bullied by their peers, victims begin to believe in power symmetry and develop intolerance toward power differentials among peers; this in turn can lead to a higher prevalence of counterattacks (6). Thus, the victims themselves resort to the perpetration of bullying, and contribute to the resulting vicious circle of perpetration and victimization, adding further to their psychological injuries (6).

In the present study, a two-step cluster algorithm was used to examine clusters and dimensions of psychopathologies (assessed with the SDQ) among respondents. These results indicated that perpetrators, victims and bully-victims regressed to the same clusters when psychopathologies were taken into account. This finding confirms the homogenous nature of psychopathologies among adolescents in Pakistan, once the large overlap between victimization and perpetration behavior is controlled for. As such, it is a relatively novel finding, given that previous studies with cluster analysis classified bullying subtypes rather than behavioral and emotional problems. For example, one study of bullying behavior subtypes identified unwanted sexual and internet solicitation subgroups, and another identified uninvolved adolescents, victims, verbal bullies, bully-victims, and physically aggressive bullies, based on social support and skills status and social behavior (25). A similar conclusion can be drawn from the mediation analyses, which challenge the prevalent notions that

pure victimization is categorically associated with internalizing disorders and pure perpetration with externalizing disorders. We feel that future studies should conceptualize the association between pediatric behavioral disorders and bullying behaviors from a dimensional approach (47, 48).

The present results and analysis have several practical implications. They underscore the synergistic effect of perpetration and victimization behavior among young people, leading to a plethora of emotional and behavioral psychopathologies that persist later in life. Moreover, these strengths and difficulties tend to cluster together. Therefore, intervention programs should be multimodal and comprehensive, targeting both externalizing disorders such as aggression and internalizing disorders such as depression among youth. These intervention programs should also implement psycho-educational knowledge of victimization, perpetration and bully-victim behavior together (24, 25). Our results are also corroborated by a study that found a similar clustering of physical health behaviors among different forms of bullying (27). According to that research, Dutch adolescents who showed bullying behavior had high rates of risk-prone behavior, screen use, sedentary lifestyle, higher body mass index values, problematic self-efficacy and problematic SDQ scores (27).

Strengths of the Study

The present study has several strengths. Our large sample of Pakistani schoolchildren included respondents in seven cities across two provinces of Pakistan, which provided high statistical power for the data analyses. Despite the use of a convenience sampling method, the approach used to seek voluntary participation together with the high response rate make our findings potentially generalizable to the Pakistani population of schoolchildren in the same age group. The participating schools in this study were situated in small cities catering to their respective populations. But a large proportion of these children had a rural background, which increases the generalizability of our findings to the rural population as well.

Limitations

The cross-sectional nature of this study limits inferences related to temporality and causality. These hypotheses should therefore be explored in future studies of longitudinal cohorts. In addition, the use of a self-administered instrument may have led to some recall bias; moreover, no collateral information was obtained from the children's parents or teachers.

In conclusion, the prevalence of bullying perpetration and victimization behaviors among Pakistani schoolchildren was very high and was associated with behavioral difficulties. This study also provides insights into the association between childhood psychopathologies, different patterns of bullying behavior, and the mediators governing them. Bullying perpetration was associated with externalizing symptoms, whereas being a victim was associated with both externalizing and internalizing psychopathologies. The higher prevalence of distress among victims of bullying can be explained by comorbid externalizing and internalizing disorders, and by a greater tendency of victims to engage in bullying perpetration themselves as a learned behavior.

Our findings have several implications for Pakistani policy makers and researchers. We emphasize the need to understand the patterns of behavioral difficulties in order to design effective anti-bullying initiatives, psychosocial counseling procedures, and school-based mental health services.

ETHICS STATEMENT

Ethical approval for this study was granted by the Peoples University of Medical and Health Sciences for Women, Nawabshah, and it was found to meet the ethical criteria of the Declaration of Helsinki (1964) and comparable standards. The informed consent form and a detailed brochure outlining the objectives of the study were mailed to each participant's parents. They were assured that all data would be anonymous and that no individual findings would be reported.

AUTHOR CONTRIBUTIONS

SN and AW conceived and designed the study, supervised data collection, analyzed the data and interpreted it, and wrote the initial draft of the manuscript. ZS, WA, MW, JR, and TA collected the data and edited the draft extensively. All authors reviewed the final draft and approved it for publication.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyt.2019.00976/full#supplementary-material

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Family Violence, Sibling, and Peer Aggression During Adolescence: Associations With Behavioral Health Outcomes

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Bullying and sibling aggression can appear as similar behavior, though the latter is comparatively understudied. Aligned with the Theory of Intergenerational Transmission of Violence, research suggests that exposure to family violence increases an individual's risk for perpetrating violence in their own future relationships. Additionally, Problem Behavior Theory suggests that engaging in one problem behavior (e.g., bullying) increases the likelihood of engaging in other problem behavior (e.g., substance use). In Phase 1, this study of middle school students from the U.S. examined how exposure to family violence predicted membership in latent classes of bullying and sibling aggression perpetration (N = 894, sampled from four middle schools). In Phase 2, we used mixture modeling to understand how latent classes of family violence, sibling aggression, and bullying predict future substance use, mental health outcomes, and deviance behavior later in high school. Results yielded four profiles of peer and sibling aggression: *high all*, *high sibling aggression*, *high peer aggression*, and *low all aggression*. Youth who reported witnessing more family violence at home were significantly more likely to fall into the *sibling aggression* only and *high all* classes, compared to the *low all* class. Phase 2 results also yielded four classes: a *high all* class, a *sibling aggression and family violence* class, a *peer aggression* class, and a *low all* class. Individuals in the *high all* class were more likely to experience several unfavorable outcomes (substance use, depression, delinquency) compared to other classes. This study provides evidence for pathways from witnessing violence, to perpetrating aggression across multiple contexts, to developing other deleterious mental and behavioral health outcomes. These findings highlight the negative impact family violence can have on child development, providing support for a cross-contextual approach for programming aimed at developing relationships skills.

Keywords: bullying, substance (drug) abuse, peer deviance, childhood trauma and adversity, adverse child experiences, aggressive behavior

INTRODUCTION

Aggressive behavior manifests across contexts and environments throughout adolescence, including school (e.g., bullying peers) and home (e.g., sibling aggression). Bullying estimates vary but, in general, 19.3 to 36.5% of middle and high school students report traditional bullying perpetration, and 10.9 to 15.8% of students perpetrate cyberbullying (1–3). However, sibling conflict is comparatively understudied and often understood as normative (4). Some regard sibling rivalry as a marker for positive social development (5, 6). However, Tippett and Wolke (7) identified a homotypic relationship between sibling agression and school bullying: children who bullied a sibling were also likely to bully peers at school and children who were victimized by a sibling were also more likely to be victimized by peers at school. Most children (about 80%) in the U.S. grow up with at least one sibling, and this relationship is touted as one of the longest and most relevant relationships in an individual's life (8). Prior work suggests that sibling aggression is a highly prevalent form of family violence: between 30 and 80% of youth between ages 3 and 17 report being physically assaulted at least once by a sibling during their lifetime (9, 10). An observational study reported between 7 and 12 violent events occurring between siblings in just 3 h of in-home observations (11). These instances appear to be distinctly different and more harmful than developmentally normative sibling conflict. Similar to bullying among peers, sibling aggression is associated with both short- and long-term problems including maladaptive adjustment in adolescence, increased risk for behavioral problems later in life, and greater frequency of engagement in dating violence (12–15).

Observing family violence is a well-established risk factor for youth engagment in both sibling aggression and bullying at school (16–19). Drawing from Social Learing Theory of Aggression (20), when youth observe caretakers or other relevant models invoke aggression in conflict resolution and achieve a desireable outcome, they thereby learn that this behavior is a useful tool. Others have found aggression to be a pathway to gaining social attention (21). This conceptualization also generalizes across contexts. However, the literature has yet to explore the heterogeneity that exists in peer and sibling aggression homotypicality, the extent to which exposure to parental violence predicts this heterogeneity, and the long-term outcomes associated with profiles of exposure to parental violence, peer, and sibling aggression.

Youth Aggression Across Home and School Contexts

Bullying is defined as recurring acts of aggression perpetrated by an individual or group that are intended to harm another individual. This aggression occurs across a power gradient and can be physical (e.g., hitting), verbal (e.g., name-calling), relational (e.g., social exclusion), or result in damage to property, and can happen in person or through online media (e.g., text messaging, e-mail, chats; 22–24). Among a 2015 nationally representative sample of high school students (grades 9 through 12), 20.2% reported being targets of bullying on school property in the past year (25). In a recent meta-analysis, among the 80 studies assessing bullying among adolescents, 34.5% were agents of traditional bullying and 36% were targets of traditional bullying (26). Prior work has found at the individual level, students who use alcohol and other drugs, are highly impulsive, demonstrate low levels of empathy, and hold traditional beliefs about masculinity are all at heightened risk for bullying others (27–29). At the relational level, students who face heighted risk are those who are exposed to family violence and hostility, have low parental monitoring, have low social support, and have friends involved in delinquent behavior (29–33). At the community level, risk of becoming a bully is associated with exposure to neighborhood violence (30, 34). However, also at the community level, reporting a strong sense of school belonging appears to mitigate risk in bullying involvement (29, 32).

Despite the substantial research on risk factors associated with bullying, fewer have sought to expand empirical knowledge related to sibling aggression. Unfortunately, unlike bullying, there is little consensus among scholars on how to define or operationalize sibling aggression. For example, prior work has used a variety of terminology to define sibling aggression including violence, abuse, bullying, and rivalry (35). Further, some theorists have noted the need to incorporate concepts of harmful intent or repetition of the behavior into the definition of sibling aggression (36). Informed by the current debate about a precise definition, we adopt a holistic approach to understanding sibling aggression outlined by Wolke, Tippett, and Dantchev (37) which includes "any unwanted aggressive behavior(s) by a sibling that involves an observed or perceived power imbalance and is repeated multiple times or is highly likely to be repeated; [sibling] bullying may inflict harm or distress on the targeted sibling including physical, psychological, or social harm" (p. 918). Reported prevalence rates vary by type of aggression (37). However, studies that assess multiple forms of aggression have found that victims of sibling aggression report more physical and verbal forms of aggression and fewer experiences of relational or emotional forms of aggression (38, 39). Similar to the voluminous literature on bullying, prior work notes that youth who experience more than one type of sibling aggression tend to report greater mental health problems (14). Some sibling conflict is normative, harmless, and can even be useful for learning to resolve interpersonal conflict (5, 40). However, prolonged conflict between siblings can be problematic, and differentially affect internalizing and externalizing problems. The link between sibling conflict and heightened depressive mood, loneliness, and poor self-esteem (14, 41, 42). Similarly, sibling conflict has been associated with externalizing problems (e.g., substance use, fighting) among adolescents (43) and increased conduct problems during early adolescence (44). Early longitudinal studies have also noted that, among female siblings, older sister hostility predicted increases in young sister behavior problems over time (45).

Thus, behavioral characteristics of sibling aggression are phenotypically similar to bullying behavior, with most youth reporting multiple forms of aggression (e.g., physical, verbal, relational, emotional; 46). Further, similarities exist across

negative outcomes associated with both peer and sibling aggression (37). Additionally, aggressive behavior rarely occurs in isolation and most studies (with a few exceptions, e.g., 7) to date have investigated predictors and correlates of peer and sibling aggression separately. Of relevance, Problem Behavior Theory suggests that engaging in one problem behavior (e.g., bullying) increases the likelihood of engaging in other problem behavior (47). Robust research indicates that the mechanism results from three interlocking systems: the personality system (e.g., one's values and expectations), the perceived environment system (e.g., parental monitoring, peer approval), and the behavior system (e.g., behavior that elicit reward and punishment). These systems interact to either heighten or decrease risk of engagement in problem behavior. Thus, Problem Behavior Theory may explain co-occurrence of bullying and sibling aggression, as well as other problem behaviors such as substance use, peer delinquency, and delinquent behavior. In support of Problem Behavior theory, a number of studies have found that aggression and mental and behavioral health outcomes often co-occur among adolescents (48–51). For example, in a meta-analysis Ttofi, Farringon, Losel, Crago, and Theodorakis (52) found students who bully are significantly more likely to use substances (compared to students who do not bully). They also found that victims of bullying were not more likely than non-victims to use substances, although this finding should be replicated given the small number of studies examined between victimization and later drug use. Unsurprisingly, several studies, have also documented the co-occurrence between perpetration aggression as an adolescent and experiences of depression (53–55).

Exposure to Family Violence and Adolescent Aggression

One of the most commonly studied correlates of adolescent maladaptive behavior is exposure to family violence. This can include direct violence exposure such as child abuse, neglect, or emotional abuse as well as indirect forms of violence such as witnessing intimate partner violence. For example, prior work on adolescent exposure to violence has reported that 32% witness family assault, 25% witness partner assault, and almost 58% witness assaults in the community (e.g., seeing someone get attacked, hearing gun shots; 9). Witnessing parental conflict, being directly victimized in the home, and witnessing violence in the community has a graded dose-response relationship with negative outcomes (56–58). That is, the more parental violence experienced by youth the greater the risk for future social, mental, and physical health problems. Specifically, several studies have found that exposure to parental violence can increase a youth's risk for later violent experiences. For example, exposure to one or more forms of violence, including interparental violence, has been associated with both perpetration of and victimization from physical violence (59) and sexual violence (60). Recently, Davis and colleagues (56) reported on the heterogeneity in exposure to family and community violence and the association with peer aggression and victimization. Results indicated youth exposed to parental violence early in adolescence and those who reported witnessing increasing community violence were more likely to engage in bullying and be victims of peer aggression. Similar findings have been reported for the association between exposure to family violence (and other household or family characteristics) and sibling aggression. For example, Hardy (61) found that experiences of family stress (defined broadly) was associated with higher rates of sibling aggression. Others have found exposure to maternal aggression such as low warmth, overt aggression, relational aggression, and witnessing higher rates of parent to parent violence have been associated with higher rates of sibling aggression (35, 62–64).

A useful theoretical frame for these findings is the theory of intergenerational transmission of violence (65–67), which is rooted in Social Learning Theory (20). This theory posits that witnessing intimate partner violence early in life (e.g., between parents) increases the risk that an individual will later perpetrate violence in their own relationships (66). Several studies offer support for this theory by identifying witnessing of family violence as one of the most robust and important predictors of future relationship violence (i.e., within romantic and other close relationships) among adults and adolescents (68–70). Notably, Ehrensaft and colleagues (71) found that over the course of 20 years, children who witnessed intimate partner violence were more likely to mimic these patterns as perpetrators and also become victims, compared to children who did not witness intimate partner violence. Further, extant research has found that witnessing intimate partner violence is associated with dysregulated affect, a tendency to blame oneself for negative occurrences, and an overall increase in internalizing problems (72, 73). To summarize known consequences, a 2008 meta-analysis of the effects of exposure to domestic violence on internalizing and externalizing problems found medium to large effect sizes for internalizing problems (d = 0.48), externalizing problems (d = 0.47), and trauma symptomology (d = 1.54; 74). Thus, exposure to parent or family violence appears to be highly influential in a child's life and future outcomes. Regarding mechanisms of violence transfer, Social Learning Theory lends a helpful understanding. According to Bandura (20), the home or community acts as a learning space for socialization and interpersonal relationships. Thus, when aggression is modeled in these spaces, children are learning that these strategies are normal or useful (75). Aggressive interpersonal behavior learned intergenerationally also appear to be cognitively mediated such that observing violence can shape one's belief system to accept violence as normal or acceptable (76). This increases the chances that violence will be employed across contexts (76). Thus, if youth witness positive outcomes of violence perpetration (e.g., an expression of jealousy), schemas develop that accept violence as effective means of conflict resolution with partners (71).

Current Study

Taken together, these somewhat siloed bodies of evidence suggest that witnessing family violence is associated with future violence perpetration, and that this behavior often manifest

similarly across close relationships, often perpetrated by the same individuals. However, these literatures lack insight into the heterogeneity that exists in perpetrating peer and sibling aggression, and the role of witnessing and learning from parental violence in this heterogeneity. Additionally, little is known about long-term outcomes associated with profiles of exposure to parental violence, peer, and sibling aggression perpetration. A deeper understanding of these dynamics has potential to inform intervention on a number of levels. Parents, teachers, and school personel interact with students in separate settings and have varying levels of involvement and connection with each other. However, problem behavior that presents similarly in both settings may benefit from a comprehensive intervention approach that addresses the critical role of learned use of violence.

The current study had two phases. Phase 1 assessed heterogeneity in peer and sibling aggression. Specifically, we tested the theory of intergenerational transmission of violence, by using early adolescent exposure to family violence as predictors of emergent profiles of peer and sibling aggression and how these profiles differ by demographics (i.e., sex, race/ethnicity). We expected at least two distinct profiles of peer and sibling aggression to emerge (H1). Further, and in line with the theory of intergenerational transmission of violence, we expected family violence to predict membership in classes that involve more proximal forms of aggression (e.g., sibling) versus primarily peer aggression (H2). In Phase 2, we included exposure to family violence in a mixture model with peer and sibling aggression. This phase allowed us to examine family violence exposure and engagement in peer and sibling aggression in tandem. We utilized emergent profiles to predict behavioral health outcomes such as substance use (tobacco, alcohol, and cannabis), mental health (depression), and delinquency (peer delinquency and delinquent behavior) by emergent class. We predicted that at least two classes of family violence and peer and sibling aggression would emerge (H3). Specifically, we expected at least one class will emerge that includes high family violence exposure and high endorsement of peer and sibling aggression. Finally, we predicted that youth who endorse high aggression (both peer and sibling) as well as those who are exposed to high levels of family violence would have greater substance use, mental health problems, and engagement in greater delinquent behavior (H4).

METHODS

Participants

Participants were 894 students from four Midwestern middle schools. Surveys were administered at five time points: Spring/Fall 2008 (Waves 1/2), Spring/Fall 2009 (Waves 3/4), and Spring 2012 (Wave 5). Data were collected every semester in middle school in order to capture temporal associations among risk and protective factors of multiple forms of violence as part of a larger study. At baseline the sample was 29.9% White, 52.3% African American, 4.1% Hispanic, and 1.4% Asian or Pacific Islander and 12.3% multiracial or other. The sample was 50.7% assigned a girl at birth and 49.3% assigned a boy at birth. At baseline, students were in 5th (5.7), 6th (54.9), and 7th (39.4%) grade. See **Table 1** for demographic information.

Procedure

Parental Consent

The current study was formally announced in school newsletters, school district newsletters, and e-mails from the principals prior to the Spring of 2008. Upon receiving approval from the institutional review board (IRB) and district school board, a passive consent process was implemented. A consent form containing information about the purpose of the study and information meetings at each school was distributed to the parents or guardians of every student enrolled in the school. Parents or guardians who did not wish to have their child participate in the study were instructed to complete and return the form. Additionally, students assented (or dissented) to participantion *via* a procedure described on the coversheet of the survey. Surveys were identified only with a unique code number assigned to each student so researchers could track a student's responses across multiple time points, but ensure confidentiality.

Survey Administration

Students were initially informed about the nature of the study by one of the six trained research assistants, the principal investigator, or another faculty member who administered the survey. Researchers assured students that their participation in the study was entirely voluntary and that they could skip any question or stop participating in the survey at any time if they were uncomfortable completing it.

Surveys were conducted in classrooms ranging from 10 to 25 students. The survey took approximately 40–45 min to complete. Members of the research team ensured confidentiality during the survey administration by spacing students apart such that they could not see each other's answers. The survey was administered and read aloud while students responded individually. Students could ask questions if they did not understand an item. At least one trained counseling psychology doctoral-level psychology student was on site to provide immediate support and direct

TABLE 1 | Descriptive statistics of all study variables.

Variable	Mean (or *n*) and Standard Deviation (or %)
Sex	
Boy	441 (49.3%)
Girl	453 (50.7%)
Sibling Aggression (Waves 3 and 4)	0.24 (0.35)
Bullying Perpetration (Waves 3 and 4)	0.15 (0.29)
Family Aggression (Waves 1 and 2)	0.99 (0.91)
Tobacco (Wave 5)	0.18 (0.69)
Alcohol (Wave 5)	0.28 (0.75)
Cannabis (Wave 5)	0.73 (1.62)
Depression (Wave 5)	1.02 (0.62)
Delinquency (Wave 5)	0.33 (0.44)
Peer Deviance (Wave 5)	0.82 (0.85)

students to appropriate services if necessary. Students were also provided the research team's contact information to seek more information about the study, and online resources and hotline numbers to address bullying or violence. Also, students were reminded about in-school resources available to them (e.g., guidance counselors).

Measures

Each participant completed demographic information that included questions about their sex (boy or girl), age, grade, and race/ethnicity. For race, participants were given six options: African American (not Hispanic), Asian, White (not Hispanic), Hispanic, Native American, or Pacific Islander. Students could mark all that applied. Then, students completed questions about a wide range of scales measuring different forms of violence (e.g., peer, family) as well as risk (e.g., substance use) and protective factors (e.g., social support) associated with aggression and violence at each wave.

Family Violence

In Phase 1, we combined Waves 1 and 2 (Spring/Fall 2008). In Phase 2, we combined Waves 3 and 4 (Spring/Fall 2009). The Family Conflict and Hostility Scale (77) measured the level of past year perceived violence in the family environment. The scale contains three items from a larger survey, which was designed for the Rochester Youth Development Study. The three items were: "How often is there yelling, quarreling, or arguing in your household?", "How often do family members lose their temper or blow up for no good reason?", and "How often are there physical fights in the household, like people hitting, shoving, or throwing things?" Response options range from 0 (*Never*) through 3 (*Always*) on a 4-point Likert-type scale. One additional item was used that assessed family violence "Before you were 9 years old, did you ever see or hear one of your parents or guardians being hit, slapped, punched, shoved, kicked, or otherwise physically hurt by their spouse or partner?" Given that the survey did not assess *current* risk for students' safety the IRB did not require a mandated reporting protocol. Cronbach's alpha coefficient was.73 for Waves 1 and 2.

Bullying Perpetration

The nine-item Illinois Bully Scale (78) was used to assess the frequency of bullying perpetration across Waves 3 and 4. For example, students were asked how often in the past 30 days they engaged in each behavior (e.g., teased other students, excluded others from their group of friends, threatened to hit or hurt another student). Response options included 0 (*Never*), 1 (*1 or 2 times*), 2 (*3 or 4 times*), 3 (*5 or 6 times*), and 4 (*7 or more times*) on a 5-point Likert-type scale. Scores were averaged across Waves 3 and 4. The construct validity of this scale has been supported *via* exploratory and confirmatory factor analysis (78). Although a power differential is not assessed with the Illinois Bully Scale, the scale has correlated positively with peer nominations of bullying (78). The scale correlated moderately with the Youth Self-Report Aggression Scale (r = .65; 79), suggesting that it was somewhat unique from general aggression. Cronbach's alpha coefficients were.84 at Waves 3 and 4.

Sibling Aggression Perpetration

A sibling aggression perpetration scale (in Waves 3 and 4) was created for this study and included five items that assessed aggression between siblings (80). Items were selected from the University of Illinois Bullying Scale in order to parallel that scale. Five items emerged as a scale in factor analysis, which includes the following: I upset my brother or sister for the fun of it; I got into a physical fight with my brother or sister; I started arguments with my brother or sister; I hit back when a sibling hit me first; and I teased my siblings for the fun of it. Students were asked to indicate how often they did these things to a sibling or other children in their family during that last 30 days. Response options included 0 (*Never*), 1 (*1 or 2 times*), 2 (*3 or 4 times*), 3 (*5 or 6 times*), and 4 (*7 or more times*) on a 5-point Likert-type scale. Scores were averaged across Waves 3 and 4, with a Cronbach's alpha coefficient of.80 were found for Waves 3 and 4.

Substance Use: Tobacco, Alcohol, Cannabis

Substance use was measured using three single items addressing tobacco use, alcohol use, and cannabis use at Wave 5. Each participant was asked to indicate how many days in the past 30 days, they did the following: (1) smoked cigarettes, (2) drank at least on full drink of alcohol, and (3) smoked marijuana (weed, grass, hash and bud) on a 7-point Likert-type scale ranging from 0 (*0 Days*) to 7 (*20 to 30 Days).*

Depressive Symptoms

The Orpinas Modified Depression Scale (81) includes six items that asks adolescents how often they felt or acted in certain ways (e.g., "Did you feel happy", "Did you feel hopeless about your future") in the previous 30 days. Response options are 0 (*Never*), 1 *(Not Often*), 2 (*Sometimes*), 3 *(Often*), and 4 *(Almost Always*) on a 5-point Likert-type scale. Greater scores indicate more depressive symptoms. The Modified Depression scale has demonstrated strong construct validity through factor analyses and good internal consistency (.74) when administered to adolescents 10 to 18 years of age (81, 82). Cronbach alpha coefficient was.84 at Wave 5.

Self-Reported Delinquency

This 8-item scale is based on Jessor and Jessor's (47) General Deviant Behavior Scale and asks students to report how many items listed on the measure they took part in during the last year. The scale consists of items such as, "Skipped school", and "Damaged school or other property that did not belong to you." Response options included 0 (*Never*), 1 (*1 or 2 times*), 2 (*3 to 5 times*),3 (*6 to 9 times*), and 4 (*10 or more times*) on a 5-point Likert-type scale. A Cronbach's alpha coefficient of.67 was found for Wave 5.

Peer Deviance

The Friend's Delinquent Behavior-Denver Youth Survey is a 7-item scale (83) that asks participants to report how many of their friends within the last year "Hit or threatened to hit someone," "Purposely damaged or destroyed property that did not belong to them," and "Used alcohol", to name a few. Response options

were 0 (*None*), 1 (*Very Few*), 2 (*Some of them*), 3 (*Most of them*), and 4 (*All of them*) on a 5-point Likert-type scale. Cronbach's alpha coefficient was.88 for Wave 5.

Analytic Plan

The current study consists of two phases to address our research questions. Specifically, in Phase 1 we used Latent Class Analysis (LCA) to examine heterogeneity in peer and sibling aggression during middle school. LCA is a technique that identifies heterogeneity within a sample (or groups) and classifies individuals based on probability of item endorsement. We used dichotomized peer and sibling aggression perpetration items in our LCA such that non-zero scores were given a value of "1." We fit models ranging from one to six classes and examined fit statistics to determine if adding an additional class improved model fit. To assess model fit, we used decreases in the negative two log likelihood (-2LL), Akaike Information Criteria (AIC), Bayesian Information Criteria (BIC), and the sample size adjusted Bayesian Information Criteria (aBIC). Further, we utilized non-significant Vuong-Lo-Mendell-Rubin Likelihood Ratio Test (VLRT), the Lo-Mendell-Rubin adjusted likelihood ratio test (LRT), and the bootstrapped likelihood ratio test (BLRT) to indicate that a $k - 1$ class solution is a better fit to the data. Once the best fitting model was established for peer and sibling aggression perpetration, we used early middle school values of family violence to predict class membership, addressing hypotheses of intergenerational transmission of violence. That is, we used family violence as a predictor of emergent peer and sibling aggression perpetration classes *via* multi-nominal logistic regression. We also examined race and gender as predictors of class membership following class enumeration.

After examining how family violence is associated with the sibling and peer aggression classes, Phase 2 included family violence in the latent class model with sibling and peer aggression. That is, we sought to understand how the addition of family violence may influence peer and sibling aggression perpetration class structure. Once the best fitting model was established (following procedures outlined above) we examined distal outcomes across emergent classes using a Wald chi-square test, yielding pairwise comparisons of all class means on each outcome. Specifically, we assessed mean differences between classes across substance use (i.e., tobacco, alcohol, cannabis), mental health (i.e., depression), and deviance (i.e., delinquency, peer deviance) outcomes in high school (Wave 5).

All analyses were conducted using *Mplus* version 8. Missing data ranged from 4–25% on variables across the study period. We used the full information maximum likelihood (FIML) estimator in *Mplus* 8 (84). Missing data patterns were assessed using Little's test of Missing Completely at Random, χ^2 tests and Pearson's correlations in SPSS (IBM version 26).

RESULTS

Descriptive Statistics

Table 1 presents the means (or *n*) and standard deviations (or %) for all predictor and outcomes variables. Little's test of Missing Completely at Random suggested that data were not missing completely at random for H1-H2 [χ^2 (367) = 550.48, $p < .001$] nor for H3-H4 {tobacco use outcome [χ^2 (438) = 1071.60, $p < .001$]; alcohol use outcome [χ^2 (438) = 1089.08, $p < .001$]; marijuana use outcome [χ^2 (454) = 1121.06, $p < .001$]; depression outcome [χ^2 (421) = 1059.89, $p < .001$]; delinquency outcome [χ^2 (438) = 1071.68, $p < .001$]; peer deviance outcome [χ^2 (438) = 1091.17, $p < .001$]}. Looking at patterns of missingness among repondents, Asian students were somewhat more likely to have missing data on several items compared to students of other racial identities: tobacco use (χ^2 = 7.75, $p = .006$), alcohol use (χ^2 = 7.68, $p = .006$), marijuana use (χ^2 = 9.35, $p = .002$), delinquency (χ^2 = 8.19, $p = .005$), and peer deviance (χ^2 = 11.34, $p = .001$). Also, age at baseline was negatively correlated with providing data for the Wave 5 measures including alcohol use, tobacco use, marijuana use, peer deviance, delinquency, and depression (*r* values range between.07 and.17, $p < .01$). Participant sex and other racial identities had no significant associations with providing data.

H1: Latent Classes of Peer and Sibling Aggression

Phase 1 of the analysis identified classes of peer and sibling aggression during middle school and examined family violence as a predictor of the classes. Results of the LCA with peer and sibling aggression perpetration indicated that a four-class model fit the data best (see **Table 2**). The four-class model had the lowest -2LL, AIC, BIC, CAIC, and AWE among all the models with significant LMRT. The significant LMRT and Adjusted LMRT indicated that the improvement in fit (i.e., reduction in -2LL) from the three to four-class model was statistically significant. An entropy value of 0.85 indicated good class

TABLE 2 | Model fit Indices for 1 through 5 latent class models with sibling and peer aggression only.

No. of classes	-2LL	AIC	BIC	CAIC	AWE	LMRT *p value*	Adj LMRT *p value*	Entropy
1	13691.35	13719.35	13786.49	13800.49	13923.63	–	–	1.00
2	11313.79	11371.79	11510.86	11539.86	11794.94	.001	.001	.875
3	10835.87	10923.87	11134.89	11178.89	11565.90	.001	.001	.829
4	**10565.80**	**10683.80**	**10966.75**	**11025.75**	**11544.70**	**.001**	**.001**	**.850**
5	10454.69	10602.69	10957.57	11031.57	11682.45	.107	.110	.863

-2LL, Negative 2 log likelihood; AIC, Akaike Information Criteria; BIC, Bayesian Information Criteria; CAIC, Consistent Akaike Information Criteria; AWE, Approximate Weight of Evidence Criterion; LMRT, Lo-Mendell-Rubin Test; Adj LMRT, Adjusted Lo-Mendell-Rubin Test. Bolded text indicates solution retained.

separation (85). The four latent classes included a *high all* aggression class (17.34%, n = 155: 83 boys, 72 girls), that had the highest probabilities across both sibling and peer aggression, a *sibling aggression* class (34.56%, n = 309: 123 boys, 186 girls, that had high probabilities of engaging in sibling aggression, but low engagement in peer aggression, a *peer aggression* class (8.84%, n = 79: 46 boy, 33 girl), that had high probabilities of engaging in peer aggression but low engagement in sibling aggression, and a *low aggression* class (39.26%, n = 351: 189 boy, 162 girl), that had the lowest probabilities of engaging in any form of sibling or peer aggression. **Figure 1** displays the probability plot of the four sibling and peer aggression classes. We also looked at demographic predictors (e.g., sex, race/ethnicity) of class membership. Regarding sex assigned at birth, girls were significantly more likely to be in the *sibling aggression* compared to all other classes, with all p-values lower than 0.005. Asian students were significantly more likely to fall into the *sibling aggression* class than all other classes. African-American/Black students were most likely to fall into the *high all* and *sibling aggression* classes, though were also significantly more likely to be *in low aggression* than the *peer aggression* class. Latinx students were most likely to fall into *peer agression* and *sibling aggression* classes. White students were most likely to fall into *high all* and *sibling agression* classes. Multiracial students were most likely to be in the *low all* class.

H2: Intergenerational Transmission of Violence: Family Violence Predicting Peer and Sibling Aggression Classes

After identifying the sibling and peer aggression classes, we examined the extent to which family violence was associated with differences between the aggression classes. **Table 3** presents the odds ratios and confidence intervals for a multinomial logistic regression that examines family violence as a predictor of the sibling and peer aggression classes. The results indicated that increases in family violence were associated with higher odds of being in the *high all* [AOR = 2.55, CI = (1.95, 3.33)] and *sibling aggression* [AOR = 1.82, CI = (1.41, 2.35)] classes compared to the *Low aggression* class. In addition, increases in family violence were associated with lower odds of being in the *sibling aggression* [AOR = 0.71, CI = (0.57, 0.90)] and *peer aggression* [AOR = 0.47, CI = (0.32, 0.71)] classes compared to the *high all* class. This indicates that youth who endorse higher rates of family violence are more likely to be in the *high all* (e.g., high endorsement of both sibling and peer aggression) compared to classes that represent sibling or peer aggression only. Finally, youth endorsing higher family violence had lower odds of being in the *peer aggression* [AOR = 0.66, CI = (0.45, 0.98)] class compared to the *sibling aggression* class, indicating witnessing family violence is associated with higher odds of being in a class of individuals that perpetrates aggression towards siblings compared to peers only.

H3: Latent Classes of Peer Aggression, Sibling Aggression, and Family Violence

Phase 2 of the current study identified middle school classes of peer aggression, sibling aggression, and family violence. Further, we examined how emergent classes predicted substance use (tobacco, alcohol, and cannabis), mental health (depression), and deviance (delinquency and peer delinquency) outcomes in high school. Results of the LCA indicated that a four-class model fit the data best (see **Table 4**). The four-class model had the lowest -2LL, AIC, BIC, CAIC, and AWE among all the models with significant LMRT. Like the first LCA, the significant LMRT and Adjusted LMRT indicated that the improvement in fit (i.e., reduction in -2LL) from the three to four-class model was statistically significant. An entropy value of 0.85 indicated good

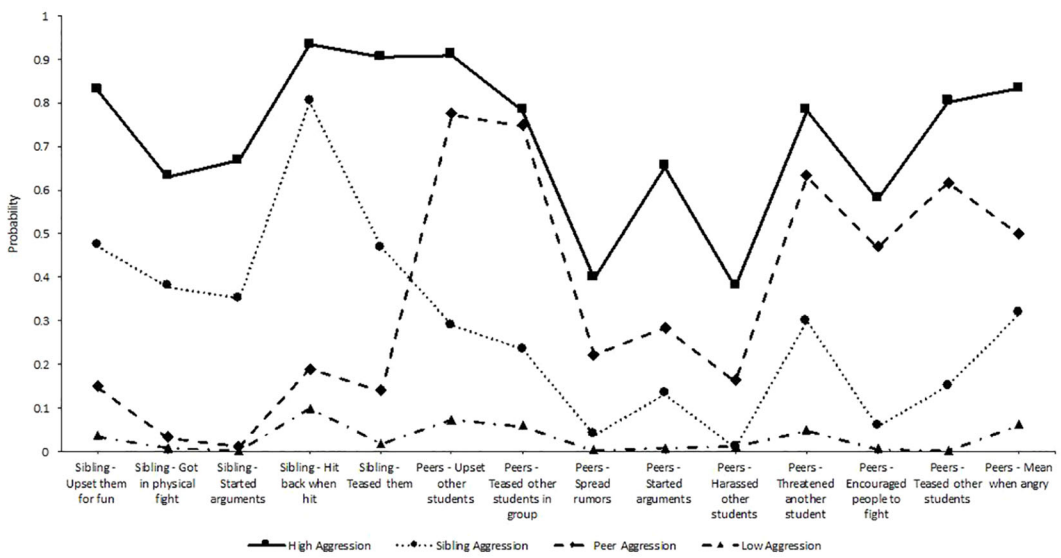

FIGURE 1 | Latent class probabilities for a 4 class solution with sibling and peer aggression (waves 3 and 4).

TABLE 3 | Class counts for a 4 class solution with sibling and peer aggression.

Classes	Frequency	Percentage
High Aggression	155	17.34%
Sibling Aggression	309	34.56%
Peer Aggression	79	8.84%
Low Aggression	351	39.26%

N = 894.

class separation. The four latent classes included a *high all* class (16.56%, *n* = 148: 76 boy, 72 girl), that had the highest probability of endorsing sibling aggression, peer aggression, and witnessing family violence. Further, a *sibling aggression and family violence* class emerged (32.10%, *n* = 287: 119 boy, 168 girl, that had high probabilities of engaging in sibling aggression and witnessing family violence, but low engagement in peer aggression. The third class was labeled *peer aggression* (11.00%, *n* = 98: 55 boy, 43 girl), which had high probabilities of engaging in peer aggression but low engagement in sibling aggression and low exposure to family violence. Finally, a *low aggression* class emerged (40.38%, *n* = 361: 191 boy, 170 girl), that had the lowest probabilities of engaging in any form of sibling or peer aggression as well as low endorsement of family violence. **Figure 2** displays a plot of the four sibling, family, and peer aggression classes.

We also looked at demographic predictors of class membership. Regarding sex assigned at birth, girls were significantly more likely to be in the *sibling aggression and family violence* class compared to all other classes, with all *p*-values lower than 0.05. Individuals who identify as African-American/Black, White, or another racial identity were no more likely to fall into any one class compared to any other (all *p*-values greater than 0.05). Asian/Pacific Islander as well as Latinx students were equally likely to be in the *high all, sibling and family aggression,* and *peer aggression,* classes and significantly more likely to fall into each compared to the *low all* class.

H4: Substance Use, Mental Health, and Deviance Outcomes

After identifying the sibling, family, and peer aggression classes, we examined the extent to which the middle school classes predicted differences in substance use, mental health, and deviance in high school. **Table 5** presents the means and standard errors of each outcome variable across each of the four emergent classes. Regarding substance use behavior, the *high all* and *sibling aggression and family violence* classes reported significantly higher rates of alcohol use compared to the *low all* class. In addition, the *high all* and *peer aggression* classes reported higher rates of cannabis use compared to the *sibling aggression and family violence* and *low all* classes. There were no differences found for tobacco use. For the mental health outcome, the *high all* class reported higher levels of depression compared to both the *peer aggression* and *low all* classes. Further, the *sibling aggression and family violence* class reported higher average levels of depression compared to the *low all* class. Considering deviancy, the *high all* class reported higher levels of delinquency compared to *sibling aggression and family violence* class and the *low all* aggression classes. Further, and the *peer aggression* class reported higher average levels of delinquency compared to the *low all* aggression class. There were no class differences found for peer delinquency or tobacco use.

TABLE 4 | Family aggression (waves 1 and 2) predicting sibling and peer aggression classes (waves 3 and 4).

Variables	Family Aggression Predictor	
	OR	95% OR Confidence Interval
Reference Low All		
Vs. high all	2.55	[1.95, 3.33]
Vs. sibling aggression	1.82	[1.41, 2.35]
Vs. peer aggression	1.21	[0.81, 1.80]
Reference High All		
Vs. sibling aggression	0.71	[0.57, 0.90]
Vs. peer aggression	0.47	[0.32, 0.71]
Reference Sibling Aggression		
Vs. peer aggression	0.66	[0.45, 0.98]

Confidence Intervals that include 1 are not significant at p < .05.

DISCUSSION

Adolescence is a period of development when important physiological (e.g., puberty, brain development) and psychological (e.g., expectation of emotion regulation) changes occur in conjunction with an increasing desire for autonomy, higher reliance on peers for social context, and a propensity for experimentation with high risk behavior (e.g., substance use, delinquency; 86). Additionally, some youth also experience high rates of family violence (56–58). Prior research has shown that youth who experience some form of violence (e.g., family, community) are at increased risk of engaging in unhealthy behavior to cope with this adversity. For example, youth who are exposed to violence early in life may have a more difficult time managing internalizing symptomology (e.g., depression) and have higher rates of aggressive behavior (56, 57). Throughout the literature aggression has focused on peer-to-peer and family (parental) violence, thereby limiting scholarly understanding of a unique form of violence that often transcends both spheres (87). Further, minimal research exists on how sibling aggression relates to behavioral health outcomes among youth. In the current study, we explored heterogeneity in peer and sibling aggression, and how exposure to family violence relates to engagement in multiple ecologies of aggression. Additionally, we examined heterogeneity in family violence as well as heterogeneity in peer and sibling aggression and how these dynamics relate to important behavioral health outcomes.

We found ample heterogeneity in sibling and peer aggression. Specifically, results yielded four profiles of peer and sibling aggression: *high all, high sibling aggression only, high peer aggression only, and low all* aggression. This indicates that, among adolescents, there may be specific subgroups of individuals that engage in poly-perpetration (e.g., within the peer and sibling context) and, simultaneously, there may be groups of youth who are only perpetrators of aggression within a specific context. However, our aim in Phase 1 of our study was to,

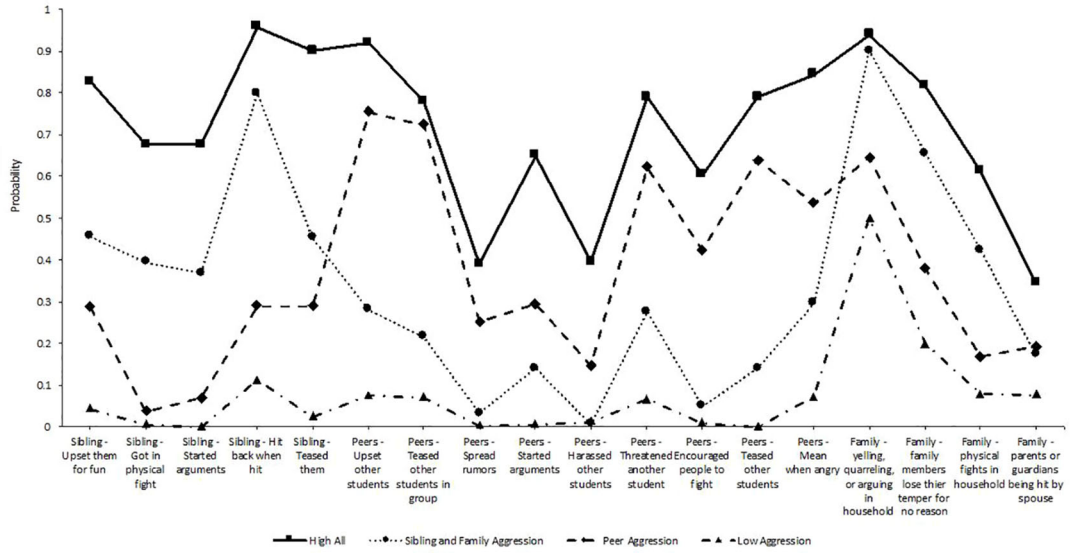

FIGURE 2 | Latent class probabilities for a 4 class solution with sibling, peer, and family aggression (waves 3 and 4).

not only understand if there was heterogeneity in multiple aggression social contexts, but also to test the theory of intergenerational transmission of violence by examining early adolescent exposure to family violence as a predictor of emergent profiles of peer and sibling aggression. Specifically, we predicted that exposure to family violence would predict membership into classes that involve more proximal forms of aggression (e.g., among siblings) rather than more distal forms (e.g., among peers). We found that youth who reported witnessing more family violence at home were 82% more likely to fall into the sibling aggression only class (compared to low all), and 155% more likely to fall into the high all class (compared to low class). These findings largely align with previous research linking witnessing violence in the family to engagement in future aggression within relationships (e.g., peers and siblings; 88). Specifically, social learning theory posits that youth will mimic or model behavior that, from their perspective, appear to provide positive rewards (e.g., conflict resolution; 20). For example, youth who witness violence may see aggression (e.g., fighting, teasing, putting others down) as a way to maintain control in relationships or increase feelings of agency. Further, according to the Cycle of Violence model, fighting and/or violence are often ways to relieve interpersonal tension that has built over time and is followed by a short pleasant "honeymoon" phase thus perpetuating the cycle (89). This is in direct relation to the theory of intergenerational transmission of violence where youth reproduce aggression typologies which they were exposed to early on in life within their own relationships (90). Previous studies have used cross-sectional data and linear regression analyses to identify general co-occurrence among these constructs (7, 37). However, the current analyses extend our understanding of these phenomena in several important ways. First, the current study clarifies temporal associations such that previously witnessing family violence is associated with poly-perpetration (e.g., both peer and sibling aggression). Our study aligns with prior longitudinal work noting that parent behavior (e.g., child maltreatment, intimate partner violence) increases the risk of sibling victimization as well as bullying perpetration (62, 35, 91, 92). Further, prior work has reported the absence of parental warmth (93), and the presence of harsh parenting practices (7) are associated with higher bullying behavior between siblings. The current study also provides insight into common profiles of these aggressive behavior and prevalence of each type. Moreover, it provides an updated understanding of

TABLE 5 | Model fit indices for 1 through 5 latent class models with sibling, peer, and family aggression.

No. of Classes	-2LL	AIC	BIC	CAIC	AWE	LMRT *p value*	Adj LMRT *p value*	Entropy
1	17726.772	17762.772	17849.0947	17867.0947	18025.41741	–	–	1.00
2	15060.164	15134.164	15311.60511	15348.60511	15674.04623	.001	.001	.870
3	14447.094	14559.094	14827.65352	14883.65352	15376.21305	.001	.001	.837
4	**14138.854**	**14288.854**	**14648.53193**	**14723.53193**	**15383.20987**	**.001**	**.001**	**.850**
5	13970.64	14158.64	14609.43634	14703.43634	15530.23269	.626	.627	.825

-2LL, Negative 2 log likelihood; AIC, Akaike Information Criteria; BIC, Bayesian Information Criteria; CAIC, Consistent Akaike Information Criteria; AWE, Approximate Weight of Evidence Criterion; LMRT, Lo-Mendell-Rubin Test; Adj LMRT, Adjusted Lo-Mendell-Rubin Test. Bolded text indicates solution retained.

behavior that may appear topographically similar (e.g., peer aggression), but have different roots (e.g., sibling aggression). For example, students that exhibit peer aggression only (no sibling aggression) are less likely to have witnessed family violence than students who exhibit peer and sibling aggression (poly-perpetration). Thus, an understanding of commonly occurring profiles and their correlates, especially across domains that do not share informants (i.e., parents see behavior at home, teachers see behavior at school), is critical to intervention policy and programming.

In Phase 2 of our study, we conducted a mixture model using peer aggression, sibling aggression, and family violence items which allowed us to examine classes of common combinations of involvement in each. This analysis yielded four classes: a *high all* class, a *sibling aggression and family violence* class, a *peer aggression* class, and a *low all* class (**Table 6**). We then examined mental and behavioral health outcomes across emergent classes (**Table 7**). It is interesting that our profiles extracted a class that included family violence and sibling aggression in addition to a class that reported high prevalence rates of both aggression typologies and family violence. This allows us to compare, directly, outcomes for aggression classifications that occur in the family with aggressive behavior that occur in the family and peer context. Looking across outcomes, the *high all* aggression class was significantly more likely to experience deleterious outcomes, on average, compared to the *low all* aggression group (specifically looking at depression, substance use, and deviance). Across some outcomes, specifically cannabis use and deviance, the *peer aggression* only class emerged as significantly more likely to experience undesirable outcomes compared to the *low all* aggression group. Further, youth in the *high all* class reported more alcohol use, cannabis use, and delinquency compared to youth in the *sibling aggression and family violence* class, indicating the addition of peer aggression (the only difference between these classifications was endorsement of peer aggression) is a vital component for long term problem behavior. Thus, in general, youth who engage in multiple forms of aggressive behavior and are exposed to high levels of family violence are more likely to engage in problematic behavior over and above single aggression typologies (e.g., peer and sibling only). Our results are akin to recent work assessing poly-perpetration. For example, in a longitudinal prospective cohort design, youth who reported abuse or neglect (e.g., child maltreatment) were more likely to be perpetrators of subsequent criminal violence, child abuse, and intimate partner violence (94). Milaniak and Widom (95) also found that the youth with early childhood violence exposure were more likely to be poly-perpetrators of violence compared to youth without such histories. Further, in this sample, gender and racial associations with class membership were not particularly strong. This study may not have sensitively captured relevant cultural dynamics of interpersonal violence, but perhaps these dynamics are found to some degree across racial and gender groups. However, in both analyses, girls were significantly more likely to be in the classes characterized by sibling agression (and not peer aggression). Perhaps these analyses support prior work (45) in identifying older sister aggression as a distinct behavior from general sibling aggression. Alternatively, perhaps for girls, aggression is more likely to occur in the home and is regulated across contexts whereas boys are more commonly socialized to exhibit the same behavior across contexts with less regulation. However, more information about gender and age of aggression targets among siblings is needed to draw inferences [i.e. though we know the participant is a girl, we have no information regarding sex of her sibling(s)].

Results from the current study offer further support for Problem Behavior Theory as well as Social Learning Theory. That is, our study extends Problem Behavior Theory such that youth who are poly-perpetrators of violence *and* experience high rates of family violence are more likely to experience multiple problem behavior later in life. Further, our results extend Social Learning Theory such that the cycle of violence, which is often discussed in relation to exposure to family violence, is not just limited to the family sphere. Especially for individuals who have

TABLE 6 | Class counts for a 4 class solution with sibling, peer, and family aggression.

Classes	Frequency	Percentage
High Aggression	148	16.56%
Sibling and Family Aggression	287	32.10%
Peer Aggression	98	11.00%
Low Aggression	361	40.38%

N = 894.

TABLE 7 | Middle school latent classes (waves 3 and 4) predicting depression, delinquency, peer deviance, and substance use outcomes in high school (wave 5).

Variable	1. High Aggression Mean/SE	2. Sibling and Family Aggression Mean/SE	3. Peer Aggression Mean/SE	4. Low Aggression Mean/SE	Chi-Square Comparisons $p < .05$
Substance Use					
Tobacco	0.37 (0.13)	0.11 (0.04)	0.32 (0.14)	0.12 (0.05)	
Alcohol	0.50 (0.14)	0.33 (0.07)	0.30 (0.10)	0.16 (0.05)	1, 2 > 4
Cannabis	1.18 (0.27)	0.56 (0.13)	1.36 (0.32)	0.50 (0.11)	1, 3 > 2, 4
Mental Health					
Depression	1.26 (0.10)	1.11 (0.06)	1.00 (0.09)	0.88 (0.43)	1 > 3, 4; 2 > 4
Deviance					
Delinquency	0.53 (0.65)	0.33 (0.04)	0.42 (0.06)	0.24 (0.29)	1 > 2, 4; 3 > 4
Peer Delinquency	0.95 (0.13)	0.83 (0.08)	0.86 (0.12)	0.76 (0.06)	

experienced family violence, peer aggression must be integrated into our understanding of how youth are perpetuating learned violence. Additionally, the finding that youth exhibiting the highest rates of aggression are also most likely to use substances holds implications for how peers become involved in substance use and deviant acts. Given that peer and sibling bullying inherently occur across a power dynamic, perhaps victims are also coerced either implicitly or explicitly into using substances or engaging in deviant behavior. This dynamic may partially account for individuals in the peer-only or low aggression classes reporting high rates of, for example, cannabis use and delinquency. Finally, while we did find that poly-perpetration in addition to family violence was associated with long-term problem behavior, this class also reported the highest rates of depression. Extant literature has described the entanglements between problem behavior (particularly involving aggression and substance use) and depressive symptomology. Thus, it is vital that schools, practitioners, and researchers continue to explore not just problem behavior among poly-perpetrators of aggression, but also mental health outcomes as these youth may be at most risk of experiencing long term mental health problems. Findings from this study underscore the importance of assessing sibling violence when working with youth exhibiting deleterious behavior in school.

Limitations and Conclusion

The current study should be interpreted in the context of several limitations. First, the current data were drawn from only one region in the U.S., thus limiting generalizability. Second, we did not capture count of siblings, but instead asked students to think about either siblings or other children in their families when answering the sibling aggression measures. Regarding the classes that report peer aggression only, we cannot distinguish between students in this class who do not have siblings and students who do have siblings but only engage in aggression at school. Further, we did not assess changes in peer and sibling aggression as a function of exposure to family violence. Future research may wish to investigate how exposure to family violence is associated with trajectories of peer and sibling aggression. Third, we did not assess poly-victimization as a precursor to peer and sibling aggressive behavior. Future work should investigate how poly-victimization (e.g., exposure to multiple types of violence such as family, community, and peer) relates to poly-perpetration. Also, power dynamics based on identity components among agents and targets of both sibling and peer aggression were not captured in this study. Future work may consider assessing self-reported gender identity (including non-binary and trans identities), sexuality, disability, and other relevant identities. This may allow for a more nuanced analysis of identity-based agent, target, and aggression profiles. Further, the current study did not measure socio-economic status (SES). Two studies have identified inverse correlations between SES and sibling violence, indicating associations among these constructs (35, 62). Additionally, an item assessing family violence included the word "spouse," which some students may not have understood. This item also did not ask about other forms of romantic and/or cohabitating relationships among caregivers. Finally, the current study does not provide any causal links from exposure to family violence to peer and sibling aggression. More nuanced methodologies that allow for the disaggregation of within- and between-person variance may provide a closer approximation of causality.

The current results provide evidence for pathways from witnessing violence, to perpetrating aggression across multiple contexts, to developing other deleterious mental and behavioral health outcomes. These findings highlight the deleterious impact of family violence on child development, providing support for a cross-contextual approach for programming aimed at developing relationships skills to prevent conflict and violence. Future directions should consider exploring protective factors that interrupt the pathways from witnessing violence in the family to perpetration aggression with peers, especially in the context of racial or ethno-cultural differences. Additionally, future work should aim to identify other predictive differences (e.g., environmental, personality) between perpetrating sibling only and sibling and peer aggression among students who do witness family violence. In short, the current study extends several theoretical orientations and provides the first account of how exposure to family violence is associated with poly-perpetration of aggression across both sibling and peer context. Further, this study notes long-term problem behavior such as substance use and delinquency as well as mental health correlates of youth who have experienced family violence and perpetrate aggression toward both peers and siblings. Programming that addresses poly-perpetration is vital for prevention of long-term problems, especially among those youth who have experienced greater amounts of family violence.

Ethical Considerations

Our study included passive consent (e.g., waiver of consent from parents). Parents were mailed two copies of a parent information letter through US mail and through an email from the school. These letters were sent per prior approval from our IRB. In Spring 2012, two copies of a parental information letter were sent to parents of students in participating districts that included a description of the study and an option to deny their son/daughter participation. Student waiver of parental consent was used for several reasons. First, a waiver of parental consent gave us the best chance of obtaining a representative sample and the most accurate information given the nature of this study. Moreover, evidence suggests that active consent procedures can result in biased samples with under-representation of lower achieving and less involved students (96). Our decision to use a waiver of active consent was in line with American Psychologist Association (APA) requirements. As noted by Kobor and Studwell (97), "APA has worked in coalition with a number of science, education, and public health organizations to protect the ability of scientists to conduct research in schools without having an absolute requirement of prior, written parental consent." As such, although APA states that, at a

minimum, parents should be informed about school-based research projects and offered an opportunity to withdraw their children, APA's position maintains that even in the case of sensitive research topics active consent is not a necessity.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by University of Illinois at Urbana Champaign. Written informed consent for participation was not provided by the participants' legal guardians/next of kin because passive consent was used—school based research.

AUTHOR CONTRIBUTIONS

KI helped conceive the analyses in this manuscript, draft the manuscript, and addressed revisions. DE wrote the grant that allowed for data collection, collected the data, helped conceive the study and drafted portions of the study. GM helped analyze the data, interpret results, and drafted parts of the manuscript. JD helped conceive the analyses in manuscript, interpreted results, and helped write the manuscript. All authors read and approved the final version of the manuscript.

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Cybervictimization and Cyberbullying: The Role of Socio-Emotional Skills

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Social and emotional competences are considered to have a crucial role in cyberbullying as, e.g., difficulties concerning emotion regulation and empathy can characterize both cyberbullies and cybervictims. Although, the dynamics of socio-emotional processes underlying cyberbullying are still open for research, as e.g., there are contradicting results concerning the role of empathy in cybervictimization. Thus, the aim of our study was to explore the specific maladaptive emotion regulation strategies characterizing cybervictims and to clarify the role of empathy in cybervictimization. Furthermore, another goal was to explore whether moral disengagement characterizes cyberbullies in absence of empathic and adaptive emotion regulation skills. 524 students (214 males, aged 12–19 years) participated in our research. We used self-report questionnaires to measure cyberbullying perpetration and cybervictimization, adaptive and maladaptive emotion regulation strategies, moral disengagement, affective, cognitive empathy, and intention to comfort. Our main findings show that cyberbullying is associated with difficulties in socio-emotional competences. Cyberbullies and bully-victims demonstrate less empathic responsiveness and display higher moral disengagement than noncyberbullies. On the other hand cybervictims tend to use both adaptive and maladaptive emotion regulation strategies to cope with their negative emotions. In addition, cybervictims have higher cognitive and affective empathy than cyberbullies and bully-victims. Our findings confirm and extend the research on the relationship among socio-emotional skills and cyberbullying as well as cybervictimization. Moreover, our results have important implications for prevention programs targeting emotion regulation and empathy.

Keywords: cyberbullying, cybervictimization, empathy, cognitive emotion regulation, moral disengagement

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INTRODUCTION

Although cyberbullying is a trending research topic, we still know little about the dynamics behind perpetration and victimization. Emerging research evidence have showed that cyberbullying can have serious physical and psychological impact, for example psychosomatic and depressive symptoms, anxiety, self-harming behavior and substance abuse (1–3). Therefore, prevention and intervention programs are needed to deal with cyberbullying behavior and these consequences (4, 5). To develop these programs, targeted research is needed to understand the individual and social processes influencing the engagement in cyberbullying.

Advances in communication technology may create specific opportunities for cyberbullying among adolescents (6, 7). Social media sites unintentionally support and maintain cyberbullying by forming groups, posting pictures and videos and commenting others' shared content (8). Cyberbullying, by a definition, is *"an aggressive act or behavior that is carried out using electronic means by a group or individual repeatedly and over time against a victim who cannot easily defend himself or herself"* (9, p. 376.). Cyberbullying is characterized by many specific features that distinguish it from traditional bullying (4, 10). Kwan and Skoric (8) describe three unique characteristics that are different from traditional bullying: (a) there is a broader audience who can see the humiliation of the victim, (b) Internet has unlimited capacity, the abusive content is available for longer time, it can be downloaded and uploaded repeatedly, and (c) cyberbullies can be anonymous: approximately 20%–30% of cybervictims do not know the identity of the cyberbully (9, 11). Studies investigating the consequences of anonymous cyberbullying provide conflicting results: some studies (9, 11) showed that anonymity causes more severe harm on the victim. Whereas, Nocentini and colleagues (12) found contradictory evidence showing that being cybervictimized by a known person is more harmful. Besides anonymity, online disinhibition (13) also induces cyberbullying (14) through lack of face-to-face encounter and repercussions. Additionally, as socio-emotional skills have a significant role in traditional bullying, e.g. empathy (15) and moral disengagement (16), current research aims to explore whether they also affect cyberbullying involvement.

Socio-Emotional Skills and Cyberbullying

Our current study suggests that adolescents' socio-emotional skills contribute to engagement in cyberbullying activities. A large body of literature (17–23) confirm that lack of empathy could explain cyberbullying behavior among adolescents. Empathy helps individuals to take others' perspective, to feel congruent but not identical vicarious emotions by witnessing another person's experiences, emotions or suffering (24). Cyberbullies are unable to understand and feel the vicarious emotions of others (19, 22, 23). Moreover, cyberbullies not only show low empathy in the affective domain but they tend to lack the skill to take others' perspective (17, 20). Further on, cybervictims also lack the skill of taking others' perspective and feeling others' emotions (21). Although, the link between cybervictimization and empathic skills seems to be more complicated. For instance, in some studies (19, 25, 26), findings show that empathy does not explain cybervictimization among adolescents. Further, other studies (20, 27, 28) suggest that cybervictims show empathic sensitivity to others' affective states. Taken together, previous studies have showed a consensus on the lack of empathic skills characterizing cyberbullies, whereas the role of empathy in cybervictimization is unclear.

Emotion regulation also can serve as an important factor in cyberbullying. If youngsters are unable to use adaptive forms of emotion regulation strategies, the risk of engagement in cyberbullying increases (29, 30). The adaptive regulation of emotions has crucial role in successful social functioning (31), social competence (32), emotional and cognitive well-being (33), and regulation of aggression (34). Indeed, adolescents who dysregulate their negative emotions are more at risk to become cyberbullies (29). Cybervictims also show problems with regulating their emotions (30). Based on the Cyclic Process Model (35), if cybervictimized adolescents are not able to regulate the wide range of negative emotions—i.e. heightened levels of anger, depression, distress—that can be the antecedent of their tendency to become cyberbullies. Previous studies suggested that maladaptive emotion regulation explains perpetration of cyberbullying. Yet, it is not clear which of the maladaptive emotion regulatory strategies—blaming others, rumination, catastrophizing, or self-blame (36)—have a role in cyberbullying or cybervictimization.

Cyberbullies may use selective activation and disengagement of internal and moral standards—i.e. moral disengagement (37)—to avoid feelings of guilt in the lack of socio-emotional skills. Moral disengagement is a set of cognitive strategies that reconstruct cruel behavior as serving socially worthy or moral purposes (social and moral justification), exploit the contrast principle (advantageous comparison), use language to make the behavior socially acceptable (euphemistic language), reduce accountability for the behavior (displacement and diffusion of responsibility), ignore, minimize, or distort the consequences of the act (disregarding and denial of injurious effects) or blame the victim for the behavior (dehumanizing, attribution of blame) (38). Cyberbullies frequently use moral disengagement strategies to justify their aggressive online behavior (25, 39–41). Specifically, cyberbullies use diffusion of responsibility, distortion of consequences and attribution of blame to minimize the feelings of guilt and the consequences of their acts (25, 40). Additionally, both cyberbullies and bully-victims manipulate the reconstruction of their behavior to be seen as socially acceptable by using moral justification, euphemistic labeling and advantageous comparison (25). Although, most of the previous studies have used a generalized method to measure moral disengagement strategies (37), whereas they lack the use of a specified method [e.g. Cyber Bullying Moral Disengagement Scale, 39)] that measures moral disengagement in cyberbullying situations and might lead to a more specific conclusion about the role of moral disengagement in cyberbullying.

In sum, the findings from previous studies suggest a relationship between socio-emotional skills and cyberbullying (17–23, 29, 30, 35). Empathy, adaptive emotion regulation, and lack of use of moral disengagement strategies could be possible protective factors against cyberbullying behavior. However, findings for associations between socio-emotional competences and cybervictimization are less consistent. Previous studies reported contradictory findings from the no relationship to the high empathy associated to cybervictimization. Additionally, the specific maladaptive emotion regulation strategies cybervictims use are also unclear. Further research is necessary to understand whether impaired socio-emotional competence is responsible for the use of moral disengagement in cyberbullying.

Aim of Study

The goal of our study was to analyze the role of affective and cognitive empathy, intention to comfort, specific adaptive and maladaptive emotion regulation strategies, and moral disengagement in perpetration of cyberbullying and

cybervictimization. The first objective of our study was to clarify the inconsistent previous results and examine whether lack of empathic skills also characterize the cybervictims as well as cyberbullies. We hypothesized that cybervictims are unable to feel vicarious emotions and take others' perspective. Another aim of this study was to explore the role of moral disengagement in cyberbullying and its relation to the role of empathy and emotion regulation in cyberbullying. Therefore, we hypothesized that whereas cyberbullies and bully-victims use moral disengagement to suppress the feelings of guilt, they are unable to understand their own as well as others' emotions. A third goal of this study was to explore the specific maladaptive emotion regulation strategies that may have a predictive role in cybervictimization.

METHODS

Participants

The participants were 524 Caucasian adolescents from one, rural and urban high school (40.84% boys, M=15.73, SD=1.30; 59.16% girls, M=15.72, SD=1.20), aged 12–19 years (M= 15.73, SD= 1.24). The choice of school and students was incidental based on accessibility. 6.9% of the students were cyberbullies, 13.5% were cybervictimized, 5.2% were bully-victims and 74.4% were outsiders. Ethical approval in conducting this study was granted from the Hungarian United Ethical Review Committee for Research in Psychology.

Materials

We used a quantitative comparative correlational design by means of four anonymous self-administered questionnaires (For the mean scores, standard deviations and Cronbach's alphas see **Table 1**):

Short version of the Cyber Victim and Bullying Scale (CVBS-S, Arató et al., unpublished) is an abbreviated form of the Cyber Victim and Bullying Scale (42). The Cyber Victim and Bullying Scale measures both cyberbullying perpetration and cybervictimization with 22 items. The Scale of Cyber Bullying has three subscales: cyber verbal bullying, hiding identity and cyber forgery. The Scale of the Cyber Victim has the same three subscales reworded to measure cybervictimization. Using Item Response Theory (IRT) and confirmatory factor analysis we created a shorter adaptation for both scales, 11 items remaining in both scales designed to measure cyberbullying perpetration and cybervictimization without subscales. The participants of the adaptation procedure were 632 high school students (261 men, mean age=16.47, SD=1.50). Since this scale had not been used or validated before, confirmatory factor analyses was used to test whether the items reliably reflected cyberbullying. The results confirmed an acceptable model fit: CMIN/DF=2.66; RMSEA=0.06 (90% CI=0.05; 0.06); SRMR=0.07; TLI=0.92; CFI=0.094. Cronbach Alpha for the scale of cyberbullying perpetration was 0.83, for the scale of cybervictimization it was 0.87. Participants answered on a five-point scale (1=never, 2=rarely, 3=occasionally, 4=frequently, 5=always) to indicate how often they engaged in cyberbullying activities or became victims of it in the last one year.

The Empathy Questionnaire for Children and Adolescents (EmQue-CA, Overgaauw, Rieffe, Broekhof, Crone, & Güroglu, 2017) is a self-report measure consisting of 14 items and three scales: (1) affective empathy measuring the extent to which someone is feeling other's distress, (2) cognitive empathy measuring the extent to which someone understands why others are in distress, (3) intention to comfort measuring the extent to which someone wants to help distressed others. The participants answered on a three-point Likert-type scale (1—not true, 2—somewhat true, 3—true) whether the empathy-related descriptions were true for them.

The Cognitive Emotion Regulation Questionnaire [CERQ, (36) trans. by Miklósi et al. (43)] consist of 36 items and has nine scales. Five scales measure adaptive emotion regulation strategies: acceptance, positive refocusing, planning, positive reappraisal and putting into perspective. An additionally four scales measure maladaptive emotion regulation strategies: self-blame, rumination, catastrophizing, and other blame. The CERQ uses a five-point

TABLE 1 | Descriptive statistics and Spearman correlation for the variables.

	Cyberbullying perpetration	Cybervictimization	Mean score	Std. deviation	Cronbach Alpha
(1) Cyberbullying perpetration (CVBS-S)	1	0.27**	13.54	4.08	0.83
(2) Cybervictimization (CVBS-S)	0.27**	1	23.45	8.53	0.87
(3) Affective empathy (EmQue-CA)	–0.24**	-0.01	12.21	2.65	0.66
(4) Cognitive empathy (EmQue-CA)	,–0.20**	0.16**	7.39	1.45	0.72
(5) Intention to comfort (EmQue-CA)	–0.23**	0.04	12.86	2.10	0.74
(6) Self-blame (CERQ)	–0.04	0.18**	10.41	3.51	0.81
(7)Rumination (CERQ)	–0.08	0.17**	11.62	4.00	0.83
(8) Catastrophizing (CERQ)	0.02	0.00	8.06	3.83	0.74
(9) Other blame (CERQ)	0.15**	0.02	8.53	2.89	0.75
(10) Acceptance (CERQ)	–0.02	0.17**	11.24	3.33	0.65
(11) Positive refocusing (CERQ)	–0.04	0.06	10.91	4.20	0.88
(12) Planning (CERQ)	–0.06	0.17**	13.40	3.70	0.81
(13) Positive reappraisal (CERQ)	–0.05	0.03	11.98	3.85	0.78
(14) Putting into perspective (CERQ)	–0.05	0.00	11.29	3.52	0.73
(15) Moral disengagement (CBMDS)	0.46**	0.04	13.45	4.13	0.73

**$p < 0.01$.

Likert-type scale to measure the extent, subjects use the different emotion regulation strategies after a stressful event.

The Cyber Bullying Moral Disengagement Scale (CBMDS, Bussey et al., 2014) is a one factor scale consisting of eight items. Each item refers to cyberbullying and one item represents each of the moral disengagement mechanisms: moral justification, euphemistic language, advantageous comparison, displacement of responsibility, diffusion of responsibility, distorting consequences, attribution of blame, and dehumanizing. Participants implied on a four-point Likert-scale (1 - don't agree, 4 - totally agree) to what extent they agreed with the statements.

Procedure

After the school principal agreed to participate in the study, parents' consent were asked. The students completed the questionnaires by paper-pencil during school hours supervised by teachers or research assistants.

Statistical Analysis

We created four cyberbullying groups to test the differences between cyberbullies, cybervictims, bully-victims, and outsiders (students not involved in cyberbullying) using the mean scores and standard deviations (for the mean scores and standard deviation see **Table 1**). Students were considered cyberbullies if they scored higher than the sum of the mean and one standard deviation on cyberbullying perpetration scale of CVBS-S. Students scoring higher than the sum of the mean and one standard deviation on the cybervictimization scale of CVBS-S were considered as cybervictims. Students scoring higher than the sum of the mean and one standard deviation on both the cyberbullying perpetration and the cybervictimization scales of the CVBS-S were considered as bully-victims. Consequently, those scoring lower than the mean on both the cyberbullying perpetration and the cybervictimization scales of the CVBS-S were considered as outsiders.

Normality tests showed that the variables are normally distributed. Consequently, Pearson correlations, multivariate analyses of variance (MANOVAs) and linear regression analyses were used to test the associations among the variables. Pearson correlations were conducted to explore the relationship among cyberbullying perpetration, cybervictimization, empathy, adaptive and maladaptive cognitive emotion regulation strategies, and moral disengagement scales. Based on the correlational analyses we ran linear regression analyses. A regression analysis with stepwise extension was conducted to determine the predictors of cyberbullying perpetration with other blame, affective and cognitive empathy, intention to comfort and moral disengagement as independent variables. Another regression model with stepwise extension was tested to determine the predictors of cybervictimization with self-blame, rumination, acceptance, planning, and cognitive empathy as predictor variables. Multivariate analyses of variance (MANOVAs) with Bonferroni-corrected *post hoc* tests were performed to discover differences among the cyberbullying groups in empathy, moral disengagement and emotion regulation.

RESULTS

For the descriptive data, prevalence of cyberbullying and cybervictimization in gender and age groups see **Tables 1** and **2**.

Differences Among the Cyberbullying Groups (Cyberbullies, Cybervictims, Bully-Victims and Outsiders) in Empathy

The analysis of variance revealed statistically significant differences between the cyberbullying groups in affective empathy [$F(3, 502)=7.78, p=0.00, \eta_p^2 = 0.04$]. According to the Bonferroni-corrected *post hoc* tests outsiders scored significantly higher than cyberbullies and bully-victims, as well as cybervictims scored significantly higher than cyberbullies and bully-victims. The two latter groups did not differ, also cybervictims and outsiders did not differ in empathy (for mean scores and standard deviations see **Table 3**). The cyberbullying groups also differed in cognitive empathy [$F(3, 502)=7.14$, $p=0.00$, $\eta_p^2 = 0.04$]. Reported by the Bonferroni-corrected *post hoc* tests cybervictims scored significantly higher than cyberbullies and bully-victims. The two latter groups did not differ, as well as cybervictims and outsiders did not differ (for the mean scores and standard deviation see **Table 3**). We also found a significant group difference on the intention to comfort scale [$F(3, 502)=9.35, p=0.00, \eta_p^2 = 0.05$]. According to the Bonferroni-corrected *post hoc* tests outsiders scored significantly higher than cyberbullies and bully-victims. The two latter groups did not

TABLE 2 | Descriptive data about the prevalence of cyberbullying and cybervictimization in gender and age groups.

	Girls (n=309) M (SD)	Boys (n=214) M (SD	12–14 years olds (n=79) M (SD)	15–16 years olds (n=309) M (SD)	17–19 years olds (n=135) M (SD)
Cyberbullying perpetration (CVBS-S)	12.66 (3.12)	14.80 (4.92)	13.61 (4.79)	13.33 (3.81)	13.96 (4.24)
Cybervictimization (CVBS-S)	22.98 (8.14)	24.14 (9.05)	21.66 (9.48)	23.22 (8.50)	24.83 (7.47)
	Prevalence – girls (%)	**Prevalence – boys (%)**	**Prevalence – 12–14 years olds (%)**	**Prevalence - 15–16 years olds (%)**	**Prevalence - 17–19 years olds (%)**
Cyberbullies	2.60	13.10	6.30	5.50	10.40
Cybervictims	13.90	13.10	15.20	13.90	11.90
Bully-victims	2.90	8.40	3.80	5.20	5.90
Outsiders	80.60	65.40	74.70	75.50	71.90

TABLE 3 | Results of multivariate analyses of variances (MANOVAs).

	Outsiders *(n=390)* M (SD)	Victims *(n=71)* M (SD)	Perpetrators *(n=36)* M (SD)	Bully-victims *(n=27)* M (SD)	F	df	η_p^2	Significant Post Hoc
Self-blame	10.21 (3.48)	11.65 (3.71)	10.03 (3.58)	10.00 (2.76)	3.66*	3, 502	0.02	V-O
Acceptance	11.16 (3.35)	11.99 (3.53)	9.97 (3.13)	11.89 (2.46)	3.31*	3, 502	0.02	V-B
Rumination	11.49 (4.01)	13.14 (3.90)	10.74 (3.95)	11.00 (3.63)	4.39**	3, 502	0.03	V-B, V-O
Positive refocusing	10.91 (4.02)	10.82 (4.69)	10.66 (4.41)	10.85 (4.38)	0.05	3, 502	0.00	–
Planning	13.25 (3.67)	14.32 (3.51)	12.03 (4.09)	13.74 (3.31)	3.40*	3, 502	0.02	V-B
Positive reappraisal	12.03 (3.82)	12.00 (3.87)	10.91 (4.11)	12.07 (3.37)	0.92	3, 502	0.01	–
Putting into perspective	11.29 (3.48)	11.45 (3.68)	10.14 (3.32)	11.63 (3.48)	1.37	3, 502	0.01	–
Catastrophizing	8.05 (3.52)	8.34 (3.24)	8.06 (2.74)	8.04 (3.39)	0.14	3, 502	0.00	–
Other blame	8.48 (2.84)	8.01 (2.45)	9.23 (3.91)	9.93 (2.83)	3.61*	3, 502	0.02	B/V-V
Affective empathy	12.40 (2.69)	12.38 (2.45)	10.80 (2.51)	10.56 (2.10)	7.78**	3, 502	0.04	V-B, V-B/V, O-B, O-B/V
Cognitive empathy	7.41 (1.37)	7.89 (1.27)	6.77 (1.80)	6.74 (1.68)	7.14**	3, 502	0.04	V-B, V-B/V
Intention to comfort	13.06 (2.04)	12.94 (1.71)	11.46 (2.59)	11.74 (2.33)	9.35**	3, 502	0.05	V-B, O-B/V, O-B
Moral disengagement	13.07 (3.74)	12.44 (4.15)	16.63 (4.32)	18.56 (4.19)	26.32**	3, 502	0.14	B-V, B-O, B/V-V, B/V-O

*O, outsiders; V, victims; B, cyberbullies; B/V, bully-victims *p < 0.05, **p < 0.01.*

differ. Also, cybervictims scored significantly higher than cyberbullies (for mean scores and standard deviations see **Table 3**).

Differences Among the Cyberbullying Groups (Cyberbullies, Cybervictims, Bully-Victims and Outsiders) in Moral Disengagement

The analysis of variance revealed statistically significant differences among the cyberbullying groups in moral disengagement [$F(3, 502)=26.32, p=0.00, \eta_p^2 = 0.14$]. According to the Bonferroni-corrected *post hoc* tests cyberbullies and bully-victims scored significantly higher than cybervictims and outsiders. The two latter groups, as well as cyberbullies and bully-victims did not differ (for the mean scores and standard deviations see **Table 3**).

Differences Among the Cyberbullying Groups (Cyberbullies, Cybervictims, Bully-Victims, and Outsiders) in Emotion Regulation Strategies

The analysis of variance revealed statistically significant differences between the cyberbullying groups in self-blame [$F(3, 502)=3.66, p=0.01, \eta_p^2 = 0.02$]. Based on the Bonferroni-corrected *post hoc* tests cybervictims scored significantly higher than outsiders. The other groups did not differ (for mean scores and standard deviations see **Table 3**). The cyberbullying groups also differed in rumination [$F(3, 502)=4.39, p=0.01, \eta_p^2 = 0.03$]. According to the Bonferroni-corrected *post hoc* tests cybervictims scored significantly higher than cyberbullies and outsiders. The other groups did not differ (for mean scores and standard deviations see **Table 3**). There was also significant difference between the cyberbullying groups in other blame [$F(3, 502)=3.61, p=0.01, \eta_p^2 = 0.02$]. As reported by the Bonferroni-corrected *post hoc* tests bully-victims scored significantly higher than cybervictims. The other groups did not differ in other blame (for mean scores and standard deviations see **Table 3**). The cyberbullying groups differed in acceptance [$F(3, 502)=3.31, p=0.02, \eta_p^2 = 0.02$] as well. According to the Bonferroni-corrected *post hoc* tests victims scored significantly higher than cyberbullies. The other groups did not differ significantly (for mean scores and standard deviations see **Table 3**). Furthermore, there was significant difference between the cyberbullying groups in planning [$F(3, 502)=3.40, p=0.02, \eta_p^2 = 0.02$]. As reported by the Bonferroni-corrected *post hoc* tests cybervictims scored significantly higher than cyberbullies. The other groups did not differ (for mean cores and standard deviations see **Table 3**).

Determinants of Cyberbullying Perpetration and Cybervictimization

Based on the results of Pearson correlations (see **Table 1**) we conducted two linear regression analyses with stepwise extension to discover which variables could predict cyberbullying perpetration and cybervictimization. The final model of cyberbullying perpetration could account for 21% of the variability [$F(5,515)=136.24, p=0.00$]. Moral disengagement (Beta=0.46,p=0.00) was found to have the most influential, significant effect on cyberbullying perpetration (for detailed results see **Table 4**). Further, the final model of cybervictimization could account for 3% of the variability [$F(5,512)=17.35$, p=0.00]. Self-blame (Beta=0.18,p=0.00) was found to have the most influential, significant effect on cybervictimization (for detailed results see **Table 4**).

DISCUSSION

The main goal of our study was to clarify the roles of empathy, emotion regulation and moral disengagement in cyberbullying perpetration and cybervictimization. Understanding the specific roles of socio-emotional skills can help to understand the dynamics behind cyberbullying and may serve as a base for prevention/intervention programs. Our results demonstrated a pattern of socio-emotional skills underlying cybervictimization and cyberbullying perpetration. We showed that cybervictims do not lack empathic skills. Further, they regulated their emotions in

TABLE 4 | Results of linear regression analyses with stepwise extension.

Linear regression models of cyberbullying perpetration						Linear regression models of cybervictimization					
Model 1	**R^2**	**F**	**df**	**Beta**	**t**	**Model 1**	**R^2**	**F**	**df**	**Beta**	**t**
Moral disengagement	0.21	136.24**	1,515	0.46**	11.67	Self-blame	0.03	17.35**	1,512	0.18**	4.15
Model 2	**R^2**	**F**	**df**	**Beta**	**t**	**Model 2**	**R^2**	**F**	**df**	**Beta**	**t**
Moral disengagement	0.02	75.64**	1,514	0.43**	10.73	Self-blame	0.02	13.15**	1,511	0.16**	3.51
Intention to comfort				–0.14**	–3.48	Cognitive empathy				0.13**	2.97
Model 3	**R^2**	**F**	**df**	**Beta**	**t**	**Model 3**	**R^2**	**F**	**df**	**Beta**	**t**
Moral disengagement	0.01	52.72*	1,513	0.41**	10.33	Self-blame	0.01	10.52*	1,510	0.12**	2.65
Intention to comfort				–0.14**	–3.55	Cognitive empathy				0.12**	2.60
Other blame				0.09*	2.36	Planning				0.10**	2.25

*$p < 0.05$, **$p < 0.01$.

both adaptive and maladaptive ways. Moreover, moral disengagement characterized cyberbullies and bully-victims whereas they had difficulties with understanding others' emotions and perspective.

Our first hypothesis was that cybervictims have the same problems concerning empathic skills as cyberbullies. However, our results demonstrated that cybervictims and cyberbullies differ in empathic competences. This is in line with previous findings (17, 19, 20, 22, 23) showing that cyberbullies are unable to take others' perspective or feel vicarious emotions. In contrast, cybervictims did not show the same deficit in affective and cognitive empathy or intention to comfort. Cybervictims were more focused on others' distress and had a stronger tendency to help others than cyberbullies and bully-victims. This result can serve as an explanation why bully-victims are engaged in cyberbullying as both perpetrators and victims. Bully-victims' difficulties in understanding others' emotions and perspective can be a risk factor why after cybervictimization, instead of adaptively coping with their negative experiences, bully-victims turn to cyberbullying. Whereas, cybervictims' better empathic skills can be a protective factor against their subsequent cyberbullying perpetration. It is possible that the experience of being victimized leads adolescents to pay more attention to others' feelings. Also, such social sensibility could be an antecedent of cybervictimization. In all, further longitudinal research could help understand more about the role of empathy. As well as empathy could serve as a base for programs against cyberbullying to help prevent cybervictims' subsequent cyberbullying behavior and to prevent cyberbullies' repeated aggressive acts.

Our second hypothesis was that moral disengagement plays a crucial role in cyberbullying. We showed that moral disengagement is indeed associated with cyberbullying perpetration. This is consistent with previous studies (25, 39–41) showing a link between cyberbullying and the use of moral disengagement strategies. A previous study (25) found that only cyberbullies are characterized by affective empathy deficit and heightened use of moral disengagement. In contrast, our results showed that moral disengagement characterized not only cyberbullies but also bully-victims. Cyberbullies and bully-victims used these strategies more often compared to cybervictims and outsiders. Whereas bully-victims and cyberbullies used cognitive strategies to suppress the feelings of guilt, they were unable to understand other people's emotions and perspective. An explanation may be that cyberbullies and bully-victims disengage from moral standards in the absence of certain socio-emotional skills. They are unable to understand others' emotions and their own affective states. Without these socio-emotional skills, cyberbullies and bully-victims will use alternative strategies to regulate their negative emotions. Further, bully-victims used other blame as an emotion regulation strategy that is also a way of moral disengagement such as attribution of blame and dehumanization. Consequently, using less moral disengagement strategies may lead to an opportunity for cyberbullies and bully-victims to learn how to understand their own and others' emotional states.

The third aim of the current study was to find the specific emotion regulation strategies that characterize cybervictims. Our results showed that bully-victims used other blame to regulate their affective states compared to victims. According to the Cyclic Process Model (35) there is a risk of using maladaptive emotion regulation strategies for cybervictims to deal with their anger and distress. As a consequence of using maladaptive emotion regulation strategies, another risk of becoming a cyberbully emerges for cybervictims. Indeed, other blame may be the maladaptive emotion regulation strategy underlying cybervictims' cyberbullying perpetration. Although previous results state that both cyberbullies and cybervictims are unable to adaptively regulate emotions (29, 30); our results showed specific emotion regulation strategies characterizing cybervictims but not cyberbullies. Cybervictims used a set of adaptive and maladaptive emotion regulation strategies, e.g. rumination, self-blame, acceptance and planning, compared to cyberbullies and outsiders. One possible explanation could be that cybervictims first use maladaptive emotion regulation strategies but then they switch to using adaptive ones. This shifting might be the result of their better empathic skills, or they receive social support helping them to regulate their distress adaptively. Furthermore, self-blame had a predictive role in cybervictimization. Thus, cybervictims who blame themselves for what happened to them will deem themselves victims of cyberbullying. Consequently,

they will be in risk of substance use, depressive symptoms, anxiety, self-harming behavior etc. (1).

Some limitations of our study shall be noted. First, although anonymity should have lowered the risk of socially desirable answers, adolescents might have underreported their involvement in cyberbullying. On account of opportunity sampling, our sample was not representative of the Hungarian adolescent population. Further, it is important to be noted that the estimates of partial eta squared are weak, though the multivariate analysis of variance showed significant differences between the cyberbullying groups. Moreover, on account of the cross-sectional design of our study we could not test whether cybervictims regulate their emotions first by negative emotion regulation strategies and later shift to adaptive regulation. Without longitudinal data we can only hypothesize the temporal change in the use of cybervictims' affect regulation. Also, our research did not include traditional bullying that could have been informative being highly correlated with cyberbullying. Finally, we used an unpublished scale to measure cyberbullying engagement.

Overall, our results demonstrated the importance of empathy, emotion regulation strategies and moral disengagement in both cyberbullying perpetration and cybervictimization. An interesting outcome of this study was that cybervictims used both adaptive and maladaptive emotion regulation strategies. Moreover, cybervictims were able to understand others' emotions and perspective. Both of these results are worth further research to help understand why adolescents are victimized on the Internet and how they can be helped to adaptively overcome the consequences of cyberbullying. In addition, cyberbullies and bully-victims used moral disengagement strategies to justify their aggressive online behavior whereas they lacked empathic skills. Based on our results, decreasing the degree of using moral justification, cyberbullies and bully-victims may be capable of learning how to understand others' and their own affective states. Consequently, our results might serve as a base for prevention/intervention programs. Higher levels of affective and cognitive empathy, intention to comfort others and adaptive emotion regulation could be protective factors against cyberbullying.

DATA AVAILABILITY STATEMENT

All datasets generated for this study are included in the article/supplementary material.

ETHICS STATEMENT

Ethical approval in conducting this study was granted from the Hungarian United Ethical Review Committee for Research in Psychology (2017/96). The consent procedure (approved by the Hungarian United Ethical Review Committee for research in Psychology) was the following: We gave written information about the research project in the selected high schools. Whereas, our participants were aged between 14 and 18, first we asked the written consent of their parents, then the written consent of the adolescent participants. We granted anonymity for the participants and help to find psychological care if needed or asked for.

AUTHOR CONTRIBUTIONS

NA, BL, and KL designed the study. NA directed the research project. NA and AZ analyzed the data. All authors discussed the results and contributed to the final manuscript.

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Association Between Sub-types of Sibling Bullying and Mental Health Distress Among Chinese Children and Adolescents

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Sibling bullying is a common phenomenon in childhood and adolescence worldwide and has a significant association with mental health distress. However, there have been few studies that have examined the associations between any specific sub-type of sibling bullying and depression as well as anxiety. Besides, the association between sibling bullying and psychological well-being was never explored among the Chinese population. The purpose of this cross-sectional study was to examine the associations between the number of sub-types of sibling bullying involvement and depression as well as anxiety among Chinese children and adolescents. Multi-stage stratified cluster sampling was used to recruit 5,926 participants aged 10 to 18 who had at least one sibling living in the household. Different sub-types of sibling bullying involvement were determined by using Olweus Bully/Victim Questionnaire (OBVQ). The nine-item Patient Health Questionnaire (PHQ-9) and the seven-item Generalized Anxiety Disorder Scale (GAD-7) were used to screen clinical ranges of major depression and generalized anxiety disorder, respectively. Of the participants, 1,235 (20.8%) were bullied by siblings, and 1,230 (20.8%) perpetrated bullying behavior against siblings over the past 6 months. After controlling potential confounders, adjusted model of logistic regression analyses indicated that all three sub-types of sibling victimization and perpetration were significantly associated with both depression and anxiety. There were linear associations between the number of sub-types of sibling bullying victimization and depression (adjusted OR = 1.49, 95% CI 1.32 to 1.68) as well as anxiety (adjusted OR = 1.68, 95% CI 1.48 to 1.90). Besides, linear trends were found between the number of sub-types of sibling bullying perpetration and depression (adjusted OR = 1.44, 95% CI 1.26 to 1.64) as well as anxiety (adjusted OR = 1.63, 95% CI 1.42 to 1.87). The findings underline dose–response relationships between the number of sub-types of sibling bullying involvement and mental health distress. Intervention

programs should be conducted to focus on developing mental health status of those children and adolescents who are involved in multiple sub-types of sibling victimization or perpetration.

Keywords: sibling bullying, mental health, depression, anxiety, adolescents

INTRODUCTION

Sibling bullying refers to any unwanted, repeated, and harmful aggressive behavior among siblings (1), and it encompasses three major sub-types, including verbal (e.g., name-calling, teasing), physical (e.g., kicking, hitting), and relational (e.g., excluding from social situation, spreading rumors) bullying (2, 3). Compared to a substantial body of studies related to peer bullying, bullying behavior among siblings has received less research attention (4, 5). However, if all sub-types are considered, the prevalence of sibling bullying is much higher than that of peer bullying, which is perpetrated by a peer or a group of peers (6, 7). According to a systematic review including four quantitative studies conducted in different countries, nearly 50% of children are involved in sibling bullying every month, and 16% to 20% of them experience sibling bullying more than once a week (7–9). Though sibling bullying is usually considered by the parents as a normal or harmless phenomenon (10, 11), there is ample evidence that sibling bullying increases the odds of reporting a number of psychological and adjustment problems in childhood or early adulthood, which include depression (12, 13), anxiety (14, 15), emotional and conduct problems (9, 16), self-harm behavior (13), and even suicide (12). In addition, given the overlap of sibling and peer interactions in childhood and adolescence, previous studies have found that sibling bullying has significant association with peer bullying (3, 6).

Depression and anxiety are two of the most common psychiatric symptoms (17, 18). Many research studies have examined the associations between sibling bullying and depression or anxiety on the overall experiences of victimization (being bullied by siblings) or perpetration (perpetrating bullying behaviors to siblings) (13, 19). Yet, there were few studies to examine the associations based on any specific sub-type of sibling bullying involvement (15, 20). The previous studies suggest that associations between peer bullying and mental health problems are varied and complex since peer bullying involvement was categorized into different sub-types, including verbal, physical, and relational bullying (21, 22). In a cross-sectional study, Yen et al. found that only physical peer victimization was significantly associated with all dimensions of anxiety symptoms (17). Therefore, there is an important clinical implication to explore whether different sub-types of sibling bullying have distinct or similar association with depression as well as anxiety.

Existing literature has shown that there is a dose–effect relationship between the frequency of sibling bullying involvement and mental health distress. Indeed, those children and adolescents who were involved in sibling bullying victimization or perpetration several times a month or a week were at a particular risk of suffering psychological distress compared with those who never experienced sibling bullying or were involved in sibling bullying only ever once or twice (13, 19). Likewise, involvement in both sibling and peer victimization exhibited a dose–response association with psychological problems (6), with those were bullied both at home and at school having the highest odds for psychotic disorder (19). However, to the best of our knowledge, there is no study to explore the association between the number of sub-types of sibling bullying involvement and mental health problems. A previous study indicated that children and adolescents who were involved in multiple sub-types of sibling bullying victimization had reported greater mental health distress compared with those who experienced only one sub-type of sibling bullying victimization (15), and the effects seem to be cumulative (3). From this perspective, it is reasonable to explore if there is a dose–response association between the number of sub-types of sibling bullying involvement and depression or anxiety.

Aggressive behavior between siblings being a common form of family violence in childhood and adolescence worldwide and the fact that sibling bullying involvement can predict mental health problems (1, 23), in eastern countries, a small group of studies have analyzed the prevalence and risk of bullying, aggression, or violence betweem siblings (24, 25). Besides, there is no previous literature that has examined the link between sibling bullying and psychological well-being among a Chinese population (26). Although the one-child policy had been in effect in China since 1980, the implementation of the policy was less stringent in rural areas. People who lived in remote regions might be allowed to have more than one child when their first child was a girl or a disabled boy (27). On the other hand, the one-child policy was replaced by a universal two-child policy in 2015, and the number of families with two or more kids in both rural and urban areas is expected to increase reasonably (28). Therefore, it is necessary to explore the characteristics and potential risks of sibling bullying among Chinese population.

Taken together, there is a paucity of studies considering the association between different sub-types of sibling bullying involvement and mental health distress. Hence, we conducted a cross-sectional study with a large sample of Chinese children and adolescents to investigate (1) associations between three major sub-types (verbal, physical, and relational) of sibling bullying involvement (victimization and perpetration) and mental health distress (depression and anxiety) as well as (2) the associations between the number of sub-types of sibling bullying involvement and depression as well as anxiety. To this effect, we made some hypotheses: (1) all three major sub-types of sibling bullying have significant associations with mental health distress; and (2) there might be dose–response associations between the number of sub-types of sibling bullying involvement and depression as well as anxiety.

MATERIALS AND METHODS

Procedures

This study was a cross-sectional survey conducted from April to July 2018. The participants were recruited from Hunan Province, China, by using multi-stage cluster sampling. We used a geography-based stratified sampling frame, which included three cities selected randomly from southern, central, and northern parts of the province, respectively. Three junior high schools and three senior high schools were selected randomly from each chosen city, and all the students of grade 7 to 12 were invited to the research. Before the field investigation, we requested permission from the principals of each school. Once the permissions were granted, investigators conducted the research in each class with the help of the form teachers. All participants signed informed consent forms, and the purpose of the study as well as the questionnaire sections were explained to them by investigators. The students were assured of the anonymity and confidentiality of the information provided in the self-reported questionnaires, and the respondents were free to discontinue their participation at any time of the study. The study received the approval from the ethical committee of Xiangya School of Public Health, Central South University.

The data collection was carried out by double input and through logical verification and sampling inspection of 10% of the input data to control the quality of data collection. If there was a problem with the input data, the researcher would check the original questionnaires in time to ensure the accuracy and reliability of the data.

Participants

Questionnaires were sent out to 8,918 students from 18 sampled schools; of these, 8,520 (95.5%) completed the survey without apparent logical errors, and missing items were fewer than 15% of those in the questionnaire. Participants with no siblings (N = 2,415) and those aged 18 or above (N = 179) were excluded. The current study focused on 5,926 children and adolescents aged 10 to 18 who had at least one brother or sister living in the household at the time of the survey. Of the sample, 2,667 were boys (45.0%) and 3,259 were girls (55.0%). The average age was 14.55 ± 1.63. Most participants lived in a two-parent family (89.9%), while 566 children were from a single-parent family or other (9.6%). Of the 5,926 students, 4,518 had one sibling (76.2%), 1,114 had two siblings (18.8%), and 294 had three or more siblings (5.0%). Furthermore, 2,815 were the first child of their family (47.5%), 2,641 were the second-born child (44.6%), and 446 were the third-born or other birth order child in the household (7.5%).

Assessment of Sibling and Peer Bullying

Sibling bullying was surveyed *via* the Chinese version of Olweus Bully/Victim Questionnaire (OBVQ). First, participants were provided with a definition of bullying according to Olweus that sibling bullying refers to any unwanted, repeated, and harmful aggressive behavior among siblings (29). Second, sibling bulling victimization was assessed by asking the participants whether they had ever been bullied by siblings in the last 6 months using the following six items: (1) having been hit, kicked, pushed, or shoved; (2) having belongings been taken or damaged; (3) having been called nasty name; (4) having been made fun of; (5) having been kept out of things on purpose, excluded from the group, or completely ignored; or (6) having had lies or rumors been spread about you and/or having had their sibling(s) try to make others dislike you. Then, sibling bullying perpetration was measured by asking whether the participant had even bullied their sibling(s) over the past half a year using the six items above. Items (1) and (2) relate to physical sibling bullying, (3) and (4) relate to verbal sibling bullying, and (5) and (6) relate to relational sibling bullying. The frequency was coded on a five-point scale ranging from 1 to 5 (1= never happened, 2 = only once or twice, 3 = two or three times a month, 4 = about once a week, and 5 = several times a week) (30). Children and adolescents were considered to be involved in any sub-type of sibling bullying victimization or perpetration if the frequency of bullying behavior mentioned above happened more than two or three times a month (2, 19).

For the status of sibling bullying, a pure victim was defined as his/her being involving in victimization but not engaging in perpetration, a pure bully was classified as his/her perpetrating bullying behavior but not being bullied, and a bully-victim was defined as his/her experiencing both victimization and perpetration of bullying. Those who neither bullied siblings nor were bullied by siblings were classified as "non-involved" (31).

Peer bullying was assessed by the Chinese version of OBVQ in the same way as sibling bullying, while the questions were adjusted for bullying behaviors between peers. Participants were asked whether they have had other students or friends bully them and had they ever bullied other students or their friends in the last 6 months using the six items as mentioned above. The Chinese version of Olweus Bully/Victim Questionnaire showed good reliability according to the existing literature (32).

In this study, the range of the internal consistency reliability (alpha Cronbach) for sub-scales of sibling bullying is from 0.76 to 0.83, and the Cronbach's alpha for sub-scales of peer bullying ranged from 0.77 to 0.84.

Depression

The Chinese version of the nine-item Patient Health Questionnaire (PHQ-9) was used to screen depression of participants (33). The PHQ-9 has nine questions with a score ranging from 0 to 3 for each item and total score ranging from 0 to 27. A higher score indicates that the participant has more depressive symptoms. A total score of 10 or more is considered to meet the clinical range of major depression (1 = Yes, 0 = No) (34, 35). The prior study showed good reliability of the Chinese version of PHQ-9 in children and adolescent population (36). In the present study, the Cronbach's alpha of PHQ-9 was 0.88.

Anxiety

The Chinese version of the seven-item Generalized Anxiety Disorder Scale (GAD-7) was used to assess anxiety disorders of children (37). The GAD-7 has seven questions with a score ranging from 0 to 3 for each item. Therefore, total score of GAD-7 ranges from 0 to 21 (38). A total score ≥ 10 of the GAD-7 is considered to meet the criterion for diagnosing generalized anxiety disorder (1 = Yes, 0 = No) (38, 39). The Chinese version of GAD-7 had good reliability among Chinese population according to early findings (40). In this study, the alpha Cronbach for GAD-7 was 0.93.

Confounding Variables

Potential confounding factors were selected based on the literature with regard to the association between sibling bullying and psychological problems (12, 13), which included gender, age, number of siblings (one, two, or more than three), birth order (the first, the second, the third, or other), family composition (living in a two-parent family or a one-parent family), maternal education (primary school or less, junior high school, senior high school, college, or higher). Besides, parental conflict and parental abuse were considered as confounding variables in this study according to prior work (14, 25). Parental conflict and parental abuse were measured by asking participants "how often your parents fight with each other" and "how often your parents hit or abused you". The frequency coded on a five-point scale in the last half year, ranging from 1 to 5 (1= never happened, 2 = only once or twice, 3 = two or three times a month, 4 = about once a week, and 5 = several times a week). Peer bullying (0 = not involved and 1 = involved in victimization or perpetration).

Statistical Analysis

In our analyses, if the participant completed the survey with the missing items more than 15% in the questionnaire, we would exclude the whole information of the participant.

First, prevalence of participants involved in sibling bullying involvement was summarized by descriptive statistics [n (%)]. To assess associations between sibling bullying status (pure victim, pure bully, and bully-victim) and major depression as well as generalized anxiety disorder, two adjusted model of logistic regression analyses were performed separately. Second, for examining whether there were associations between different sub-types of sibling bullying and depression as well as anxiety, a set of adjusted model of logistic regression analyses were conducted to assess the associations after excluding those participants who were involved in any two or three sub-types of sibling bullying victimization or perpetration. Then, in order to examine the associations between the number of sub-types of sibling bullying involvement and depression or anxiety, a set of adjusted model of logistic regression analyses were performed with all participants who were categorized into four sub-groups (0 = participants not involved in any types of sibling bullying, 1 = participants involved in any one type of sibling bullying, 2 = participants involved in any two types of sibling bullying, and 3 = participants involved in all three types of sibling bullying). Finally, for testing if there is a dose–response relationship between the number of sub-types of sibling bullying involvement and depression or anxiety, we ran a set of adjusted model of logistic regression analyses again with the number treated as a continuous term.

Dependent variables of all adjusted logistic regression analyses mentioned above were major depression (total score ≥ 10) and generalized anxiety disorder (total score ≥ 10) separately. To address possible bias, potential confounding variables included gender, age, family composition, maternal education, number of siblings, birth order, parental conflict, parental abuse, and peer bullying. The associations were reported *via* adjusted odd ratios (OR) and 95% confidence intervals (95% CI). The significance level was set at $p < 0.05$. All of the statistical analyses were conducted by SPSS 22.0.

RESULTS

Of the 5,926 children and adolescents, 1,235 (20.8%) reported at least one sub-type of sibling bullying victimization over the past 6 months. The prevalence of three sub-types of sibling bullying victimization was 13.8% (verbal), 7.6% (physical), and 4.0% (relational). In addition, 1,230 (20.8%) participants had bullied their siblings with any sub-type of sibling bullying in the last half a year. The prevalence of three sub-types of sibling bullying perpetration were 14.5% (verbal), 6.5% (physical), and 2.8% (relational). With respect to sibling bullying status, 448 (7.6%) of children were pure victim, 443 (7.5%) were pure bully, and 787 (13.3%) were bully-victim.

In mental health distress, 1,171 (19.8%) and 875 (14.8%) children met a threshold score of diagnosing major depression and generalized anxiety disorder respectively (**Table 1**).

Associations Between Sibling Bullying Status and Depression and Anxiety

When looking at the status involved in sibling bullying (pure victim, pure bully, and bully-victim), results of adjusted logistic regression analyses indicated that any role of sibling bullying involvement was significantly associated with both depression and anxiety (**Table 2**).

TABLE 1 | The prevalence of sub-types of sibling bullying involvement, depression, and anxiety (N = 5,926).

	n (%)
Sub-types of sibling bullying victimization	
Verbal	818 (13.8)
Physical	450 (7.6)
Relational	237 (4.0)
Any	1235 (20.8)
Sub-types of sibling bullying perpetration	
Verbal	859 (14.5)
Physical	387 (6.5)
Relational	165 (2.8)
Any	1230 (20.8)
Depression	1171 (19.8)
Anxiety	875 (14.8)

Associations Between Three Sub-types of Sibling Bullying Involvement and Depression and Anxiety

In victimization, after excluding 150 participants who experienced any two sub-types of sibling bullying victimization and 60 who were involved in all three sub-types of sibling bullying victimization, results of adjusted logistic regression analyses indicated that all verbal, physical, and relational victimization of sibling bullying were significantly associated with both depression and anxiety.

In terms of perpetration, after excluding 111 children or adolescents who acted any two sub-types of sibling bullying to their siblings and 35 who perpetrated all three sub-types of sibling bullying, there were significant associations between all three major sub-types of sibling bullying perpetration and depression as well as anxiety (**Table 3**).

Associations Between the Number of Sub-types of Sibling Bullying Involvement and Depression and Anxiety

The adjusted model of logistic regression analyses indicated that children and adolescents had more risk of experiencing major depression when they reported being bullied by siblings with any one, two, or three sub-types of sibling bullying than those who were not involved in sibling bullying victimization. Meanwhile, there were significant associations between any number of sub-types of sibling bullying victimization and anxiety. What is more, a linear trend was found between the number of sub-types of sibling bullying victimization and depression (adjusted OR = 1.49, 95% CI 1.32 to 1.68, $p < 0.001$) as well as anxiety (adjusted OR = 1.68, 95% CI 1.48 to 1.90, $p < 0.001$).

The results of adjusted logistic regression analyses illustrated that participants who perpetrated any one, two, or three sub-types of sibling bullying would be more likely to report major depression than those who never acted bullying behavior to their siblings. Children and adolescents who acted any number of sub-types of sibling bullying had greater risk of anxiety compared to those who did not report sibling bullying perpetration. Afterwards, the number of sub-types of sibling bullying was treated as a continuous variable for logistic regression analyses. Liner associations were found between the number of sub-types of sibling bullying perpetration and depression (adjusted OR = 1.44, 95% CI 1.26 to 1.64, $p < 0.001$) as well as anxiety (adjusted OR = 1.63, 95% CI 1.42 to 1.87, $p < 0.001$) (**Table 4**).

DISCUSSION

This is the first study to examine the association between sibling bullying and mental health distress *via* a large and random

TABLE 2 | The associations between sibling bullying status and depression and anxiety [Adjusted OR (95% CI)].

	Sibling bullying status			
	Non-involved	**Pure victim**	**Pure bully**	**Bully-victim**
Bullying involvement (N = 5926)	4248	448	443	787
Depression (%yes)	16.8	28.3	25.5	27.4
Depression	1.00	1.73 (1.35-2.22)***	1.52 (1.17-1.98)**	1.71 (1.39-2.10)***
Anxiety (%yes)	11.8	21.7	20.1	23.6
Anxiety	1.00	1.85 (1.41-2.44)***	1.50 (1.12-2.01)**	2.09 (1.68-2.62)***

Significant confounding variables:
Depression = female gender, older age, living in a one-parent family, parental conflict, parental abuse, and peer bullying.
Anxiety = female gender, older age, living in a one-parent family, maternal education with college or more, parental conflict, parental abuse, and peer bullying.
***p < 0.01, ***p < 0.001.*

TABLE 3 | The associations between different sub-types of sibling bullying involvement and depression and anxiety [Adjusted OR (95% CI)].

	Sub-types of sibling bullying			
	Non-involved	**Verbal only**	**Physical only**	**Relational only**
Victimization (N = 5716)	4691	620	281	124
Depression (%yes)	17.7	22.6	29.5	29.8
Depression	1.00	1.38 (1.10-1.74)**	1.83 (1.35-2.47)***	1.71 (1.11-2.64)*
Anxiety (%yes)	12.6	18.1	21.7	24.2
Anxiety	1.00	1.65 (1.29-2.12)***	1.64 (1.16-2.30)**	1.93 (1.21-3.07)**
Perpetration (N = 5780)	4696	715	258	111
Depression (%yes)	17.9	23.9	30.6	26.1
Depression	1.00	1.46 (1.18-1.80)***	1.78 (1.30-2.44)***	1.72 (1.06-2.78)*
Anxiety (%yes)	12.8	18.7	24.4	23.4
Anxiety	1.00	1.55 (1.23-1.96)***	1.80 (1.27-2.54)**	1.87 (1.12-3.15)*

Significant confounding variables:
Depression (Victimization/Perpetration) = male gender, older age, living in a one-parent family, parental conflict, parental abuse, and peer bullying.
Anxiety (Victimization/Perpetration) = male gender, older age, living in a one-parent family, maternal education with college or more, parental conflict, parental abuse, and peer bullying.
**p < 0.05, **p < 0.01, ***p < 0.001.*

sample in a non-western country. Moreover, the current study contributes new information with regard to the association from specific sub-type of sibling bullying involvement. The findings highlight the associations between three major sub-types of sibling bullying involvement and mental health problems. After controlling potential confounding variables, including individual characteristics, family characteristics, and other forms of family violence, we found that all verbal, physical, and relational victimization and perpetration of sibling bullying were associated with major depression as well as generalized anxiety disorder. More importantly, the number of sub-types of sibling bullying involvement is significantly associated with mental health distress in a dose–response fashion.

Confirmed our hypothesis, linear associations were found between the number of sub-types of sibling bullying involvement and depression and anxiety. Children and adolescents had higher odds of suffering major depression and generalized anxiety disorder with the number increasing, and those who were involved in all three sub-types of sibling bullying victimization or perpetration were at the highest risk of experiencing mental health distress. The finding extends existing studies that have identified dose–effect relationships between the frequency, the role, and the context of bullying involvement and mental health problems (13, 19). Therefore, target population of anti-bullying programs and mental health promotion must include not only those children who are involved in frequent bullying behavior (13), those who are bully-victims (a child that is both bully and victim) (2, 9), and those who are bullied by both siblings and peers (6) but also those who are involved in multiple types of victimization or perpetration.

Our work provides a new insight into the measurement of sibling bullying when examining the associations between bullying behavior among siblings and negative health outcomes. According to previous studies, sibling bullying involvement was generally treated as a binary term, and a victim or a bully of sibling bullying could be identified as long as any one item of the questionnaire met the cutoff value (13, 19). For example, a child would be classified as a victim when he or she had been hit by a brother or sister several times a month over the past half a year. Meanwhile, another child who had been hit, completely ignored, and made fun of by his or her siblings several times a month in the last 6 months was also identified as a victim of sibling bullying (19). From the findings of this study, the two children mentioned above may have different odds of experiencing mental health distress. Thus, future research should to treat sibling bullying involvement as a continuous variable according to the number of sub-types of sibling bullying in which participants are involved.

On the other hand, the cutoff value of sibling bullying in this study was "more than two or three times a month" (2, 19), which is different from some studies using the more stringent cutoff value, such as "more than once a week" (12, 31). When we chose "about once a week" as cutoff value in the study, the prevalence of sibling bullying was less than 5%, and it is much lower than 30.8% that reported in some western country (12). The difference might stem from different culture and concept of sibling relationship. Sibling bullying is a new issue but not a well-accepted topic in China in recent years. Chinese children and adolescents would avoid revealing their frequent aggressive behaviors among siblings because of traditional family values, which underline harmony and endurance.

Despite the potential contribution to the literature of sibling bullying, there are several limitations to this study. First, the nature of a cross-sectional survey limits our study to draw causality between sibling bullying and mental health distress. Moreover, there may be a bidirectional relationship between sibling bullying and depression or anxiety, which had been identified as the relationship between peer bullying and poor mental health outcomes (21, 41). Therefore, future longitudinal studies need to explore whether there is a bidirectional model between sibling bullying and mental health distress. Second, the study recruited children and adolescents aged 10 to 18 due to the fact that children aged under 10 may be unable to understand the questionnaire completely. However, the prevalence of sibling bullying

TABLE 4 | The associations between the number of sub-types of sibling bullying involvement and depression and anxiety [Adjusted OR (95% CI)].

	Number of sub-types of sibling bullying involvement				
	0	**1**	**2**	**3**	**Linear trend**
Victimization (N = 5926)	4691	1025	150	60	
Depression (%yes)	17.7	25.4	36.0	48.3	
Depression	1.00	1.54 (1.28-1.85)***	1.86 (1.26-2.76)**	3.77 (2.10-6.77)***	1.49 (1.32-1.68)***
Anxiety (%yes)	12.6	19.8	36.0	43.3	
Anxiety	1.00	1.65 (1.35-2.02)***	2.80 (1.88-4.17)***	4.90 (2.72-8.84)***	1.68 (1.48-1.90)***
Perpetration (N = 5926)	4696	1084	111	35	
Depression (%yes)	17.9	25.7	28.8	51.4	
Depression	1.00	1.56 (1.30-1.86)***	1.62 (1.03-2.55)*	2.89 (1.37-6.11)**	1.44 (1.26-1.64)***
Anxiety (%yes)	12.8	20.6	28.8	57.1	
Anxiety	1.00	1.61 (1.33-1.96)***	2.28 (1.44-3.61)***	5.79 (2.73-12.26)***	1.63 (1.42-1.87)***

Significant confounding variables:

Depression (Victimization/Perpetration) = male gender, older age, living in a one-parent family, parental conflict, parental abuse, and peer bullying.

Anxiety (Victimization/Perpetration) = male gender, older age, living in a one-parent family, maternal education with college or more, parental conflict, parental abuse, and peer bullying.

**p < 0.05, **p < 0.01, ***p < 0.001*

peaks in childhood according to previous studies (6, 42). In the future study, we might invite younger children as our sample and information of investigation will be provided by their caregivers. In addition, the prevalence of sibling bullying in this study was measured by one of the siblings in a family through self-reported questionnaire, and there might be a information bias. Future research should consider the characteristics of sibling bullying behaviors and conduct research within a family and investigate bullying behaviors among all siblings. Finally, although the sample size of this study was rather large, the present study was conducted in a limited geographical setting. The extent to which this sample represents is unclear due to that the data of participants was only collected from students in Hunan Province, central China. Future research can recruit more children and adolescents in different regions of China.

Although there are limitations in some aspects of this study, our findings provide practical implications for clinicians, professionals, and policy makers. First, measure of sibling bullying should include specific sub-types of bullying behavior since they may have a cumulative effect on mental health outcomes. What is more, future research could take more sub-types of bullying into consideration, such as cyber bullying. At the same time, mental health education and promotion could be provided first to those children who are involved in multiple sub-types of sibling victimization or perpetration as they are at particular greater risk of mental health distress. In addition, since both sibling bullying and peer bullying are associated with depression as well as anxiety, effective preventive programs of anti-bullying should be conducted at home and at school simultaneously.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The protocol was reviewed and approved by National Office for Philosophy and Social Science (Beijing, China). The study received the approval from the ethical committee of Xiangya School of Public Health, Central South University (grant number is XYGW-2017-056). Informed consents were obtained from the principal of each chosen school, the students who participated in the study, and their parents.

AUTHOR CONTRIBUTIONS

XL, as the first author, developed the initial manuscript. XL and MY were also responsible for the data collection and the data analysis. CP guided the overall design of the study. CP and YY also negotiated for program management of data and field access. ZQ, XQ, and XY contributed substantially to the revision and refinement of the final manuscript. All authors have read and approved the final manuscript.

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The Free2B Multi-Media Bullying Prevention Experience: An Exemplar of Scientific Edutainment

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Objective: The objective of the current article is to highlight an example of a new paradigm, *Scientific Edutainment*. The manuscript describes how educational researchers and technologists worked together to develop a multi-media bullying prevention experience, called Free2B for middle school students paying particular attention to ensure that the programming was not only relevant to all students but also was appealing and responsive to the needs of urban youth. Bullying is the most common form of aggression experienced among school-aged youth, which impairs students' learning and social-emotional functioning and has financial costs to society. Given that the prevalence of bullying is highest in middle school, finding brief and feasible methods for motivating and sustaining change at this age is critically important, especially in the case of urban, under-resourced schools.

Method: In response to this challenge, multidisciplinary bullying prevention researchers collaborated with international technologists to develop the Free2B multi-media bullying prevention experience through an iterative Community-Based Participatory Research (CBPR) approach. In addition, the research team conducted a series of pilot studies to iteratively develop and initially evaluate the multi-media program, helping to ensure relevance specifically for urban middle school youth.

Results: Results from the pilot studies indicated that the vast majority of middle school students found the Free2B multi-media bullying prevention experience to be enjoyable, relevant to their needs, and addressed important strategies to handle peer bullying and victimization. In addition, the brief prevention experience was associated with increases in problem-solving knowledge, prosocial attitudes about bullying, increased sympathy, and confidence in handling peer conflicts.

Conclusion: The current paper illustrates the use of a new paradigm, termed *Scientific Edutainment*, as a way to combine evidenced-based developmental science with the

latest in entertainment technology to provide innovative, engaging, and technologically-sophisticated educational programming.

Keywords: scientific edutainment, edutainment, bullying, prevention, school-based, community-based participatory research

INTRODUCTION

The term Edutainment has been used relatively frequently over the past 15-20 years to broadly describe the combination of education and entertainment in order to help children and adolescents, and sometimes institutions and/or other entities, learn and promote new skills (1–6). Some have emphasized that Edutainment denotes that the learner is actively engaged in their learning through the entertainment and technology aspects (7), and that the teaching of new skills can occur in any setting and not just within a classroom or school context (7). Thus, there has been an emphasis on the use of interactive and immersive technologies (e.g., augmented reality, immersive virtual reality, mixed reality environments) with the idea that the entertainment technology can stimulate stronger cognitive engagement from participants thereby helping to facilitate the learning process (8, 9). These interventions have been applied with some level of success to a range of different topics, including the promotion of safer teen driving (4), health education related to HIV and AIDS in 3rd world countries (10), sexual abuse prevention (11), and preschoolers' reading skills (12). The strengths of Edutainment approaches are that they may enhance creativity, transform traditional learning into interactive and immersive learning experiences, improve participant engagement and motivation, and utilize the latest innovations in technology. However, from our perspective, the strengths of Edutainment can be negated if best practice science and strong theory are not used to design the content delivered. In those cases the entertainment value may be high but the effectiveness and generalizability of the intervention strategies may be limited. As such, we refer to our work throughout the remainder of this paper as "*Scientific Edutainment*" to indicate that this signifies best practice science and theory combined with strong educational practices and the latest in entertainment technology.

The goal of the current manuscript is to provide an example of *Scientific Edutainment*, in which bullying prevention researchers partnered with an international technology team to develop a multi-media bullying prevention experience (called Free2B) for middle school students, given that bullying peaks during these years (13, 14), paying particular attention through a community-based participatory research (CBPR) process to ensure that the program not only had global relevance but also was engaging and responsive for urban youth and educators. Descriptions for how program materials were developed and initially evaluated will be described through a series of pilot studies. Through this process we will highlight how researchers can collaborate with multi-media experts to develop and iteratively evaluate and adapt materials to ensure that resulting programs are both engaging and scientifically-grounded. Challenges for researchers in trying to bridge the gap between theory, practice, and innovation will be highlighted, including the need for balancing the use of technology to engage students in learning best practice strategies in an entertaining way without depicting extreme violence.

The Problem of Peer Bullying

Peer bullying at school is a significant childhood experience that is associated with considerable behavioral, social, and academic difficulties that can be prevented and/or ameliorated through systematic prevention and intervention programs (15, 16). Bullying prevention programming for middle school students is particularly important given that bullying increases in late childhood and peaks in early adolescence (13, 14). This makes the middle school years an extremely important time period to intervene to help suppress this increase and lessen the impact of bullying. This is especially true for urban minority youth, as previous research suggests that programming has not typically been adapted to be culturally-responsive to the needs of many of these high-risk youth (15, 17, 18). A critique of empirically-supported bullying prevention programs is that some educators feel that programs are too time- and labor-intensive, not engaging to students, as well as not being culturally-relevant for urban minority youth (17, 18).

Brief technology-based bullying prevention experiences may play a role in building youth knowledge of bullying prevention facts while promoting students' attitudes that they can play an important role in reducing bullying behaviors at their school. These approaches can simultaneously provide survey results so that they each school can have a data-informed approach to addressing their school's unique bullying climate and culture, and illuminate next steps needed to create more lasting change during adolescence. As such, we developed and pilot tested an empirically-supported multi-media bullying prevention experience to support middle school students in the initial stages of bullying prevention programming through initiating collective action and evidence-based decision making. This paper details how a *Scientific Edutainment* experience was developed through CBPR as researchers and technologists partnered in the iterative design of this prevention experience. A CBPR approach combines psychological theory and best practice science with key stakeholder feedback (17), and it is similar to prior research focused on engaging youth in collaborative decision-making techniques to determine intervention preferences (19, 20). Results will be presented from a series of pilot studies that were used to ensure that Free2B is universally relevant yet scientifically rigorous and sensitive to minority youth living in urban communities.

Strengths and Weaknesses of Published Research in Bullying Prevention

Although all states have mandates requiring schools to address bullying (21), there is great variability in how schools accomplish this. Common approaches are to conduct stand-alone anti-bullying programs or a single-session assembly (22). Stand-alone bullying programs, have historically been developed and conducted in European countries (e.g., Olweus' Bullying Prevention Program) but have become more common in the United States over the past 15 years (16, 23). Strengths of some of the most well-known bullying prevention programs are that they are theoretically grounded and they include the necessary elements for bullying prevention (24–26). For instance, best practice programs address broad school climate, aim to improve supervision and monitoring in the unstructured school settings, support clear and consistent rules preventing bullying, and involve all students, school staff, and parents in supporting these efforts. Despite this, many of these efforts have resulted in relatively small reductions of bullying (16, 25) with effects declining in older adolescents (27). Limitations of stand-alone programs, even the more successful ones, are that they are labor-intensive to implement fully or as intended, especially outside of the context of a well-controlled research study, sometimes resulting in suboptimal impact (16, 28). For these reasons, use of a well-respected bullying prevention program often does not translate into positive changes. This is particularly true for urban under-resourced schools that grapple with additional stressors, such as single-parent homes, poverty, and community violence (17).

As an alternative, schools will turn to quick fixes such as a school assembly. Assemblies appeal to schools because of their minimal time commitment and lack of burden on busy teachers. However, assemblies have several inherent limitations. First, many existing bullying prevention assemblies are "lecture-style" and therefore are variably engaging. Further, many use punitive messages and reprimand bullying behavior (e.g., a zero tolerance approach), which is a reactive response to bullying (22, 29) that does not engage students to create a lasting impact when used alone (23, 29). Assemblies are often not theoretically-grounded and it is not always clear how they have integrated best practice bullying prevention core content of problem-solving, perspective-taking, sympathy, and instructions for bystanders of bullying (16, 23). This makes it impossible for assemblies to be systematized and/or scaled. Finally, an assembly is rarely coupled with data-collection that could be used to provide tailored feedback. In sum, while convenient, assemblies often lack the theoretical foundation and a positive, engaging approach that is necessary to capture student interest and foster behavior change.

>In summary, the goal of this paper was to describe how researchers and technologists can work together to establish engaging programming that is theoretically-based and empirically supported. In order to accomplish this goal, we describe how brief bullying prevention programming was developed through an iterative partnership-based approach to ensure that the result would be scientifically-grounded, theoretically-based, and make use of innovative technology to engage students in a 90 min interactive learning assembly about bullying prevention programming.

METHODS AND ITERATIVE DEVELOPMENT OF PROGRAMMING

All aspects of the project described in this manuscript were approved by the authors' institutional review board (IRB). As such, all students at participating schools received the multi-media programming and completed pre- and post-questions anonymously on a hand-held remote device. Children who participated in focus groups were required to obtain parental permission (and child consent) prior to participation.

Initial Partnership

Researchers with considerable expertise in intervention development for aggression and bullying prevention programming were approached by an international technology team who had extensive experience in developing interactive educational programming for youth. The technology team approached the researchers with their desire to develop a brief multi-media bullying prevention experience for middle school-aged youth, given the high prevalence of bullying during these years (13, 14). Each partner (e.g., the research team and the technology team) brought particular expertise and limitations to the collaboration. For example, the research team had experience in program design and methodology, psychological theory related to intervention programming, and knowledge of empirically-based best practice strategies for bullying prevention programming. In addition, the research team had substantial experience working in urban school environments, developing effective evidence-based universal and indicated aggression and bullying prevention programs (17, 30, 31) and had a good understanding of strategies for anti-bullying programming that are considered ineffective and/or could "cause harm" by scaring students as opposed to engaging and/or teaching them (32, 33). However, the research team had limited experience working with technologists and producers and were not familiar with the production process and related time-lines.

The technology team had notable strengths in developing 3D interactional experiences related to educational topics, knowing the latest in technological advances, and having considerable experience developing, producing, and scaling programming through a portable school-based assembly-style format. The technologists had also worked with research teams in the development of their prior programs, which allowed the current research team to build upon this foundation in developing a systematic and iterative process for the development of Free2B using the community-based participatory research (CBPR) model. Given that a CBPR approach can lead to stronger and more culturally-sensitive programs, but invariably also be a slower process, the research team had to figure out how to provide meaningful data-driven advice quickly and efficiently so that the production portion of the team could meet projected timeline goals. Many times this was accomplished by having the research team prioritize feedback given to the broader team in order to emphasize which aspects were most crucial.

In sum, the initial partnership took a number of meetings across several months whereby leaders of both teams met together to speak openly about the ways in which they liked to work, their respective strengths, and projected challenges. The end result was the

agreement to have weekly virtual "working meetings" between lead researchers and technologists to further establish goals, timelines, and ways to communicate and collaborate most successfully.

Developing Working Relationship and Goals

Early weekly meetings included discussing how a brief multi-media prevention program could be used to increase student awareness of bullying and motivate students to be ready for making changes to their school climate. The research team emphasized the importance of taking a positive-based approach to the project which would likely foster more engagement and change (34, 35) rather than a fear-based approach trying to scare children (29) that has often been used in docudramas and popular media. For example, researchers suggested highlighting the positive implications and power that students could gain back from a child who bullies by being a positive and proactive bystander as opposed to highlighting the negative effects of depression and suicide that peer victims can experience. Over the course of several months, A Memorandum of Understanding (MOU) was developed between the research and technology team that outlined the goals, expectations, and proposed production schedules. For instance, the MOU indicated that the research team would be responsible for developing a white paper and logic model that would help articulate the main concepts and constructs to be illustrated in the multi-media production (see below for a more detailed description), and that the white paper and logic model would be used to help ensure that different aspects of the programming were grounded in the empirical literature on best-practice strategies for peer bullying prevention. These same concepts and constructs were used to help determine outcome metrics. At the same time the MOU laid out production time-tables and the detailed type of feedback the technologists required from the research team for iteratively developing components of the program (e.g., including drafting of scripts, story-boarding, focus group feedback, and production schedules).

Generation of a White Paper on Bullying Prevention

The research team then worked for several months to develop a White Paper (e.g., Concept Paper) to clearly articulate the scientific foundation for the multi-media program in bullying. This document included: a) key background literature review and summaries related to bullying and victimization; b) diagrams and articulation of the program theory (see **Figure 1**); c) details on recommended content and associated constructs based upon best practice scientific principles related to peer bullying prevention programming; d) projected immediate, intermediate, and long-term behavioral outcomes for the program[1]; and e) representative items to utilize as part of a pre- and post-test interactive survey.

[1]Intermediate and long-term outcomes were outlined with the expectation that the multi-media experience could be combined with more intensive ongoing programming to make lasting behavioral change.

Description of Prevention Experience Components

The goal for the team working together to design the Free2B bullying prevention experience was to develop a 90 min multi-media bullying prevention experience grounded in best practice science and relevant psychological theory. In general, meetings occurred about once per month over approximately 6 months with specific tasks laid out for the research team and for the technology team between meetings. The original prevention experience that was rolled out in pilot study #1 described below consisted of four primary intervention components and 13 pre- and post-assembly questions which were completed using the interactive hand-held devices. First, an engaging 3D movie that highlights the harmful impact of all forms and modes of bullying (e.g., physical, relational, and cyber) and the role that positive bystanders can play in helping to promote a safe school climate. This included the "director's cut" following the 3D movie, where the director, actors and actresses talk openly about the impact that peer bullying has had on their lives, how it directly affected many of them growing up, and the steps they took to overcome and/or try to make it better. Second, video testimonials in which adolescents share their bullying and victimization experiences through social media (e.g., simulating a YouTube© posted video displaying thoughts on index cards) in an effort to inspire students' to take a stand against bullying. Third, an interactive quiz show in which youth learn basic knowledge about bullying, emotion regulation, and being a positive bystander. During the quiz show the youth answer multiple choice questions using interactive hand-held devices, questions include concepts related to myths and facts of bullying, how to recognize when they are becoming angry, how to best evaluate social situations before reacting quickly and/or impulsively towards others, and strategies for being a positive and proactive bystander. Finally, the dark room audio experience, during which time students hear a story in a darkened room so that they must use their auditory senses to listen, learn, and react to a story as it unfolds.

All participants completed a 13-item pre- and post-program questionnaire (outside of the interactive quiz show) through the interactive hand-held remote devices, viewed the 3D movie, listened to the dark room audio experience, and engaged and actively participated in the interactive experiences.

Underlying Program Theory of the Prevention Experience

Three psychological theories, social information processing (36), developmental-ecological (37, 38), and cognitive-behavioral theories (39, 40), as described below, were combined with a positive approach to bullying prevention in order to provide a theoretically-grounded and engaging learning experience for students. Social information processing (SIP) models of aggression suggest that a child approaches each interpersonal situation through a combination of biologically determined capabilities, memories of prior practices, and models for social situations. A child's behavioral response in a particular peer interaction is posited to be a function of how these pre-existing

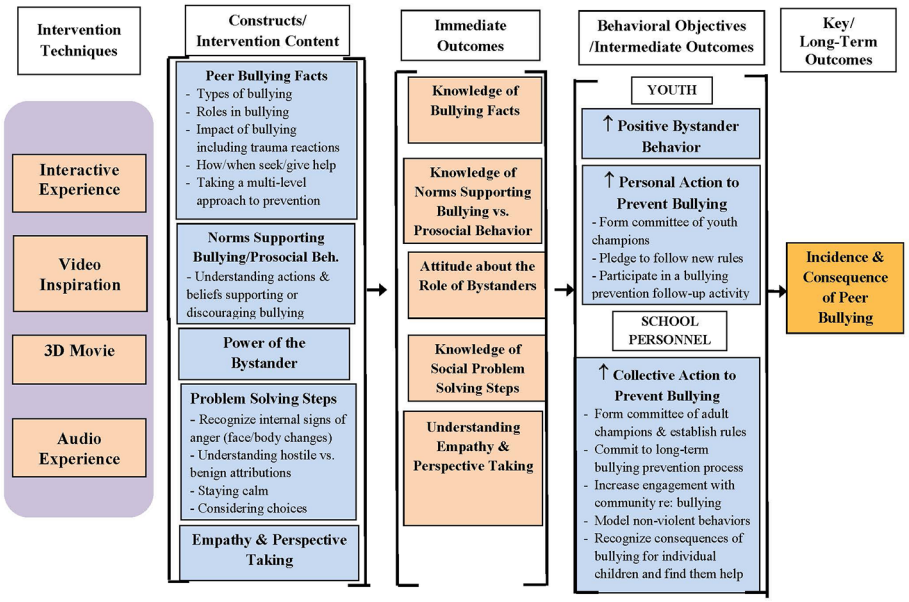

FIGURE 1 | Program theory for Free2B: Decreasing incidence and consequence of peer bullying.

capabilities interact with the way in which children process a series of social cognitive steps (36). Free2B is grounded in an SIP re-training framework, modeled after attributional re-training programs, such as the Coping Power Program (41), the Brain Power Program (42), and Friend to Friend (17, 30). These programs were chosen because they have shown aggression reduction among urban African American youth. For instance, the interactive quiz show component of Free2B focused upon illustrating several basic social problem-solving strategies including how to recognize when you are getting angry, how to slow yourself down and examine social situations prior to acting, and how to give others the benefit of the doubt when their motives are unclear. Bronfenbrenner's developmental ecological theory (37, 38) and more recently the bioecological theory (43, 44) also influenced the design of Free2B. This model suggests that development is influenced by relationships and interactions with significant others in one's social environment. As such, Free2B was designed to motivate and change the behaviors of the bystanders of bullying (both youth and adult) such that these individuals interact more positively when confronted with bullying. Finally, cognitive behavioral strategies (observing behaviors through the 3D movie and inspirational videos; shaping new behaviors) derived from social learning theory (39, 40) were also used to make Free2B engaging and impactful. For example, the video testimonial and the "director's cut" components (components 1 and 2 listed above) of Free2B were designed with the idea that by observing other youth and young adults successfully handling and/or talking about how they handle bullying would provide a model for how the students themselves could use positive bystander techniques to enhance school climate.

Researchers developed the program theory (see **Figure 1**) and primary teaching content, consulted with a local youth advisory group, and developed evaluation procedures[2]. They also recommended that the program target middle school youth, as this is the time in which rates of bullying are the highest (13, 14). The program theory illustrates how all four primary intervention components are thought to impact both proximal (e.g., knowledge of bullying facts; prosocial attitudes about positive bystander behavior) and distal (e.g., increases in positive bystander behavior and collective action to prevent bullying) outcomes. As program materials were being developed the technology team asked for more detailed guidance as to the main teaching points the researchers hoped to achieve within the program. As a result, the researchers developed a Most Important Concepts/Key Teaching Points document (see **Table 1**). This helped to articulate the main constructs and take-away messages that needed to be covered in one or multiple components of the intervention in order to ensure that the content was covered and emphasized in a scientifically-grounded manner.

ITERATIVE PILOT STUDIES RESULTS

The first pilot study of Free2B was conducted at two urban middle schools serving ethnic minority students (121 8th graders) within a large urban school district. All components of the intervention had been fully developed through the partnership previously described, and although quantitative data was

[2]All items used for pre- and post-testing were selected from validated measurement tools by examining their psychometric properties in past studies combined with the cognitive testing of the specific items with small numbers of middle school youth to ensure adequate understanding.

TABLE 1 | Most important concepts and key teaching points.

Key Point	Description	Broader Construct	Take Away Message
#1	Defining Bullying	Knowledge/ Myths re: bullying	-Bullying is aggressive behavior that occurs repeatedly in context of a power imbalance
#2	Subtypes of Bullying	Knowledge/ Myths re: bullying	-Physical (hitting, kicking, threatening), Relational (harming others by damaging reputation through gossip, social exclusion) -Verbal (insulting through words) -Cyber (Using technology to harm others)
#3	Bullying hotspots at school	Knowledge/ Myths re: bullying	-Occurs most often in unstructured settings (e.g., lunchroom, hallways) when adults are not present
#4	Who is a Bully or Victim?	Knowledge/ Myths re: bullying	-Anyone can be a bully or victim (can't tell by how someone looks), and bullies are often quite popular & socially influential despite not being well-liked
#5	Impact of bullying	Norms supporting prosocial as opposed to bullying climate	-Bullying has a negative impact on behavior, class climate, academics, & social relations
#6	Preventing bullying & improving school climate	Norms supporting prosocial as opposed to bullying climate	-Necessary for youth, diverse school personnel, & parents to work together to develop positive ways of encouraging peer interactions, establishing clear rules to prevent bullying, & forums for discussing concerns
#7	Bullying is about Power	Understanding the unique role of the Bystander	-Bullies have the power, victims have little power, and bystanders don't realize their power potential (e.g., bystanders can have power by exhibiting prosocial behaviors and messages)
#8	Teaching a series of problem-solving steps	Knowledge of Problem-Solving	-Recognizing our own body language when becoming angry/upset -Staying calm (e.g, taking deep breaths, using visual imagery, counting to 10) -Looking at each situation closely (not just assuming others "meant" to be mean or aggressive) -Considering our choices in social conflict situations
#9	Seeing others' points of view	Perspective-Taking	-Important to consider other's perspectives
#10	Recognizing others' feelings	Empathy	-Recognizing that behavior impacts others' feelings

collected and evaluated as part of this initial implementation, the focus was on ensuring the acceptability, relevance, and feasibility of the 90 min program. Further, the goal of this pilot was to obtain qualitative feedback from randomly selected 8th graders, teachers, and counselors from each school who participated in focus groups immediately following the multi-media experience. Both quantitative data and focus groups with students and staff indicated that Free2B was engaging and enjoyable, and that the show enhanced students' knowledge and prosocial attitudes about bullying. Despite this, students reported that they could not fully relate to some of the characters and/or settings in the show. This was important feedback, for which a CBPR approach was used to ensure relatability and relevance with urban minority youth by making slight adaptations to Free2B including: 1) re-filming the video testimonial component with a more diverse group of actors and actresses, 2) depicting more contextually relevant themes for bullying that any student audience should be able to relate to (e.g., the original video testimonial had the youth being bullied for having red hair, this was changed to being bullied for being overweight and not having nice clothes in the revised version), 3) enhancing the visibility and roles of the minority characters in the 3D component, and 4) adapting several visual prompts on the interactive quiz show in order to better highlight the main teaching points and constructs. Through the qualitative feedback, overwhelmingly students did not find the dark room component as informative or engaging as compared to the other components. For instance, they found the story hard to follow, having trouble differentiating the different voices and characters and at times finding the story too complicated. As a result, the research team suggested that the revised program not include the dark room experience, or that this component be substantially revised and adapted.

Following the iterative changes described above, a second pilot study was conducted with 714 7th and 8th graders from five middle schools. These schools were chosen in order to ensure that there was diversity in school type (urban versus suburban) and in terms of school neighborhood (e.g., SES level, rates of violence in community). Of the five schools, two were urban low-income schools, one was a suburban school with a moderately high SES, and two were suburban schools in relatively impoverished neighborhoods. All aspects of the 90 min experience were conducted and results indicated that 88% of students found Free2B to be enjoyable, 92% thought it taught helpful strategies to stop bullying, and 85% indicated that it addressed issues important to them. Significant paired sample t-tests and McNemar $\chi 2$ also suggested that Free2B produced immediate post-assembly changes related to increased social problem-solving knowledge, prosocial attitudes about bullying, increased sympathy, and confidence in resolving conflicts (see **Table 2**). Further, focus groups with participating students in the two urban schools suggested that changes to Free2B after the 1st study, made it more culturally-relevant, relatable, and impactful. For example, students reported that they were able to relate to characters depicted in the 3D and video testimonial parts of the program in line with the changes made following pilot study 1.

A 3rd pilot study was conducted with 1155 6th grade students from eight middle schools in a large predominately minority urban school district in another part of the country. Results produced similar positive results to those described in pilot study 2 above. For instance, 87% of students found Free2B to be enjoyable, 93% thought it taught helpful strategies to stop bullying, and 87% indicated that it addressed issues important to them. Finally, significant paired sample t-tests and McNemar $\chi 2$ were found across the same domains outlined above. The similar positive results obtained demonstrated that the program has promise with younger (6th graders) predominately urban youth and across different geographic regions of the country.

TABLE 2 | Pre and post Free2b experience scores on selected items.

Likert Questions[a]	Pre Mean	Post Mean	Paired *t*	*p* –value
It is my responsibility to help students who are bullied.	2.30	2.42	-3.30	<.001
I could help someone who was bullied.	2.84	2.94	-2.88	.004
How bad would you feel for a student who was bullied?	2.91	3.07	-5.09	<.001
Dichotomous Questions	**Pre % Correct**	**Post % Correct**	**McNemar $\chi 2$**	***p***
Bullying is a normal pat of growing up (correct answer: False)	40%	72.1%	165.42	<.001
What is the BEST way to keep calm in an argument? (correct answer: Take deep breaths)	27.8%	52.5%	96.46	<.001
When you're having an argument, what is the BEST reason to pay attention to other student's face and body? (correct answer: Because it can help you figure out how he/she is feeling)	46.6%	63.4%	62.11	<.001

Note. [a]*Items were on a scale from 1 = not at all to 4 = a whole lot.*

DISCUSSION

The primary goal of the project was to iteratively develop and preliminarily evaluate an engaging, interactive, easily administered experience aimed at bullying prevention that is effective for all youth, with particular focus on the relevance for an urban minority population given that programs are not always responsive to these children's needs and concerns (17, 18). In order to accomplish this a *Scientific Edutainment* approach was utilized which combined state-of-the-art entertainment technology, a strong theoretical foundation applied to bullying prevention research, and CBPR with youth and educators. The program was continually adapted and fine-tuned through stakeholder feedback in order to ensure engagement, relatability, and relevance for urban ethnic minority youth in addition to other student audiences.

The current manuscript highlights a number of advantages as well as challenges for using a *Scientific Edutainment* approach to program development. Strengths of this approach include that it is a paradigm that allows for the integration of multiple disciplines and fields to work together to ensure scientific rigor as well as strong youth engagement and entertainment value. Further, this paradigm illustrates how this approach can be used to address a gap in the field of bullying prevention for middle schoolers; that is, how to utilize the assembly-style format which is feasible and brief (that schools continue to use despite the availability of evidence-based effective programming) in a way that is systematic, theoretically-grounded, data-driven, and designed to provide clear teaching and training strategies for bullying prevention without glorifying violence or inducing fear in youth. The integration of technology and entertainment into the program also ensures that students are provided materials and teaching concepts through modalities and techniques of which they are familiar. This study also provides a model for how educational researchers and technologists representing the entertainment field can work together through a CBPR format to impact youth positively while ensuring that they are "doing no harm."

An additional strength of this *Scientific Edutainment* approach is that a multi-media experience such as the one presented here can be fully implemented with strong fidelity across diverse school types and settings as it only requires a large auditorium or gymnasium. Given that the 90 min experience simulates a film or movie, it requires only an MC to help redirect students and/or to answer questions if needed as the program begins. This helps to ensure that all aspects of the experience occur during each program showing. As such, the systematic procedures and high treatment fidelity which is built in to this system also addresses inherent limitations for typical school assembly programs (e.g., variable content and presentation styles, different presenters) as well as more established stand-alone programs which are often infeasible to implement as intended outside the context of a large research grant or trial (16).

There were a number of challenges that also are illustrated through the current use of a *Scientific Edutainment* approach in the current study. First, utilizing the most engaging technology while keeping the budget to a reasonable scope was a challenge, especially when utilizing a CBPR iterative approach to project development. As a result, the combined research and technology team agreed that they would provide suggestions based on their past experiences and/or quantitative or qualitative data by organizing concerns into different domains for prioritization. These included feedback and changes that were: 1) absolutely essential because if not changed they may send the wrong message and/or cause harm; 2) essential for more clearly articulating valuable teaching content or strategies; 3) non-essential but suggested in order to potentially strengthen program effects; and 4) non-essential but if budget allowed would make the final production more systematic or professional but would likely have no major impact on program effects. Given the strong relationship between the teams, researchers and technologists were able to work closely together to avoid any priority #1 issues by articulating that the goal was to motivate students to want to make a change at their school, and therefore all team members agreed that it would be much more important to tell stories of hope, of overcoming obstacles, and teaching of feasible strategies as opposed to showing the worst case scenarios for bullying victims (e.g., depression and suicide; homelessness). Given these early conversations through the CBPR process there were no times where researchers or technologists were fearful that the program could cause harm. In contrast, there were a number of times in the early stages of development where researchers used iterative data or qualitative feedback to suggest changes to the way teaching points were phrased or presented on screen, and to the diversity and/or main messages of the characters, in order to help ensure that the main teaching content was optimally portrayed and presented to diverse audiences.

It should be noted that there was a steep learning curve for both groups due to the unfamiliarity as to the production process and time-table for researchers, and to the ways in which CBPR research teams work to represent youth voice and input at each

stage of the iterative development process for the technology and producer team. Weekly virtual meetings, frequent discussions, and sharing of documents (e.g., scripts, white paper, examples) helped bridge this gap in experience for both teams. By virtue of having a close partnership between teams, the initial feedback obtained from urban students in pilot study 1, which necessitated making some changes to aspects of the program components (e.g., re-filming the video testimonial component with a new set of actors; emphasizing to a greater degree the important role held by the minority actors within the 3D film), was able to be utilized in a quick and efficient manner prior to pilot study 2.

The current study served as an illustration of the *Scientific Edutainment* paradigm. This paradigm has direct implications for bullying prevention programming and related interventions. While we recognize that any single-day experience is unlikely to reduce bullying alone[3], it is clear from these pilot studies that Free2B is unique in its ability to produce very strong immediate changes that require minimal reinforcement or involvement from teachers or school personnel. However, as suggested by best practice science and our focus group feedback, programming should go beyond a 1-day assembly in order for schools to promote and maintain an anti-bullying climate. Given that Free2B utilizes handheld devices to collect student self-reported data pre-, post- and during the interactive quiz show portion of the program, this information can be utilized to help schools move beyond a 1-day program. For instance, in the future, this data could be used to customize "school bullying need reports" based upon each school's data. The use of this data will allow for near real-time comparative studies of bullying surveillance and advance our understanding of bullying in a wide range of contexts. Further, in an age of data-based decision making in the schools the use of school-specific data to personalize planning and action steps is a crucial component that is missing from most current "one size fits all" bullying prevention programs. Finally, the use of school specific data could be used to determine current prevention programming success, plan for future programming, and/or track progress over time. Thus, future research examining the Free2B experience when combined with "school bullying needs assessment reports" can be helpful for planning and choosing more intensive or targeted bullying prevention efforts that would be important in capitalizing upon the positive initial steps from Free2B and promoting longer-term behavioral change in the schools.

Based upon our experience in using a *Scientific Edutainment* paradigm to develop bullying prevention programming we have several recommendations for helping educators think through their use of assembly-style programs to address peer bullying including that it: a) draws upon a strong scientific foundation, b) uses a positive and interactive approach which may help facilitate learning as opposed to a "fear-based" approach, and c) provides data back to schools that could include online and free resources for students, school staff, and parents. In addition, it is recommended that school personnel come up with a list of discussion questions to help students better articulate and apply the concepts learned, and use follow-up surveys to ascertain student feedback and understanding.

In summary, Free2B demonstrates rigor in its series of pilot studies, use of CBPR to ensure relevance and meaning to urban youth, and significant findings across samples varying in grade and geographic location. The use of the data collected during Free2B may address the limitation of the brief program by expanding beyond the focus on immediate changes and providing schools with a data-driven approach to influence the bullying climate through collective action and positive bystander behavior. The *Scientific Edutainment* approach utilized in the current research holds promise for detailing how diverse groups of educators, researchers, and entertainment industry groups can work together to design innovative, scientifically-grounded, and engaging means for addressing key educational problems such as peer bullying through future research.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by The Institutional Review Board, Children's Hospital of Philadelphia. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

SL, TW, BP, KB, and FW conceptualized the study and prepared the manuscript. BP and SL recruited schools for participation and oversaw study implementation, and TW conducted data analyses. SL and TW played a key role in writing the paper with critical review provided by FW. SL, TW, BP, KB, and FW gave final approval for the submitted version.

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[3] Free2B was not examined for its potential long-term impact and/or influence on bullying behaviors themselves, which could be a goal for future research.

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Bullying Perpetration and Narcissistic Personality Traits across Adolescence: Joint Trajectories and Childhood Risk Factors

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Objectives: Although there is some evidence on the longitudinal associations between bullying perpetration and narcissistic personality traits, their joint developmental trajectories across early to late adolescence are largely unknown. Accordingly, we examined the co-development of bullying perpetration and narcissistic personality traits across adolescence and examined the childhood predictors of these joint trajectories.

Method: Self-reports of bullying and narcissistic personality traits were assessed across 6 years of adolescence from Grade 7 (i.e., age 13) to Grade 12 (i.e., age 18) in a sample of 616 Canadian adolescents and childhood predictors were assessed in Grades 5 and 6.

Results: As predicted, latent class growth analyses demonstrated that most adolescents were reflected in a trajectory of low decreasing bullying (82.0%) and a smaller group followed a moderate stable trajectory of bullying (18.0%). The majority of adolescents followed a moderate stable trajectory of narcissistic traits (56.3%), followed by a high increasing trajectory of narcissistic traits (22.8%), and a low decreasing trajectory of narcissistic traits (20.9%). Six percent of adolescents followed a high-risk dual trajectory of moderate stable bullying and high increasing narcissistic traits (high-risk group). Also as predicted, higher hyperactivity, higher frustration, and lower anxiety in childhood differentiated the high-risk group from a low-risk group (low decreasing bullying and low decreasing narcissistic traits; 19.0%). Higher childhood hyperactivity also differentiated a group of adolescents who followed a trajectory of moderate stable bullying and moderate stable narcissistic traits (10.0%) from the low-risk group. Results showed that moderate stable bullying was a better indicator of high increasing and moderate stable trajectories of narcissistic personality traits than the reverse.

Conclusions: Findings suggest adolescence is a time when personality and bullying reflect dynamic and heterogeneous development. Early intervention of childhood risk factors may help prevent a high-risk developmental course of bullying and narcissistic personality traits across adolescence.

Keywords: bullying, narcissistic personality traits, joint trajectory, hyperactivity, anxiety, frustration, adolescence

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INTRODUCTION

Bullying is a significant social problem that affects up to 30% of youth and has demonstrated heterogeneous developmental pathways (1). Research from a person-centered approach has shown that the majority of youth follow a developmental trajectory pattern of low stable or decreasing bullying perpetration (approximately 42–87%), with a smaller proportion of youth following high or moderate stable or increasing trajectories [approximately 7–16% (2–5)]. Some researchers have also found evidence for a third and/or fourth group of youth following moderate stable or decreasing levels of bullying between the high and low groups [e.g., 11–35%; (4, 5)]. Identifying different subgroups of youth at risk for engaging in particular patterns of bullying can be helpful to tailor prevention and intervention efforts to adolescents. However, the joint trajectory patterns with individual differences are largely unknown. Developmental patterns of antisocial personality traits like narcissism could provide significant insight on the developmental course of bullying and youth that are at risk [e.g., (6, 7)]. Accordingly, the joint trajectories of bullying perpetration and narcissistic personality traits and their childhood predictors were examined in this study.

Bullying is a behavior that is affected by developmental and social–ecological contextual processes. From a developmental framework, bullying is a form of aggressive behavior used by children and adolescents within a power imbalance to intentionally hurt others (8, 9). This behavior peaks between early to middle adolescence, a developmental period that coincides with important biological (i.e., puberty), cognitive, psychological, and social changes (9, 10). Bullying may be one means for youth to navigate and adapt to changes such as the transition to high school, increased number of peers, and growing interest in romantic partners (11, 12). Indeed, pure bullying perpetration (i.e., engaging in bullying, but not being victimized) has been associated with important social resources such as higher social status and peer-perceived popularity (5, 13–15), dominance [e.g., (16)], power [e.g., (15)], and a greater number of dating and/or sexual partners (17, 18). Bullying can also be considered a behavior influenced by ecological contextual processes, as not all individuals use bullying behavior.

According to the ecological theory (19, 20), there are multiple nested systems varying from proximate (e.g., individual characteristics, personality) to distal (e.g., community factors, culture) that can affect development. Personality traits are important individual characteristics reflecting ways of thinking and feeling that can influence adolescent bullying perpetration directly [e.g., (21)] and indirectly by working alongside broader ecological contexts at home, school, or in the community [e.g., (22, 23)]. Bullying perpetration has been concurrently associated with personality traits reflecting antisocial tendencies including higher levels of psychopathy-linked narcissism (24) and higher levels of narcissistic exploitation (6). Children and youth who have a tendency to be exploitative and have a sense of entitlement can intentionally harm peers who they feel that they have more power over. Tendencies to be exploitative could facilitate the pursuit of bullying over time to obtain status and resources that reinforce an inflated self-image [e.g., (25, 26)]. These cross-sectional studies highlight the need for longitudinal research to determine the developmental course of antisocial personality traits alongside the development of bullying.

Personality traits are based in genetic variations, and across development, most individuals preserve their rank-order stability [i.e., rank from highest to lowest relative to all individuals (27)]. Personality research on adult samples also indicates that average levels of traits that reflect maturation such as agreeableness, conscientiousness, and emotional stability typically rise across the lifespan [e.g., (28)]. However, evidence suggests that adolescence is a developmental period when average levels of these three personality traits can drop as a result of biological, social, and psychological changes (29–31). Given the theoretical negative association between agreeableness and narcissism [e.g., (32, 33)], early adolescence is an ideal time to start examining the development of narcissism (31).

The development of moderate levels of narcissism are linked to a healthy self-worth and a positive self-concept, but higher levels of this trait reflect a sense of grandiosity, superiority, and entitlement (6, 33, 34). High levels of narcissism can also be characterized by a tendency to easily feel vulnerable and threatened when this self-view is challenged by others (25, 26, 35–37). Starting around age 8, children's developmentally normative tendencies to overestimate their own abilities begin to diminish, yet a desire for maintaining a positive self-view is evident (33, 38). During adolescence, there is some evidence suggesting variability in narcissism. In one longitudinal study, overall trends of mother-rated narcissism of children across 4 years starting at age 10 primarily reflected stability for the overall sample, but showed significant variability in individual growth trajectories [i.e., (39)]. Researchers have also begun to examine longitudinally narcissism with bullying perpetration. In one study based on a sample of youth between the ages of 11 and 13, Fanti and Henrich (34) found that baseline levels of higher narcissism and lower self-esteem predicted bullying perpetration across 1 year. In another study, Fanti and Kimonis (40) found that initial levels of narcissism were positively associated with high stable levels of bullying across 3 years of early to middle adolescence. These studies demonstrate that there can be variability in narcissism and its association with bullying but a more complete understanding of the temporal sequencing of narcissism and bullying across adolescence requires the examination of their joint trajectories.

To our knowledge, the joint trajectories of narcissism and bullying have been examined in only one study. In a sample of 393 youth followed annually across three waves starting at age 10, Reijntjes et al. (7) found four trajectory patterns of total bullying (i.e., composite of direct and indirect bullying). The majority of youth reflected a low stable pattern of bullying (37.2%), followed by an average stable pattern (27.8%), a moderate stable pattern (24.0%), and a high stable pattern (11.0%). Three trajectory groups of narcissism were found, with the largest being a medium stable group (46.8%), followed by a low stable group (43.5%), then a high stable group (9.4%). For each gender, the joint trajectories of narcissism with direct, indirect, and total bullying were examined. The majority of boys followed trajectory

groups of low bullying, with low to medium narcissism (19–28% depending on the form of bullying examined), whereas the majority of girls followed trajectory groups of low bullying with low narcissism (26–42%). A small number of boys reflected high-risk joint trajectory patterns that followed high bullying and high narcissism (3–6%) and no girls followed high-risk joint trajectory patterns. In sum, Reijntjes et al. found that boys who followed the highest trajectory of narcissism were more likely to also follow a trajectory of high bullying; whereas boys following the high bullying trajectory were equally likely to follow the three narcissism trajectories. There were also a substantial number of boys who displayed high trajectories of bullying, but not narcissism. These findings suggest that high narcissism is one of many risk factors for bullying.

In the present study, we wanted to extend the study by Reijntjes et al. (7) by examining the joint developmental trajectories of bullying and narcissistic personality traits across a longer time span from early to late adolescence. Knowing the developmental pattern of narcissistic traits and bullying perpetration could help determine whether targeting cognitive-affective processes associated with exploitative and entitled tendencies in narcissistic personality may help prevent future bullying perpetration. We also wanted to contribute novel findings regarding childhood psychological and emotional risk factors of the joint trajectories of bullying and narcissistic traits. By determining childhood predictors of high-risk joint trajectory patterns, early intervention could prevent psychological and emotional patterns from escalating into long-term bullying and narcissistic traits.

Our first objective was to examine the joint developmental trajectories of bullying perpetration and narcissistic personality traits across 6 years of adolescence, starting from Grade 7 in Canada (i.e., age 13) followed annually until Grade 12 (i.e., age 18; end of high school). Based on previous studies, we predicted to find at least two trajectories of bullying perpetration, reflecting a low stable or decreasing trajectory group and a high stable or increasing trajectory group [e.g., (2, 4, 5, 22)]. We also predicted to find at least two trajectories of narcissistic traits, reflecting a low stable or decreasing trajectory group and a high stable or increasing trajectory group [e.g., (7)]. We were primarily interested in examining high-risk joint trajectory groups characterized by high bullying and high narcissistic personality traits, or moderate and/or high bullying and narcissistic personality traits. Our second objective was to examine the temporal pattern of these two trajectories. We expected that narcissistic personality traits would more readily predict bullying perpetration than the reverse given findings by Reijntjes et al. (7), but also expected that not all youth reflecting high trajectories of bullying would be high on narcissistic personality traits, as other factors could predict bullying.

To further differentiate the high-risk group from the low-risk group (low bullying perpetration and low narcissistic personality traits), our third objective was to examine childhood predictors of the joint trajectory groups assessed in Grade 5 (i.e., age 11) and Grade 6 (i.e., age 12). Childhood psychological and emotional variables that have previously been associated with bullying were examined including hyperactivity, anxiety, frustration, and empathic concern. Bullying has been associated with traits related to childhood impulsivity and a lack of inhibitory control or conscientiousness [e.g., (21, 41)]. Evidence also links bullying with lower emotional distress such as a lack of anxiety or fear [e.g., (42, 43)], and a lack of empathic concern for others (44, 45). Difficulty with emotion regulation such as suppressing anger or frustration has also been linked with bullying (46). We predicted that these childhood psychological and emotional risk factors would differentiate youth reflecting high-risk joint trajectory patterns from their peers found in a low-risk joint trajectory group.

MATERIALS AND METHODS

Participants

Participants were from the McMaster Teen Study, which is an on-going cohort based longitudinal study on bullying, mental health, and academic achievement. In the spring of 2008, participants were recruited from 51 randomly selected primary schools from a school district in southern Ontario, Canada. Participants were in Grade 5 at Time 1 of the study and this cohort of individuals have been followed annually by the second author until Time 13, with data collection on-going. For the longitudinal study, 875 students agreed to participate, with 703 (80.6%) actually participating in at least one of the annual follow-ups from Time 2 (Grade 6) to Time 8 (Grade 12). In Grade 5, participants had a mean age of 10.91 years ($SD = 0.36$). Participants also had a median parent reported yearly household income of $70,000-$80,000 at Time 1, which was similar to that of the city of recruitment ($76,222) and province ($70,910; http://statscan.gc.ca). To be included in the current study, participants needed to have data from at least one time point across Grade 7 to Grade 12, as these were the time points available for the variables of interest for the latent class growth models. For this analytic sample, data from Grades 5 and 6 were used as predictors of the latent class growth trajectories. This led to a final analytic sample of 616 participants (87.6% of longitudinal sample; 54.2% girls). The majority of participants were White (76.1%), had a median parent reported household income of more than $80,000, and a median completed parent education level of college diploma or trades certificate.

Procedure

Study approval was obtained from the relevant school board. At Time 1, when participants were in Grade 5, they completed measures using paper and pencil in classrooms. In subsequent time points, each year participants had the option of completing either a paper/pencil or online version of measures in their homes. Parents of participants were interviewed over the telephone by a research assistant. Every year, parental consent and youth assent forms were collected [see (47) for additional details regarding procedure]. Ethics approval was obtained from the associated university ethics councils.

Measures

Trajectories From Grade 7 to Grade 12

Bullying

Bullying perpetration was assessed with five self-report items from an adapted version of the widely used Olweus Bully/Victim Questionnaire (1, 8). Participants were first provided with a definition of bullying followed by the question, "Since the start of the school year (September), how often have you taken part in bullying another student?" The remaining questions assessed specific forms of bullying including physical, verbal, social and cyber bullying. A five-point scale was used to assess each item (0 = *not at all* to 4 = *many times a week*), and all items were averaged to form a composite for each grade. Higher scores indicated higher bullying perpetration. The Cronbach's alphas were 0.72 in Grade 7, 0.78 in Grade 8, 0.77 in Grade 9, 0.77 in Grade 10, 0.81 in Grade 11 and 0.80 in Grade 12.

Narcissistic personality traits

Narcissistic personality traits were assessed using 10 items from the Narcissistic Personality Questionnaire-Revised [NPQ-R; (48)]. This measure was developed using the Narcissistic Personality Inventory as a framework [NPI; (49, 50)]. The NPI is the most commonly used scale to assess trait narcissism in non-clinical adult samples and was developed based on the criteria for narcissistic personality disorder (51, 52). Unlike other youth measures of narcissistic personality, which were designed for higher risk youth including juvenile offenders, the NPQ-R was created to assess maladaptive trait narcissism in community-based non-clinical samples of youth.

Although this measure was developed using an Asian youth sample (ages 12–19), it has been validated in North American samples (53, 54). An example of an item includes, "I can make people believe anything I want them to." A five-point scale was used to assess each item (0 = *not at all true of me* to 4 = *very true of me*), and all items were averaged to form a composite for each grade. Higher scores indicated higher narcissistic personality traits. The Cronbach's alphas were 0.78 in Grade 7, 0.80 in Grade 8, 0.81 in Grade 9, 0.81 in Grade 10, 0.81 in Grade 11 and 0.81 in Grade 12.

Childhood Predictors Assessed at Grade 5 and Grade 6

Emotional and psychological variables

All childhood variables were assessed in Grade 5 and Grade 6. Childhood psychological variables included hyperactivity and anxiety and were assessed using the Self-Report of Personality (SRP) form of the Behavior Assessment System for Children-2 [BASC-2; (55)]. Both hyperactivity and anxiety were comprised of items that were assessed on either a four-point scale (0 = *never* to 3 = *almost always*) or a dichotomous response (0 = *false* and 2 = *true*). Hyperactivity was comprised of eight items and a sample includes, "I often do things without thinking." Anxiety was comprised of 13 items, but one item was omitted at the request of the school board, resulting in 12 items. A sample item includes, "I worry about little things." Items were reverse coded where appropriate and summed for each grade adjusting for missing items (55). The Cronbach's alpha reliabilities for hyperactivity were 0.79 in Grade 5 and 0.80 in Grade 6. The scores for Grade 5 and Grade 6 were then averaged to create a composite hyperactivity score ($r = 0.51$, $p < 0.001$). The alpha reliabilities for anxiety were 0.88 in Grade 5 and 0.86 in Grade 6. The scores for Grade 5 and Grade 6 were then averaged to create a composite anxiety score ($r = 0.51$, $p < 0.001$). Higher values indicated higher hyperactivity and anxiety, respectively.

Childhood emotional variables included frustration and empathic concern. Frustration was assessed with seven items from the Early Adolescent Temperament Questionnaire-Revised (EATQ-R) self-report (56, 57). A sample item includes, "It really annoys me to wait in long lines." Each item was rated on a five-point scale (0 = *very false* and 4 = *very true*) and averaged to create a composite for each grade. Empathic concern was assessed with seven items from the Interpersonal Reactivity Index self-report [IRI; (58)]. A sample item includes, "I am a person who cares about the feelings of others." Each item was rated on a five-point scale (0 = *not at all like me* and 4 = *always like me*) and averaged to create a composite for each grade. The Cronbach's alpha reliabilities for frustration were 0.83 in Grade 5 and 0.79 in Grade 6. The scores for Grade 5 and Grade 6 were then averaged to create a composite frustration score ($r = 0.33$, $p < 0.001$). The Cronbach's alpha reliabilities for empathic concern were 0.85 in Grades 5 and 6. The scores for Grade 5 and Grade 6 were then averaged to create a composite score ($r = 0.52$, $p < 0.001$). Higher values indicated higher frustration and empathic concern, respectively.

Demographic variables

Demographic variables assessed at Time 1 were biological sex, race/ethnicity, household income, and parent education. Due to the small number of races reported, race was recoded into White (83.0%) or non-White (17.0%). Household income was reported by parents using an eight-point scale (1 ≤ *$19,999*; 2 = *$20,000–29,999*; 3 = *$30,000–39,999*; 4 = *$40,000–49,999*; 5 = *$50,000–59,999*; 6 = *$60,000–69,999*; 7 = *$70,000–$79,999*; 8 ≥*$80,000*) and highest level of completed education was reported by parents using a five-point scale (1 = *did not complete high school*; 2 = *high school*; 3 = *college diploma or trades certificate*; 4 = *university undergraduate degree*; 5 = *university graduate degree*).

Analytic Plan

Using MPlus version 7.4 (59), semi-parametric group-based methods were estimated through latent class growth analysis. With this procedure, the number and shapes of trajectories of bullying perpetration and narcissistic personality traits across Grade 7 to Grade 12 were examined and posterior probabilities were used to identify the probability of each participant belonging to a particular trajectory group. Full information maximum likelihood estimation was used to deal with missing values. The best fitting model was determined by examining the Bayesian information criterion [BIC; (60)], the Lo-Mendell-Rubin likelihood ratio test [LMR-LRT; (61)], the bootstrapped likelihood ratio test [BLRT; (62)], and entropy. Lower values for the BIC indicate a more parsimonious model. A lower LMR-LRT and a significant BLRT indicates that the solution is a better fit than the model with one less group. Finally, entropy ranges from

0 to 1, with values closer to 1 indicating a better fit (63–65). The final selected model was also examined for theoretical and conceptual clarity. Starting values were increased to STARTS = 200 40 and LRTSTARTS = 0 0 500 200 to prevent local solutions (63). The OPTSEED function was also used to ensure that estimates were replicated. Up to four classes were tested for both bullying and narcissistic personality traits, and the best fitting univariate trajectories were used to examine the joint trajectory models. Once the final models were selected, group membership was saved and imported into SPSS for each latent class growth trajectory process (bullying perpetration, narcissistic personality traits, and joint) to allow for examining group predictors.

Before examining the significant childhood predictors of the trajectory groups, all predictors were standardized. Participants had to have data on predictors either in Grade 5 or Grade 6 and if data were available for both grades, a mean score was computed. The core analysis involved a series of multinomial logistic regression models conducted in SPSS with the saved trajectory groups and therefore participants had to have data on trajectory groups and predictors. For each latent class growth trajectory process (bullying perpetration, narcissistic personality traits, and joint), in the first series of multinomial logistic regression models, only the demographic variables were simultaneously entered as predictor variables of group membership. This was followed by a second separate series of multinomial logistic regression models which included only the childhood emotional and psychological variables entered simultaneously as predictor variables of group membership in each latent class growth trajectory process. For the univariate trajectory groups (bullying, narcissistic personality traits), the low group was selected a priori as the reference group and contrasts between high and/or moderate groups were conducted. For the joint trajectory groups (i.e., bullying and narcissistic personality traits), we were mainly interested in the groups characterized by trajectories that were high or moderate on both bullying and narcissistic personality traits (i.e., high-risk groups). Therefore, we specified three contrasts a priori and these were the only contrasts tested: (a) high bullying/high narcissistic personality traits vs. low/low (i.e., low-risk group), (b) moderate bullying/moderate narcissistic personality traits vs. low/low, and (c) high bullying/high narcissistic personality traits vs. moderate bullying/moderate narcissistic personality traits. The Benjamini–Hochberg (BH) correction was separately applied to each multinomial regression model to control for Type 1 error in multiple testing (66). For the final set of multinomial logistic regression models, all demographic, emotional, and psychological predictors were entered simultaneously for each trajectory process.

RESULTS

Missing Data

The analytic sample varied slightly based on whether bullying or narcissism was available across Grades 7 to 12. The trajectory analysis for bullying included 616 participants and the trajectory analysis for narcissistic personality traits included 615 participants. For the dual trajectory, the analytic sample included 616 participants. The analytic sample was compared against the other participants in the longitudinal portion of the study (i.e., non-analytic sample) on the demographic variables using chi-square tests for sex and race, and *t*-tests for household income, parent education, and the childhood predictors (i.e., Grade 5 and 6 composites). Compared to the non-analytic sample, participants in the analytic sample were more likely to be White, have a higher household income, and have a higher level of completed parental education (all $p < 0.001$).

Descriptive Statistics

Means and standard deviations of bullying and narcissistic personality traits across Grades 7–12 overall and by sex are shown in **Table 1**. All variables demonstrated acceptable skewness and kurtosis values except for bullying in Grades 9, 11, and 12, which had kurtosis values exceeding 10, and also had extreme univariate outliers (67). Winsorizing these univariate outliers allowed us to preserve rank-ordering of these individuals, reduce the skewness and kurtosis values of the variables, and reduce the impact of these individuals on the distribution of the variables (68). Overall means revealed that bullying and narcissistic personality traits were stable as they both had significant positive intercepts, but no significant slope or quadratic terms ($p > 0.05$). There were no significant sex differences in the bullying variables, but narcissistic personality trait scores were significantly higher among boys than girls at all time points except Grade 7.

Bullying and narcissistic personality traits had significant small to moderate correlations in all grades except for Grade 9 ($r = 0.12$ in Grade 7, $r = 0.11$ in Grade 8, $r = 0.10$ in Grade 10, $r = 0.20$ in Grade 11, and $r = 0.12$ in Grade 12). Bullying perpetration and narcissitic personality traits were also stable across each adjacent time point (bullying: $r = 0.54$ −0.60; narcissism: $r = 0.50$–0.74). The means and standard deviations for the childhood predictor variables before standardizing for the primary analyses were as follows: hyperactivity, $M = 5.39$, $SD = 3.66$, anxiety, $M = 9.09$, $SD = 5.53$, frustration: $M = 2.20$, $SD = 0.72$, empathic concern: $M = 2.73$, $SD = 0.61$, household income, $M = 6.26$, $SD = 2.25$, and parental education, $M = 3.20$, $SD = 1.00$.

Developmental Trajectories

Bullying Perpetration

The two-group solution was chosen as the final model (see **Table 2** and **Figure 1**). Although the two-group solution had a higher BIC than the three-group solution, it was lower than the one-group solution. The entropy value for the two-group solution was also good and the same in value as the three-group solution. However, the BLRT and LMR-LRT values were significant for the two-group solution. The three- and four- group solutions did not add theoretically meaningful information. The majority of participants reflected a trajectory that started with low bullying perpetration and decreased over time (low decreasing; 82.0%, $n = 505$; 235 boys, 270 girls; intercept = 0.166, $p < 0.001$; slope = −0.034, $p < 0.001$; quadratic = 0.002, $p = 0.139$). A smaller number of the remaining participants reflected a trajectory of moderate predominately stable bullying perpetration over time, but with a slightly lower level of bullying toward the end of high school (moderate stable; 18.0%, $n = 111$; 47 boys, 64 girls; intercept = 0.619, $p < 0.001$; slope =

TABLE 1 | Descriptive statistics for joint trajectory variables.

	Analytic sample range		Boys		Girls		Test	Total	
	Min	Max	*M*	*SD*	*M*	*SD*	*t*	*M*	*SD*
Bullying perpetration									
Grade 7	0.00	2.20	0.23	0.31	0.23	0.35	0.02	0.23	0.33
Grade 8	0.00	2.40	0.30	0.40	0.27	0.39	0.87	0.28	0.39
Grade 9	0.00	3.20	0.22	0.41	0.21	0.33	0.55	0.21	0.36
Grade 10	0.00	2.40	0.17	0.27	0.18	0.33	−0.39	0.18	0.31
Grade 11	0.00	2.40	0.15	0.28	0.17	0.33	−0.56	0.16	0.30
Grade 12	0.00	3.40	0.16	0.34	0.15	0.27	0.41	0.15	0.30
Narcissistic personality traits									
Grade 7	0.00	3.90	2.16	0.61	2.08	0.66	1.49	2.11	0.64
Grade 8	0.00	4.00	2.19	0.63	2.03	0.68	2.77**	2.10	0.66
Grade 9	0.00	3.90	2.21	0.62	1.98	0.71	3.85***	2.08	0.68
Grade 10	0.10	4.00	2.23	0.63	1.99	0.72	3.71***	2.09	0.69
Grade 11	0.00	3.90	2.20	0.60	2.02	0.70	2.87**	2.10	0.66
Grade 12	0.20	4.00	2.24	0.61	2.05	0.66	3.13**	2.13	0.65

Descriptive statistics are based on analytic sample N = 616; Sex coded as 0 = boys, and 1 = girls.
***p < 0.01.*
****p < 0.001.*

TABLE 2 | Fit indices for latent class trajectory models for bullying perpetration and narcissistic personality traits.

No. of groups	BIC	LMR-LRT	BLRT	Entropy
Bullying perpetration				
1 Class	1,538.881	NA	NA	NA
2 Class	543.949	0.0003	<0.0001	0.887
3 Class	383.820	0.1935	<0.0001	0.887
4 Class	222.736	0.1617	<0.0001	0.867
Narcissistic personality traits				
1 Class	5,847.648	NA	NA	NA
2 Class	5,080.095	0.0001	<0.0001	0.712
3 Class	4,763.161	0.0011	<0.0001	0.746
4 Class	4,653.383	0.0594	<0.0001	0.736

BIC, Bayesian information criterion; LMR-LRT, Lo-Mendell-Rubin likelihood ratio test; BLRT, bootstrapped likelihood ratio test.

0.051, $p = 0.154$; quadratic $= -0.016$, $p = 0.012$). Participants were well-identified within their trajectory group as the posterior probabilities were 0.97 for the low decreasing group and 0.94 for the moderate stable group.

Narcissistic Personality Traits

The three-group solution was chosen as the final model (see **Table 2** and **Figure 2**). Although the three-group solution had a higher BIC than the four-group solution, it was lower than the two-group solution. The entropy value for the three-group solution was better than the other solutions. The BLRT and LMR-LRT values were also significant for the three-group solution. The four-group solution did not add any theoretically meaningful information. The majority of participants reflected a trajectory that was moderate on narcissistic personality traits over time (moderate stable; 56.3%, $n = 346$; 159 boys, 187 girls; intercept $= 2.078$, $p < 0.001$; slope $= 0.014$, $p = 0.654$; quadratic $= -0.002$, $p = 0.654$). The next largest group of participants reflected a trajectory that started with high narcissistic traits and predominately increased over time with a slight decrease at the end of high school (high increasing; 22.8%, $n = 140$; 78 boys, 62 girls; intercept $= 2.640$, $p < 0.001$; slope $= 0.105$, $p = 0.003$; quadratic $= -0.014$, $p = 0.046$). The smallest group of participants reflected a trajectory that started with low narcissistic traits and predominately decreased over time with a slightly higher level toward the end of high school (low decreasing; 20.9%, $n = 129$; 44 boys, 85 girls; intercept $= 1.639$, $p < 0.001$; slope $= -0.248$, $p < 0.001$; quadratic $= 0.039$, $p < 0.001$). Participants were well-identified within their trajectory group as the posterior probabilities were 0.88 for the moderate stable group, 0.87 for the high increasing group, and 0.88 for the low decreasing group.

Joint Trajectories of Bullying Perpetration and Narcissism

There were six possible joint trajectory groups (2×3) with distinct developmental patterns of bullying perpetration and narcissistic personality traits. The top section of **Table 3** reflects the proportion of participants in each group. The majority of participants reflected a joint trajectory pattern of low decreasing bullying and moderate stable narcissistic traits (46%, $n = 284$; 136 boys, 148 girls). The next largest group of participants reflected patterns of low decreasing trajectories of both bullying

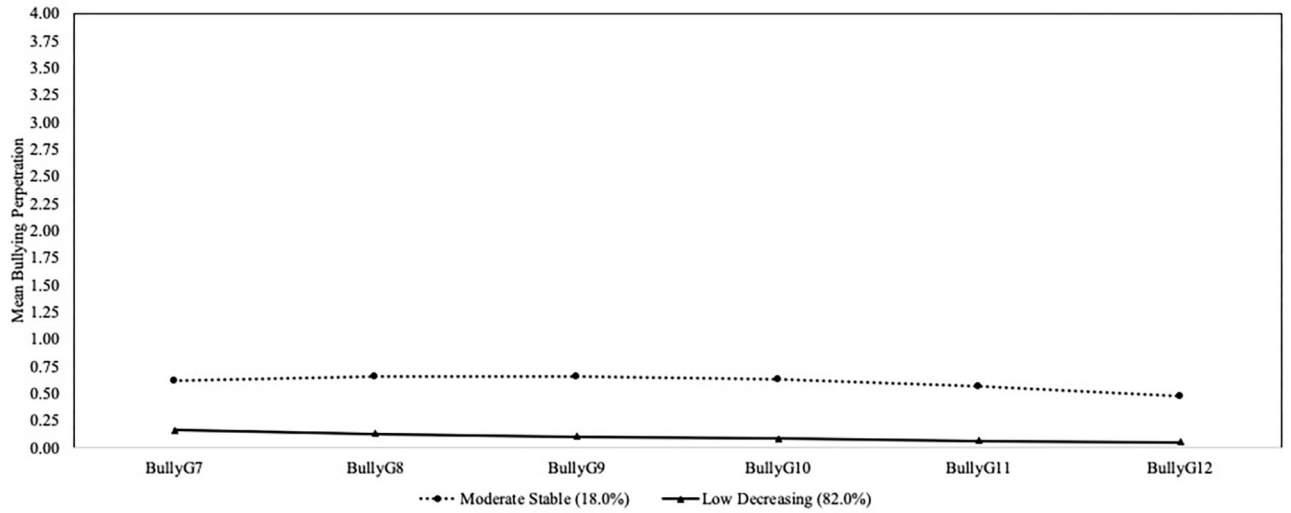

FIGURE 1 | Developmental trajectories of bullying perpetration. Bully, bullying perpetration; G, grade.

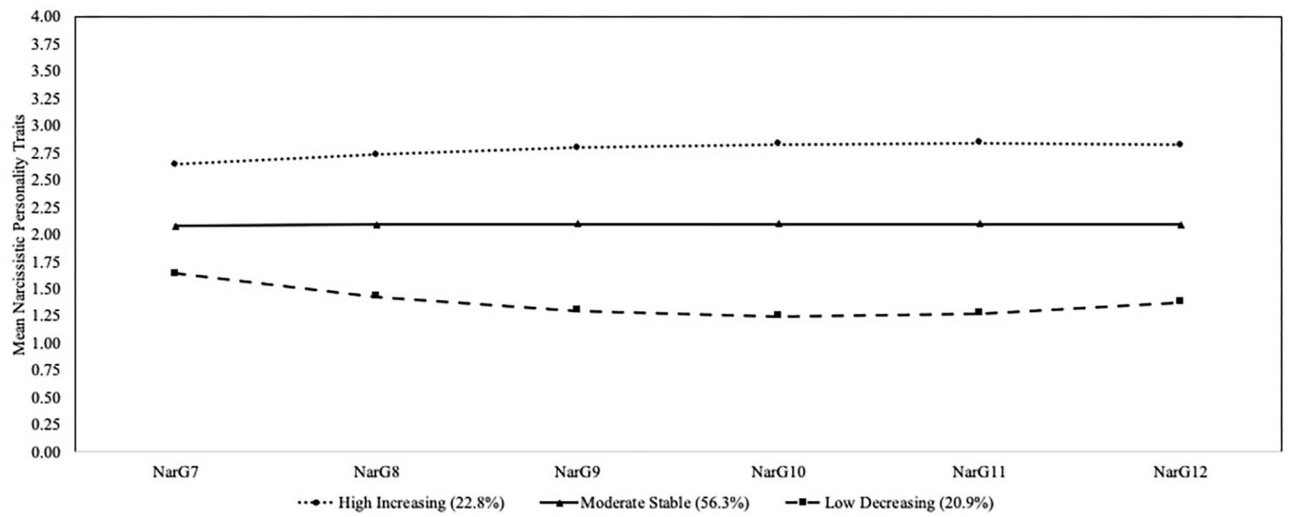

FIGURE 2 | Developmental trajectories of narcissistic personality traits. Nar, narcissistic personality traits; G, grade.

and narcissistic traits (low-risk; 19%, $n = 115$; 39 boys, 76 girls). The third largest group of participants reflected low decreasing bullying and high increasing narcissistic traits (17%, $n = 106$; 60 boys, 46 girls). Another 10% of the sample reflected trajectories of moderate stable bullying and moderate stable narcissistic traits ($n = 63$; 24 boys, 39 girls). The second smallest group of participants reflected joint trajectory patterns of moderate stable bullying and high increasing narcissistic traits (6%, $n = 34$; 18 boys, 16 girls) and the smallest group of participants reflected moderate stable bullying and low decreasing narcissistic traits (2%, $n = 14$; 5 boys, 9 girls). Therefore, the group reflecting moderate stable bullying and moderate stable narcissistic traits and the group reflecting moderate stable bullying and high increasing narcissistic traits were considered the two high-risk groups. Participants were well-identified within their trajectory group as the posterior probabilities for all joint trajectory groups were >0.81.

The bottom section of **Table 3** shows the conditional probabilities of the trajectories of bullying as a function of the trajectories of narcissistic traits, and the conditional probabilities of the trajectories of narcissistic traits as a function of the trajectories of bullying. These results suggest that a trajectory of moderate bullying was a slightly better indicator of moderate (0.57) or high (0.32) narcissistic traits than low narcissistic traits (0.11), whereas a trajectory of low bullying was a better indicator of moderate narcissistic traits (0.54) than low (0.24) and high (0.22) narcissistic traits. In contrast, all three trajectory groups of narcissistic personality traits were better indicators of low bullying than moderate bullying.

TABLE 3 | Joint and conditional probabilities of bullying perpetration and narcissistic personality traits.

	Narcissistic personality traits		
Bullying perpetration	**High increasing**	**Moderate stable**	**Low decreasing**
Probabilities of joint trajectory membership[a]			
Moderate stable	0.06 ($n = 34$)	0.10 ($n = 63$)	0.02 ($n = 14$)
Low decreasing	0.17 ($n = 106$)	0.46 ($n = 284$)	0.19 ($n = 115$)
Probabilities of bullying conditional on narcissistic traits[b]			
Moderate stable	0.26	0.20	0.10
Low decreasing	0.74	0.80	0.90
Probabilities of narcissistic traits conditional on bullying[c]			
Moderate stable	0.32	0.57	0.11
Low decreasing	0.22	0.54	0.24

[a] *Cells total 1.*
[b] *Columns total 1.*
[c] *Rows total 1.*

Childhood Predictors of Trajectory Group Membership

We examined whether there were significant differences in the proportion of boys and girls within each of the trajectory groups. There were no significant differences in boys and girls in the bullying groups, $\chi^2(1) = 0.64$, $p = 0.442$, but there was a significant difference in boys and girls in the narcissistic traits groups, $\chi^2(2) = 12.65$, $p = 0.002$, and in the joint trajectory groups, $\chi^2(5) = 14.81$, $p = 0.011$. There were significantly more girls (65.9%) than boys (34.1%) in the low decreasing narcissistic traits group, and more boys (55.7%) than girls (44.3%) in the high increasing narcissistic traits group. There were significantly more boys (56.6%) than girls (43.4%) in the joint trajectory group of low decreasing bullying and high increasing narcissistic traits, and more girls (66.1%) than boys (33.9%) in the joint trajectory group of low decreasing bullying and low decreasing narcissistic traits.

Contrasts for bullying groups are displayed in **Table 4**. The model with childhood demographic variables demonstrated that no demographic factors significantly differentiated the bullying groups. The model with childhood emotional and psychological variables indicated that higher hyperactivity significantly differentiated the moderate stable bullying perpetration group from the low decreasing bullying group, and this effect remained significant after the BH correction. When demographic, emotional, and psychological predictors were entered simultaneously, higher hyperactivity significantly differentiated the moderate group from the low group (OR = 1.463, 95% *CI* [1.122, 1.907], $p = 0.005$). Contrasts for narcissistic traits groups are displayed in **Table 4**. The model with childhood demographic variables demonstrated that sex significantly differentiated the high increasing narcissistic traits group from the low decreasing narcissistic traits group, with boys being more likely to predict membership in the high increasing group. This is consistent with results when examining the proportion of boys and girls in each trajectory group. The model with childhood emotional and psychological variables indicated that lower anxiety and higher frustration significantly differentiated the high increasing narcissistic traits group from the low decreasing narcissistic traits group. Lower anxiety also significantly differentiated the moderate stable group from the low decreasing group. All effects remained statistically significant after the BH correction. When all predictors were entered simultaneously, lower anxiety significantly differentiated the high (OR = 0.552, 95% *CI* [0.393, 0.774], $p = 0.001$) and moderate (OR = 0.737, 95% *CI* [0.563, 0.965], $p = 0.026$) narcissistic traits groups from the low group. Additionally, being a boy (OR = 0.513, 95% *CI* [0.290, 0.908], $p = 0.022$) and higher frustration (OR = 1.406, 95% *CI* [1.011, 1.954], $p = 0.043$) significantly differentiated the high group from the low group.

For the joint trajectory group contrasts, the groups were first recoded into two dependent variables to allow for contrasting only the groups of interest. In the first dependent variable, the moderate bullying/moderate narcissistic traits group was coded as 1 (high-risk group 1), the moderate/high group was coded as 2 (high-risk group 2), and the low/low group was coded as 3 (low-risk comparison group). In the second dependent variable, the moderate/high group was coded as 1 and the moderate/moderate group was coded as 2, with the latter group assigned as the comparison group. Contrasts for joint trajectory groups are displayed in **Table 5**. The model with childhood demographic variables demonstrated that no demographic factors significantly differentiated any of the groups. The model with childhood emotional and psychological variables indicated that higher hyperactivity, lower anxiety, and higher frustration significantly differentiated the moderate bullying and high narcissistic traits group from the low-risk group, whereas higher hyperactivity and lower empathic concern significantly differentiated the moderate bullying and moderate narcissistic traits group from the low-risk group. None of the variables significantly differentiated the two high-risk groups from one another. All effects remained statistically significant after the BH correction, except for the effect of empathic concern. When all predictors were entered simultaneously, lower anxiety significantly differentiated the moderate bullying and high narcissistic traits group from the low-risk group (OR = 0.508, 95% *CI* [0.278, 0.927], $p = 0.027$). In addition, higher hyperactivity (OR = 1.620, 95% *CI* [1.048, 2.504], $p = 0.030$) and lower empathic concern (OR = 0.636, 95% *CI* [0.426, 0.950], $p = 0.027$) significantly differentiated the moderate bullying and moderate narcissistic traits group from the low-risk group. Considering Chen et al.'s (69) criteria for effect sizes of odds ratios (i.e., small = 1.68, medium = 3.47, large = 6.71), all significant odds ratios reflected small effect sizes.

TABLE 4 | Multinomial logistic regression of childhood variables predicting trajectory groups of bullying perpetration and narcissistic personality traits.

	Trajectory group contrasts of bullying			
	Moderate stable vs. low decreasing			
	OR	95% CI		
Demographic variables				
Sex	1.286	[0.811, 2.039]		
Race	1.370	[0.742, 2.529]		
Household income	0.888	[0.698, 1.129]		
Parent education	0.997	[0.782, 1.272]		
Psychological and emotional variables				
Hyperactivity	1.570*	[1.240,1.987]		
Anxiety	1.085	[0.839, 1.404]		
Frustration	1.200	[0.915, 1.573]		
Empathic concern	0.808	[0.645, 1.012]		
	Trajectory group contrasts of narcissistic personality traits			
	High increasing vs. low decreasing		**Moderate stable vs. low decreasing**	
	OR	**95% CI**	***OR***	**95% CI**
Demographic variables				
Sex	0.435*	[0.255, 0.742]	0.642	[0.405, 1.020]
Race	1.336	[0.598, 2.985]	1.527	[0.773, 3.016]
Household income	1.258	[0.942, 1.679]	1.135	[0.898, 1.435]
Parent education	1.302	[0.980, 1.730]	1.185	[0.930, 1.511]
Psychological and emotional variables				
Hyperactivity	1.224	[0.914, 1.634]	1.073	[0.836, 1.378]
Anxiety	0.478*	[0.349, 0.655]	0.682*	[0.534, 0.871]
Frustration	1.519*	[1.128, 2.046]	1.116	[0.874, 1.424]
Empathic concern	1.053	[0.803, 1.380]	0.897	[0.715, 1.124]

Sex coded as 0 = boys and 1 = girls. Low decreasing trajectory group was comparison group for all contrasts.
$^*p < 0.05$.

DISCUSSION

The joint developmental trajectories of bullying perpetration and narcissistic personality traits were examined across 6 years of adolescence from Grade 7 to the end of high school in Grade 12. We extended Reijntjes et al.'s (7) findings by examining these joint trajectories across a longer time span starting from early to late adolescence and examining childhood predictors of the trajectories.

Trajectories of Bullying Perpetration and Narcissistic Personality Traits

When examining trajectories of bullying perpetration alone, we found the predicted two group solution. The majority of youth reflected a low decreasing bullying trajectory (82.0%). Although the second group was higher on bullying than the low group, mean levels across the time points reflected a moderate stable trajectory (18.0%). These two groups are generally consistent with previous findings on trajectories of bullying [e.g., (2, 4, 5, 22)]. Bullying appears to be a developmentally salient form of aggressive behavior that is prevalent during the transition from early to middle adolescence as adolescents attempt to navigate social networks (9–11). The small number of youth engaging in continued moderate levels of bullying indicates that individual development can be dependent on transactions with multiple ecological contexts for some adolescents, with one of these contexts being individual differences in narcissistic personality traits [e.g., (19)].

When examining trajectories of narcissistic personality traits alone, we found three trajectory groups. The majority of participants reflected a trajectory of moderate stable narcissistic personality traits (56.3%), with the remaining youth split across the predicted low decreasing (20.9%) and high increasing (22.8%) groups. The moderate stable trajectory group indicates that the majority of youth reflect a generally positive and realistic self-concept. The high increasing group reflects a smaller proportion of adolescents who begin to display rising levels of grandiosity, superiority, and exploitative tendencies (6, 34, 38). Researchers have noted that despite theoretical proposals, there has yet to be much empirical evidence for mean level increases in narcissism during adolescence (70). One reason that we may have found significant changes in narcissistic personality traits is that we had

TABLE 5 | Multinomial logistic regression of childhood variables predicting joint trajectory groups of bullying perpetration and narcissistic personality traits.

	Joint trajectory group contrasts					
	MB/HN vs. LB/LN[b]		MB/MN vs. LB/LN[b]		MB/HN vs. MB/MN[c]	
	OR	95% CI	*OR*	95% CI	*OR*	95% CI
Demographic variables						
Sex	0.545	[0.234, 1.269]	0.949	[0.461, 1.954]	0.550	[0.211, 1.433]
Race	1.994	[0.593, 6.707]	1.937	[0.718, 5.231]	1.042	[0.280, 3.882]
Household income	1.456	[0.852, 2.487]	0.833	[0.575, 1.209]	1.785	[0.980, 3.251]
Parent education	1.204	[0.758, 1.912]	1.262	[0.853, 1.868]	0.885	[0.520, 1.504]
Psychological and emotional variables						
Hyperactivity	1.686*	[1.067, 2.665]	1.567*	[1.069, 2.297]	1.090	[0.639, 1.859]
Anxiety	0.466*	[0.266, 0.818]	0.831	[0.555, 1.245]	0.573	[0.314, 1.048]
Frustration	1.987*	[1.115, 3.540]	1.382	[0.883, 2.164]	1.468	[0.742, 2.901]
Empathic concern	1.050	[0.665, 1.658]	0.684[a]	[0.479, 0.976]	1.461	[0.914, 2.335]

MB/HN, moderate stable bullying/high increasing narcissistic personality traits; LB/LN, low decreasing bullying/low decreasing narcissistic personality traits; MB/MN, moderate stable bullying/moderate stable narcissistic personality traits; sex coded as 0 = boys and 1 = girls.

[a] *Non-significant after Benjamini–Hochberg correction.*

[b] *LB/LN was comparison group in contrast.*

[c] *MB/MN was comparison group in contrast.*

$^*p < 0.05$.

twice the number of assessment periods compared to Reijntjes et al. (7). The six assessment periods allowed for the examination of quadratic change across the full range of adolescence, which is difficult to identify with three assessment occasions. The trajectories of narcissistic traits found in our study support adolescence as an important period of personality variability and development (29–31, 38, 39, 71). This assertion was further evident in our joint trajectory findings.

Of the six possible joint trajectory groups, our primary interest was in adolescents comprising the groups deemed to follow high-risk dual trajectories. We found that 6% of adolescents reflected a trajectory pattern of moderate stable bullying and high increasing narcissistic personality traits and 10% of adolescents reflected a trajectory pattern of moderate stable bullying and moderate stable narcissistic personality traits. We also found that 19% of adolescents reflected a trajectory pattern of low-risk (i.e., low stable bullying and narcissistic traits). These prevalence rates are somewhat consistent with findings by Reijntjes et al. (7) who found that depending on the form of bullying (i.e., indirect or direct), 3–6% of adolescent boys reflected trajectories of high bullying and high narcissism and 19-42% of adolescent boys and girls reflected low-risk joint trajectories.

The trajectory of moderate bullying was a better indicator of moderate or high narcissistic traits than the reverse. All three trajectories of narcissistic traits were better indicators of low bullying rather than moderate bullying. Only 2% of adolescents were moderate on bullying and low on narcissistic traits whereas 17% of adolescents were high on narcissistic traits and low on bullying. These results were in contrast to our predictions and findings by Reijntjes et al. (7) as these researchers found that boys who displayed high narcissism were more likely to follow trajectories of high bullying, whereas boys who displayed high bullying were equally likely to follow the three narcissism trajectories. It is possible that our findings were due to the low frequency of moderate bullying relative to low bullying and can also suggest that bullying is one of many behavioral manifestations of adolescent narcissistic personality traits [e.g., (13, 15, 25, 34)]. Further differences in these trajectory groups are evident in childhood predictors.

Psychological and Emotional Predictors of Trajectory Groups

For the individual trajectories of bullying perpetration, hyperactivity was the only significant predictor. Youth demonstrating moderate stable bullying seem to have difficulty regulating behavior, with one form of behavior being bullying [e.g., (21, 41)]. For the individual trajectories of narcissistic personality traits, lower anxiety and higher frustration significantly differentiated membership in the high increasing group from the low decreasing group, and lower anxiety significantly differentiated membership in the moderate stable group from the low decreasing group. Our findings with anxiety have previously been supported and indicate that children who are less worried about, sensitive to, or fearful of others can be higher on narcissism [e.g., (72, 73)]. The finding with frustration has been supported in evidence linking characteristics of adolescent psychopathy, a correlate of narcissism, with lower agreeableness [e.g., (32, 74, 75)]. Youth who are easily frustrated and irritated by others could develop a sense of superiority over these peers. Sex significantly differentiated the group characterized by high increasing narcissistic traits from the group characterized by low decreasing narcissistic traits, with more boys than girls in the high group. Researchers have previously found gender differences in meta-analyses regarding some aspects and forms of narcissism but not others (76).

Childhood hyperactivity differentiated both of the high-risk joint trajectory groups from the low-risk joint trajectory group and had the largest effect relative to the other childhood predictors. Childhood anxiety and frustration also differentiated the group reflecting moderate stable bullying and high increasing narcissistic traits from the group reflecting low-risk patterns. Empathic concern additionally differentiated the group reflecting moderate stable bullying and moderate stable narcissistic traits from the group reflecting low-risk patterns prior to correcting for multiple testing, and remained significant when all childhood predictors were entered simultaneously. Previously, lower anxiety has been associated with higher antisocial tendencies including callous-unemotional traits, which could indicate lower sensitivity or care for others and a lack of fear for negative consequences [e.g., (77, 78)]. In addition to low anxiety, difficulty regulating behavioral impulses (i.e., hyperactivity), potentially during frustrating interactions with peers, could also contribute to youth developing increasing feelings of superiority and entitlement over peers. Accordingly, a moderate stable trajectory of bullying perpetration can be a behavioral indication of these early risk factors. Engaging in bullying within the context of a power imbalance is likely to further reinforce the development of superior, entitled, and narcissistic self-perceptions across adolescence. Finally, despite significant differences in the proportion of boys and girls in the low-risk group (i.e., more girls than boys), the demographic variables did not significantly differentiate the joint trajectory groups, indicating that groups were relatively similar across sex, race, and socioeconomic status.

Limitations

There were some limitations to this study. First, all measures were self-report and subject to shared-method variance. The inclusion of additional informants such as peer-rated bullying may help reduces these biases [e.g., (79)]. However, self-reports can be valid in revealing underlying motivations of bullying perpetration that are not as easily assessed by observers (80). Second, the joint trajectory design allowed for examining the dynamics between narcissistic traits and bullying, but did not allow us to know if one causes the other. It is also possible that psychological and emotional difficulties are outcomes of the joint trajectory groups. Third, although our sample size was large, it resulted in some joint trajectory groups having smaller cell sizes. This could have underpowered our ability to find effects with our high-risk groups ($n = 34$ for the group reflecting moderate bullying and high narcissistic traits, and $n = 63$ for the group reflecting moderate bullying and moderate narcissistic traits). We also did not find a high bullying trajectory group which could have been a result of participants underreporting bullying perpetration when using self-reports. Larger sample sizes could help increase the ability to further identify individuals at-risk. Fourth, we used the Narcissistic Personality Questionnaire-Revised to assess narcissistic personality traits, which includes exploitation and superiority subscales (48). Reijntjes et al. (7) used the Childhood Narcissism Scale (33), which assesses a general construct of narcissism, and other researchers such as Fanti and Kimonis (40) have used the Antisocial Process Screening Device, which captures narcissism that co-occurs with psychopathic traits and was designed for higher-risk samples including juvenile offenders (81). We are unable to make direct comparisons of our conclusions on narcissistic traits and bullying with previous researchers' findings because we used a different measure. Researchers can investigate whether results are replicated across measures.

Implications and Conclusions

Our findings provide support for the developmental and ecological frameworks of bullying and provide several novel contributions. First, our results revealed that a small proportion of individuals who continue to use bullying across adolescence were likely to also demonstrate high increasing or moderate and stable narcissistic personality traits. This finding suggests that addressing cognitions and attitudes related to entitlement, superiority, and exploitation can help reduce bullying behavior. Second, we found significant changes in the high increasing and low decreasing trajectories of narcissistic personality traits. Adolescence has been suggested to be an important developmental period for personality development, yet limited empirical evidence demonstrates these mean level changes [e.g., (31, 70)]. Our findings support adolescence as a malleable developmental period for narcissistic personality traits. Fourth, our results indicate that childhood psychological and emotional characteristics can predict high-risk trajectories of adolescent bullying and narcissistic traits. Intervening early signs of difficulty with behavioral and emotion regulation and a lack of sensitivity or care for others may be key methods of preventing the development of bullying and narcissistic traits in the long-term. Additional longitudinal studies examining the development of bullying and narcissistic traits can further help reveal developmental continuity and change across the lifespan, important predictors and outcomes, and critical periods for intervention.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the McMaster University Research Ethics Board and the University of Ottawa Office of Research Ethics and Integrity. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

AF and TV created the current study idea. AF performed the statistical analyses and drafted the manuscript. TV is the principal investigator of the broader longitudinal study and also

helped draft the manuscript. All authors contributed to the final manuscript.

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Bullying Victimization and Trauma

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Bullying victimization and trauma research traditions operate quite separately. Hence, it is unclear from the literature whether bullying victimization should be considered as a form of interpersonal trauma. We review studies that connect bullying victimization with symptoms of PTSD, and in doing so, demonstrate that a conceptual understanding of the consequences of childhood bullying needs to be framed within a developmental perspective. We discuss two potential diagnoses that ought to be considered in the context of bullying victimization: (1) developmental trauma disorder, which was suggested but not accepted as a new diagnosis in the DSM-5 and (2) complex post-traumatic stress disorder, which has been included in the ICD-11. Our conclusion is that these frameworks capture the complexity of the symptoms associated with bullying victimization better than PTSD. We encourage practitioners to understand how exposure to bullying interacts with development at different ages when addressing the consequences for targets and when designing interventions that account for the duration, intensity, and sequelae of this type of interpersonal trauma.

Keywords: bullying victimization, consequences, PTSD (posttraumatic stress disorder), complex PTSD, developmental trauma disorder

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INTRODUCTION

In this article, we argue that bullying victimization be considered a repetitive interpersonal trauma where reactions are understood within the combined framework of a developmental trauma disorder and a complex post-traumatic stress disorder. This comprehensive and integrated understanding requires that the research gap between the fields of bullying and interpersonal trauma to be bridged.

Even though exposure to bullying is about being harmed intentionally by others, it is unclear from the literature whether bullying victimization (i.e., being the target of bullying; henceforth called bullying) should be considered as a form for interpersonal trauma. With some exceptions, the bullying and trauma research traditions operate quite separately. This is confirmed by examining the table of contents of bullying and trauma journals, as well as conference proceedings and agendas related to conventions within these two respective fields. Trauma journals and trauma conferences seem more or less to lack contributions about the topic of bullying. There may be several reasons why this is the case. Originally, the bullying research tradition among children and adolescents emerged from the educational field where the purpose was to define the phenomenon, estimate prevalence, and understand its etiology (1, 2). The intent was to help identify perpetrators and implement effective interventions to stop this devastating behavior (2). Trauma research, emerged within the fields of psychiatry and psychology (3), with a focus on how to reduce or heal symptoms attributed to traumatic experiences. From its conception, there has been discussions about what constitutes trauma and which criteria must be satisfied in order to define a life event

as traumatic (4). This discussion is particularly pertinent for the classification of trauma required for the diagnosis of post-traumatic stress disorder [PTSD; American Psychiatric Association (5)]. Perhaps the focus on the psychiatric sequelae is a contributing factor for why research on bullying has not been integrated within the trauma field. There is also some disagreements about whether bullying can be classified as a traumatic event and whether it can satisfy the diagnostic criteria for PTSD (6).

In this article, we discuss these issues. First, we review studies that connect bullying with symptoms of PTSD. We then demonstrate that the research on the outcomes of bullying show far more complex consequences than the classic symptoms of PTSD. A discussion concerning whether the negative mental health correlates and outcomes of bullying are related to the fact that bullying often goes on over time, sometimes for years, and thus should be approached within a developmental perspective is advanced. Given the stability of bullying victimization (7), we discuss another potential framework that could be better suited for understanding the consequences of bullying. Specifically, the "developmental trauma disorder" (DTD) that was suggested as a new diagnosis for the Diagnostic and Statistical Manual for Mental Disorders 5 [DSM-5, (5); see (8, 9)]. Even though the proposed diagnosis was not accepted by the DSM-5 committee, a somewhat similar diagnosis, termed "complex post-traumatic stress disorder" has been included in the ICD-11 in the new conceptualization of stress-related disorders (10). As the DSM-5 is still the predominant disorder classification system used for research on trauma, we nevertheless discuss whether it could be a source for, or give ideas to, the development of a possible conceptual framework for an integrated understanding of the consequences of being exposed to bullying within a trauma perspective. This idea is explored by examining how empirically established consequences of bullying fit with the symptomatology defined for the proposed diagnostic criteria for DTD. We conclude by discussing the significance this may have for future research and practice.

CONCEPTUAL DEFINITION AND PREVALENCE OF BULLYING

Bullying is understood as a systematic abuse of power (11–13). An often used operationalization of bullying is provided by Olweus (2) who states that a "A student is being bullied or victimized when he or she is exposed, repeatedly, and over time, to negative actions on the part of one or more other students" (p. 1,173). Olweus further adds that "in order to use the term bullying, there should also be an imbalance in strength" (p. 1,173).

Bullying can also happen to adults (6). Although there seems to be some consensus to define cyberbullying as bullying that occurs via the internet or cell phones, some researchers are more specific in terms of taxonomies and measurement (14).

The prevalence of bullying depends on which population is studied and how bullying is defined and operationalized. For example, child respondents self-report different prevalence rates depending on whether they are provided with a definition of bullying or not in the questionnaire (13). Even when a standardized definition is provided, along with identical measures and sampling procedures, large differences are still noted between countries. For example, Craig et al. (15) report prevalence rates ranging from 5% to about 45% in a cross-national study of bullying conducted in 40 countries. When it comes to gender differences, the meta-analysis by Cook et al. (16) of 153 studies demonstrated that boys were more involved in bullying as perpetrators, targets, and target-perpetrators (i.e., bully-victims, targets who become bullies), although the strength of the gender effect varied somehow for these three groups. In terms of ethnic group difference in bullying victimization, a recent meta-analysis by Vitoroulis and Vaillancourt (17) demonstrated no main effect difference across countries among ethnic majority and minority children and adolescents. However, moderator analyses indicated that ethnic majority youth were more exposed to peer victimization than minority youth in the US (Cohen's $d = 0.23$).

BULLYING AND PTSD SYMPTOMS

The major diagnosis that captures the aftermath of potential traumatic experiences is PTSD. In recent years, several studies have revealed strong associations between bullying and PTSD symptoms (18–24). Two studies found that between 30% and 40% of bullied teens scored above the clinical cutoff for PTSD symptoms (20, 25). Rivers (23) investigated 119 individuals who identified as lesbian, gay, or bisexual, and about 25% of them reported having trouble with negative memories of bullying well after leaving school. Seventeen percent had profiles of PTSD in accordance with the DSM-IV (26), with one in 10 reporting that they regularly experience flashbacks. In a recent meta-analysis by Nielsen et al. (6) representing 2,132 children from seven combined studies, a correlation of 0.39 (95% CI: 0.24–0.52; $p < 0.01$) was reported between bullying and an overall score for PTSD symptoms. The authors concluded that there was a strong association between bullying exposure and PTSD symptoms in children and adolescents.

IS BULLYING A TRAUMATIC EVENT AND THEREBY RESULTS IN A TRAUMATIZED RESPONSE?

PTSD is different from most other psychiatric disorders insofar as there is an established link between exposure to (a) traumatic event(s) and resulting symptoms (5). Eight diagnostic criteria are listed in the DSM-5 (labeled A through H). Of relevance to our review is the A criterion (stressor) which states that the person was exposed to "actual or threatened death, serious injury, or sexual violence" (p. 271). The exposure can be direct, as a witness, by learning that a relative or close friend was exposed, or indirectly by being exposed to aversive details of the trauma (e.g., as first responders medics). Whether bullying fulfills the A criterion for PTSD depends on how the A criterion is understood and interpreted. Although criterion A refers to exposure to

"actual or threatened death, serious injury, or sexual violence," it is not clear if exposure to bullying satisfies this condition. Idsoe et al.'s (27) review concluded that it remains unclear if criterion A is indeed met. However, two studies involving adults suggested that bullying does fulfill the A criterion for PTSD (28, 29). In a third study, Signorelli et al. (30) concluded that the A criterion was not fulfilled, and thereby PTSD was not regarded as an adequate diagnosis for exposure to bullying. There were several problems with these studies that raise concerns about their conclusions. All three studies had small sample sizes [from $n = 1$ (case study) to $n = 64$], as well as poor descriptions of, and lack of control for, potential alternative traumatic events that could have been present before, during, or after the period that bullying took place. Nielsen et al. (6) pointed to these problems when they concluded that no existing studies could provide good evidence for or against bullying exposure as satisfying the A criterion for adults and recommended that future studies investigate these issues using longitudinal designs and clinical interviews.

What about the studies mentioned above (20, 25) that reported clinically significant levels of PTSD symptoms among bullied children? The problem with these studies is that the symptoms could indicate disorders other than PTSD. Moreover, because we do not have valid information about the duration of symptoms, we cannot disentangle the problems from alternative diagnoses of acute stress disorder (when symptoms consistent with PTSD last for a minimum of 2 days and a maximum of 4 weeks after the traumatic event) or adjustment disorder (when symptoms consistent with PTSD occur in response to a stressor that is not consistent with the A criterion, they start within 3 months after exposure, and resolve within 6 months—if not, they occur in response to a chronic stressor).

There has been a general discussion within the trauma field about whether the A criterion has been given too much importance [e.g., (4)]. Bedard-Gilligan and Zoellner (31) studied this within three different samples: (1) undergraduate women recruited through participant pools at two large metropolitan university campuses, (2) undergraduate men and women recruited through an undergraduate participant pool at a third metropolitan university campus, and (3) women responding to advertisements seeking women with trauma histories. Participants were included if they endorsed an event that "bothers you the most" from a checklist of events (Item 14) on the Post-traumatic Diagnostic Scale [PDS; (32)]. Bedard-Gilligan and Zoellner (31) calculated rates of criterion A events and PTSD and applied them to investigate the predictive utility of Criterion A for PTSD symptoms, duration, and functional impairment. The Criterion A did not predict much better than chance and the authors questioned the importance of this criterion. In another study, Robinson and Larson (33) found that life events like expected death, serious illness of someone close, romantic relationship problems, family relationship problems, predicted similar, if not higher, levels of PTSD symptoms than individuals reporting a traumatic event in accordance with the A criterion. These researchers questioned whether traumatic events are necessary to elicit symptoms of post-traumatic stress. Based on such discussions, the removal of the A criterion from the PTSD diagnosis has been suggested because of the possibilities of identifying people with high levels of symptoms without it (4). It should be noted however, that the DSM-5 committee narrowed the definition of trauma, to be specific to life threatening events or sexual violence. This was done to avoid what some researchers labeled "criterion creep" (34, 35), which refers to expanding the pool of qualifying events. Notwithstanding this important discussion, it is worthy to recognize that studies have identified a wide range of childhood events beyond exposure to bullying that are associated with PTSD symptoms without the stressor meeting the DSM-5 criteria for trauma [see (34), for a review]. It is also possible that bullying sometimes, but not always, constitutes a life event that satisfies the A criterion. There are cases in which children and adolescents feared for their lives because of being bullied by their peers. For example, a former student from Howell Cheney Technical High School in the US sued the state after being bullied during her junior year, claiming that she feared for her life (36). In our clinical encounters we have also had clients describe that they thought they were going to die in relation to being bullying.

IF BULLYING IS A TRAUMATIC EVENT FOR SOME, ARE SYMPTOMS OF PTSD THE MAJOR OUTCOME?

Even though bullying is associated with PTSD symptoms, it has also been linked to a range of other mental health outcomes like loneliness, anxiety, depression, suicide ideation/attempts (37–39). Terr (40, 41) suggested two categories of trauma—Type I traumas and Type II traumas—that may elicit different reactions. Type I trauma is mainly the result of a single traumatic event like a car accident or an attack by a violent dog, while Type II trauma is the experience of repeated exposure to traumatic situations, like bullying, which by definition, is repeated in nature (11–13). Terr suggested that although Type I traumas are more closely linked to PTSD than Type II traumas, Type II traumas nevertheless seem to result in a much more complex symptomatology. When Bremner (42) suggested the concept "trauma-spectrum disorders," his reasoning was to capture a whole range of psychological problems associated with childhood trauma, not only PTSD, but also borderline personality disorder, dissociative identity disorder, depression, substance abuse, and psychosomatic problems. Although his proposal was related to child abuse, consequences of bullying, as an interpersonal repetitive trauma, could be conceptualized to capture a range of problems as well. This would be consistent with empirical findings demonstrating complex mental health problems linked to bullying (37–39, 43).

To move forward, we believe a closer look at what is occurring within the field of childhood trauma in general is needed. It has been suggested that early interpersonal childhood trauma like

physical or sexual abuse and neglect are associated with complex symptomatology (8, 44). Also questioned is whether traditional psychiatric disorders and possible comorbid diagnoses fit with such complex symptoms and whether assigning traditional diagnoses for such problems could reduce the possibilities of providing proper treatment (8, 9). In 2009, a group of merited researchers within the trauma field proposed to include a diagnosis for children and adolescents in the forthcoming DSM-5 (9) that they named "Developmental Trauma Disorder" (DTD). The authors underscored the importance of understanding childhood trauma within a developmental psychopathological framework (45) with increased attention paid to the effects of early adverse life experiences on brain development (46) in order to establish interventions that were developmentally appropriate. They pointed to the adverse problems that can emerge if children are exposed to chronic interpersonal stressors, especially if they are followed by inadequate caregiving systems from parents, and how these environmental risks could be the onset of developmental trajectories that include a range of emotional and behavioral difficulties. Even if children with complex trauma-related clinical presentations also met diagnostic criteria for PTSD, this diagnosis alone could fail to capture the broader range of psychiatric symptoms that could result in the provision of incomplete or inadequate interventions. van Der Kolk et al. (47) have demonstrated that DTD cannot be reduced to a combination of PTSD plus psychiatric comorbidities nor is it simply a variant of PTSD. They have also argued that evidence-based treatments for PTSD do not address the developmental impairments that many of these children suffer from, even though they may lead to a reduction in PTSD symptoms.

In the literature on developmental trauma, little is explicitly stated about bullying, although it is sometimes briefly mentioned like when D'andrea et al. (48) mentioned that "victimization in childhood may take many forms, including assault, abduction, bullying, and neglect" (p. 187–188). DTD was suggested based on studies of child sexual abuse and exposure to family violence. Exposure to these forms of interpersonal violence is often part of children's life from very early on and can impact the development of the brain's anatomy, functionality, and connectivity [e.g., (49); see review by (50)]. When applying a developmental perspective, we need to understand how exposure interacts with development at different ages (e.g., pre-adolescence vs. adolescence). For example, will a child with a "safe" early childhood be less susceptible to later stress? [For a review of PTSD and the neurodevelopmental network perspective, see (51)].

Even though bullying exposure does not fulfill the kind of event(s) needed to satisfy the proposed diagnosis of DTD, it is useful to examine empirical findings to see how the sequelae of symptoms fit with the suggested criteria for DTD proposed for the DSM-5. Toward this aim, we go through the seven main diagnostic criteria (labeled A through F) as proposed by van der Kolk et al. [(9), p. 5–7], and we link each criterion to empirical findings for bullying.

PROPOSED CRITERIA FOR A DEVELOPMENTAL TRAUMA DIAGNOSIS AND HOW SYMPTOMS AMONG CHILDREN WHO EXPERIENCED BULLYING FIT WITHIN THIS FRAMEWORK

A. Exposure

The child or adolescent has experienced or witnessed multiple or prolonged adverse events over a period of at least 1 year beginning in childhood or early adolescence, including:

A. 1. Direct experience or witnessing of repeated and severe episodes of interpersonal violence; and
A. 2. Significant disruptions of protective caregiving as the result of repeated changes in primary caregiver; repeated separation from the primary caregiver; or exposure to severe and persistent emotional abuse [(9), p. 5].

"Criterion A requires multiple, ongoing exposures to both interpersonal violence and disruptions in caregiving" [(9), p. 8].

Criterion A and Bullying

The nature of bullying exposure fits well with the ongoing negative interpersonal acts that constitutes the A1 criterion. When it comes to the A2 criterion it becomes less clear to what extent this holds true for bullying. Nevertheless, we explore why adequate care/support is regarded important for normal functioning and development. Findings from seminal research in developmental psychology clearly demonstrate that experiencing comforting, responsive, and supportive relationships with secure and predictable primary caregivers are important for adequate development and adaptation (52–55). A fundamental tenet of attachment theory is that the attachment style developed between the infant and the caregiver influences future relationships (56). Indeed, attachment theory has been suggested as a useful conceptual framework for linking problematic parent-child relationships to peer bullying (57) and empirical evidence show that children with secure attachments to parents and peers are less likely to be perpetrators or targets of bullying (58). Moreover, warm, supportive, and well-structured families help protect children from the negative outcomes associated with bullying victimization and thus promote emotional and behavioral resilience to bullying (59). The capacities associated with the regulation of emotions are likely anchored in the nature of the attachment between the child and the primary caregiver in the first year of life. The quality of the responses elicited in the caregiver to meet physiological needs provide the child with a sense of security that consequently is "encoded physiologically in the experience of non-disruptive and need-satisfying regulation of early states" [(60), p. 20].

When a child experiences danger, he/she is likely to experience fear. In this case, caregivers can provide support by functioning as an external regulatory system through soothing, caressing, or talking to calm to the child. Early experiences of such emotion regulating relationships lay an important basis for the child's development of regulatory capacities as a gradual shift from

other-regulated to self-regulated affective responses throughout childhood. Children who experience trauma in the context of caregivers that do not provide this kind of support can develop emotion dysregulation that can give rise to adverse psychological symptoms. However, traumas are major developmental events potentially leading to emotion dysregulation even in favorable relationships in the family. Likewise, ongoing unfavorable relationships in the family can cause emotion dysregulation without necessitating the development of DTD. The two problems do not have to occur simultaneously. Many factors can lead to emotion dysregulation in a child and increase the risk of bullying becoming a traumatic event (criterion A1) without implicating criterion A2 (for example genetic, constitutional, and temperamental vulnerabilities—i.e., dysregulated parents having dysregulated children because of the aforementioned factors).

One reason for why children who live in unsupportive, neglectful, or dangerous families show problems with emotion-based regulation is that they can be inclined to be vigilant, distrustful, and wary or they may develop an aggressive and confrontational stance (as modeled at home). Children living in such environments can experience an exaggerated need to defend themselves (61). Some can even act on impulse as a self-protecting strategy in violent homes. The taxing effect of maltreatment or other catastrophic stressors on children may exhaust their socio-emotional resources leaving them less able to integrate external stimuli and their own affective experiences to produce a desired outcome. An additional explanation for their dysregulation may be that they have not had enough experience with "desirable outcomes." Successful regulation of emotion is at least partly influenced by the goals a child wants to achieve and if these goals are inappropriate, the expression of emotion is likely to be dysfunctional as well.

When children become older, support and care within other social environments becomes important such as relationships with peers, teachers, and coaches (62, 63). Lereya et al. (64) found that children who were bullied by peers only, were more likely than children who were maltreated only [assessed as physical, emotional, or sexual abuse, or severe maladaptive parenting (or both)] to have mental health problems in young adulthood. It is possible that the stronger association found for bullying was because its assessment occurred closer to the onset of mental health problems than the assessment of child maltreatment. Another reason could be that associations with specific abuse types were obscured in the overall maltreatment variable. However, it has also been found that social support moderates the effects of bullying on anxiety/depression (65). These findings suggest that relationships with peers can be associated with a potential "double" negative impact, similar to what is seen with parents. By "double" we mean that peers not only cause pain through bullying, but also fail to provide the type of support needed to cope with the abuse at hand. It is possible that inadequate support from peers and negative acts from peers happen concomitantly, and thereby—when experienced over time—interfere with healthy development. Accordingly, bullying could be interpreted in line with the A–criteria (1 and 2), constituting a kind of developmental trauma by being exposed to long-lasting stress in combination with inadequate support for regulating negative emotions, that again could be reflected in a dysregulated neurobiological stress response system and an under stimulated regulatory system (50, 66). This is in accordance with Harris' group socialization theory (63), postulating that as children get older, the peer group becomes their primary socializing agent, and if this socializing context is problematic, like the socializing context of parents, negative outcomes should be expected. Keeping in mind this new socializing context, it is clear how the A2 criterion can relate to bullying exposure.

B. Affective and Physiological Dysregulation

The child exhibits impaired normative developmental competencies related to arousal regulation, including at least two of the following:

B. 1. Inability to modulate, tolerate, or recover from extreme affect states (e.g., fear, anger, shame), including prolonged and extreme tantrums, or immobilization.
B. 2. Disturbances in regulation in bodily functions (e.g., persistent disturbances in sleeping, eating, and elimination; over-reactivity or under-reactivity to touch and sounds; disorganization during routine transitions).
B. 3. Diminished awareness/dissociation of sensations, emotions, and bodily states.
B. 4. Impaired capacity to describe emotions or bodily states [(9), p. 5].

Criterion B and Bullying

B. 1. Inability to Modulate, Tolerate, or Recover From Extreme Affect States

Several studies have shown that children and adolescents who are targets of bullying score particularly high on emotion dysregulation and suppression, reactive aggression, hostility, sadness, and depressive symptoms (67–73).

B. 2. Disturbances in Regulation in Bodily Functions

Children/adolescents exposed to bullying are found to be at increased risk for disordered eating behavior (70, 74–76). We recommend that bullying should be considered when evaluating risk and treatment planning for children with eating problems. Targets of bullying and bully-victims also report sleep disturbances (77, 78) and it is therefore recommended to consider sleep problems as a possible sign that a child is being bullied.

B. 3. Diminished Awareness/Dissociation of Sensations, Emotions, and Bodily States

There is a significant emerging literature demonstrating that bullying is related to dissociation (79, 80). In a meta-analysis and review of 10 prospective studies, Cunningham et al. (81) found that exposure to bullying prior to age 18 predicted the later development of psychotic symptoms.

B.4. Impaired Capacity to Describe Emotions or Bodily States

To the best of our knowledge, there are not many studies directly examining impaired capacity to describe emotions or bodily states in relation to bullying. However, as we have reported,

impaired emotional regulation has been noticed (82, 83). In these studies, emotional constriction following parental maltreatment and other emotional regulation problems were risk factors for bullying. Impaired capacity to describe emotions or bodily states are also close to alexithymia, which has been related to bullying (19).

In sum, several studies have established a link between exposure to bullying and several outcomes belonging to the B criteria in the proposed diagnosis of DTD.

C. Attentional and Behavioral Dysregulation

The child exhibits impaired normative developmental competencies related to sustained attention, learning, or coping with stress, including at least three of the following:

C. 1. Preoccupation with threat, or impaired capacity to perceive threat, including misreading of safety and danger cues.
C. 2. Impaired capacity for self-protection, including extreme risk-taking or thrill-seeking.
C. 3. Maladaptive attempts at self-soothing (e.g., rocking and other rhythmical movements, compulsive masturbation).
C. 4. Habitual (intentional or automatic) or reactive self-harm.
C. 5. Inability to initiate or sustain goal-directed behavior [(9), p. 5].

Criterion C and Bullying

C. 1. Preoccupation With Threat, or Impaired Capacity to Perceive Threat, Including Misreading of Safety and Danger Cues

Several studies on bullied adolescents have documented important findings with respect to criterion C1—preoccupation with threat, or impaired capacity to perceive threat, including misreading of safety and danger cues, including hostile attributions (84), distressing paranoid thinking and subsequent misappraisal of threat (85), and biased interpretations of social situations and the intentions of others (86). fMRI studies have found that peer victimization is associated with increased neural response to being socially excluded (87–89), greater activation than controls in the amygdala, orbitofrontal cortex, and ventrolateral prefrontal cortex when viewing video clips of facial expressions that depicted negative interpersonal feedback (90), and thicker cortex in the fusiform gyrus compared to children who were not bullied by their peers [see review by Vaillancourt and Palamarchuk (50)].

C. 2. Impaired Capacity for Self-Protection, Including Extreme Risk-Taking or Thrill-Seeking

Bullying victimization is associated with several types of health risk behavior such as violence, obesity, decreased physical activity, sexual risk, and substance use (91–94).

C. 3. Maladaptive Attempts at Self-Soothing

Criterion C.3 has been documented as chronic masturbation, rocking, self-harm, or other repetitive self-stimulating types of behavior. Bullying victimization is associated with impaired capacity for self-protection, including sexual risk, and substance use (91, 94).

C. 4. Habitual (Intentional or Automatic) or Reactive Self-Harm

Exposure to bullying has been related to non-suicidal self-harm such as cutting, self-hitting, skin picking, head banging, and self-burning (95, 96), and suicidal thoughts and attempts (97–99).

C. 5. Inability to Initiate or Sustain Goal-Directed Behavior

An inability to sustain goal-directed behavior may include lack of curiosity, difficulties with planning or completing tasks, and/or avolition. Carroll et al. (100) found that twins (M = 15.39 years, SD = 1.74) who experienced more severe bullying were biased toward detecting goal relevant stimuli during an affective go/no go task. We believe preoccupation with detecting threats triggered by bullying may interfere with and redirect attention from other goal-directed behavior. In a study of 390 African American and Iraqi refugee adolescents, Kira et al. (101) reported that exposure to bullying had significant effects on perceptual reasoning, processing speed, and working memory, after controlling for cumulative trauma and discrimination. Vaillancourt et al. (102) found that peer victimization predicted memory problems over a 2-year period in a study of 168 children, controlling for prior peer victimization, symptoms of depression, and levels of cortisol. These neurocognitive deficits likely interfere with the initiation and sustainment of goal-directed behavior.

The link between being the target of bullying and concurrent and subsequent depression is one of the most robust findings in the literature [see meta-analyses by Moore et al. (94, 103–105)]. Although not directly examined, depression, a disorder of motivation (5), likely interferes with the ability to initiate and sustain goal directed behavior in children who were bullied.

D. Self and Relational Dysregulation

The child exhibits impaired normative developmental competencies in his/her sense of personal identity and involvement in relationships, including at least three of the following:

D. 1. Intense preoccupation with safety of the caregiver or other loved ones (including precocious caregiving) or difficulty tolerating reunion with them after separation.
D. 2. Persistent negative sense of self, including self-loathing, helplessness, worthlessness, ineffectiveness, or defectiveness.
D. 3. Extreme and persistent distrust, defiance or lack of reciprocal behavior in close relationships with adults or peers.
D. 4. Reactive physical or verbal aggression toward peers, caregivers, or other adults.
D. 5. Inappropriate (excessive or promiscuous) attempts to get intimate contact (including but not limited to sexual or physical intimacy) or excessive reliance on peers or adults for safety and reassurance.
D. 6. Impaired capacity to regulate empathic arousal as evidenced by lack of empathy for, or intolerance of,

expressions of distress of others, or excessive responsiveness to the distress of others [(9), p. 6].

Criterion D and Bullying

D. 1. Intense Preoccupation With Safety of the Caregiver or Other Loved Ones (Including Precocious Caregiving) or Difficulty Tolerating Reunion With Them After Separation

We could not find any studies linking this criterion to bullying exposure, so this remains to be investigated (many of the studies for the DTD proposal involved younger children who are dependent on caregivers).

D. 2. Persistent Negative Sense of Self, Including Self-Loathing, Helplessness, Worthlessness, Ineffectiveness, or Defectiveness

Being exposed to bullying is associated with lower self-esteem and poorer self-concept (14, 103), that are more pronounced in children than in adolescents (106). It is noteworthy, however, that most of the studies' participants were between the ages of 8 and 13 years. The development of self-esteem has been shown to be highest at around ages 9–12 and to decrease thereafter (107, 108). Saint-Georges and Vaillancourt (109) found evidence for a self-perception driven model that was characterized by the indirect effect of self-esteem on later peer victimization via depressive symptoms in adolescents followed prospectively for 5 years. Bullying exposure has also been associated with helplessness (110) and shame (71).

D. 3. Extreme and Persistent Distrust, Defiance, or Lack of Reciprocal Behavior in Close Relationships With Adults or Peers

Exposure to bullying is associated with distrust of adults (111), paranoid ideation and suspiciousness (112), and psychotic symptoms (81, 113). However, causality needs to be discussed, at least for paranoid thinking and psychotic symptomatology. In contrast to the assumed role of bullying as an environmental trigger, the results of a study conducted by Shakoor et al. (114) suggest that exposure to bullying is linked to self-rated paranoia almost entirely via genetic influences.

D. 4. Reactive Physical or Verbal Aggression Toward Peers, Caregivers, or Other Adults

This criterion refers to aggressive behavior which is reactive (i.e., impulsive or dysregulated) as opposed to instrumental (i.e., intentionally coercive or manipulative). A consistent finding from the bullying field is that targets score higher than control children on reactive aggression (115) but this can be moderated by gender and age (12). Haltigan and Vaillancourt (116) found, in a longitudinal study of bullied children, strong associations between child reported reactive temperament and elevated features of borderline personality disorder (BPD). Specifically, being in a high trajectory group membership for elevated BPD features was 10.23 times higher among children bullied by their peers.

D. 5. Inappropriate (Excessive or Promiscuous) Attempts to Get Intimate Contact (Including but Not Limited to Sexual or Physical Intimacy) or Excessive Reliance on Peers or Adults for Safety and Reassurance

This criterion refers to inappropriate boundaries often displayed in children exposed to DTD Criteria A traumatic stressors. This may include sexualized behavior, inappropriate physical boundaries, or excessive self-disclosure. It should be kept in mind that with DTD, most of the research is from the sexual abuse field, where intimacy boundaries have been extensively violated. Accordingly, it is expected that this criterion will not be as prominent in relation to bullying exposure. Nevertheless, there are studies showing links between bullying perpetration and increased sexual behavior [i.e., number of partners, younger sexual debut; e.g., (91, 117)], which is linked to higher social status (118). It seems reasonable to assume that some bullied children and adolescents will engage in sexual behavior as a way of elevating their standing in the peer group or to create protective alliances.

D. 6. Impaired Capacity to Regulate Empathic Arousal as Evidenced by Lack of Empathy for, or Intolerance of, Expressions of Distress of Others, or Excessive Responsiveness to the Distress of Others

Criterion D.6 refers to an inability to appropriately gauge perspective in social situations, such that one is either excessively responsive to others' emotions, or unable to feel empathy. Such emotional lability can be seen in the features of borderline personality, which has been linked to bullying (116, 119, 120). The link between empathy and bullying is mixed. A review by Van Noorden et al. (121) found an association between lower perspective taking and bullying victimization, whereas others have found non-significant effects (122, 123). Estévez et al. (124) found that targets of school violence scored significantly higher on the dimension of emotional attention, but significantly lower on emotional clarity (more confused about their emotions), and their ability to regulate their emotion, as well as less affective empathy, indicating that they were less able to share the positive emotions of others.

E. Post-traumatic Spectrum Symptoms

The child exhibits at least one symptom in at least two of the three PTSD symptom clusters B–D [(9), p. 6].

Criterion E and Bullying

We refer to our previous section on PTSD symptoms in this article which demonstrates a link between exposure to bullying and PTSD symptoms.

F. Duration of Disturbance

Symptoms in DTD Criteria B–E at least 6 months [(9), p. 6].

Criterion F and Bullying

We did not find any published study explicitly looking into the duration of symptoms in criteria B–E. However, in general we know that consequences of bullying can last for a very long time. Sigurdson et al. (125) found that being involved in bullying at the

age of 14–15 years, predicted lower education, increased risk of poor general health, illegal drug use, and poorer spouse/partner relations at the age of around 27. The negative long-term impact of bullying has also been shown in other studies spanning decades post-exposure (64, 126).

G. Functional Impairment

The disturbance causes clinically significant distress or impairment in at two of the following areas of functioning:

- Scholastic: under-performance, non-attendance, disciplinary problems, drop-out, failure to complete degree/credential(s), conflict with school personnel, learning disabilities or intellectual impairment that cannot be accounted for by neurological or other factors.
- Familial: conflict, avoidance/passivity, running away, detachment and surrogate replacements, attempts to physically, or emotionally hurt family members, non-fulfillment of responsibilities within the family.
- Peer Group: isolation, deviant affiliations, persistent physical or emotional conflict, avoidance/passivity, involvement in violence or unsafe acts, age-inappropriate affiliations, or style of interaction.
- Legal: arrests/recidivism, detention, convictions, incarceration, violation of probation or other court orders, increasingly severe offenses, crimes against other persons, disregard or contempt for the law or for conventional moral standards.
- Health: physical illness or problems that cannot be fully accounted for physical injury or degeneration, involving the digestive, neurological (including conversion symptoms and analgesia), sexual, immune, cardiopulmonary, proprioceptive, or sensory systems, or severe headaches (including migraine) or chronic pain or fatigue.
- Vocational (*for youth involved in, seeking or referred for employment, volunteer work or job training*): disinterest in work/vocation, inability to get or keep jobs, persistent conflict with co-workers or supervisors, under-employment in relation to abilities, failure to achieve expectable advancements [(9), p. 6–7].

Criterion G and bullying

Bullying was found to be associated with lower academic achievement (127), poorer health outcomes (125), difficulties in keeping jobs (128), unemployment (126, 129), problems with making or keeping friends (128), and lack of having a romantic partner (126).

COMPLEX TRAUMA IN ICD-11

In ICD-11, the description of complex trauma is as follows: "Complex post-traumatic stress disorder" (Complex PTSD) is a disorder that may develop following exposure to an event or series of events of an extremely threatening or horrific nature, most commonly prolonged or repetitive events from which escape is difficult or impossible (e.g., torture, slavery, genocide campaigns, prolonged domestic violence, repeated childhood sexual, or physical abuse). All diagnostic requirements for PTSD are met. In addition, Complex PTSD is characterized by severe and persistent (1) problems in affect regulation; (2) beliefs about oneself as diminished, defeated, or worthless, accompanied by feelings of shame, guilt, or failure related to the traumatic event; and (3) difficulties in sustaining relationships and in feeling close to others. These symptoms cause significant impairment in personal, family, social, educational, occupational, or other important areas of functioning (10).

The studies pertaining to bullying and the DSM are relevant for ICD-11 as well. The diagnosis requires an event or series of events of an extremely threatening or horrific nature, where the possibility of escape is difficult or impossible. In our clinical encounters, targets of bullying have described that they thought they were going to die. As for the accompanying overwhelming emotions to intrusive memories such as fear or horror, we expect that reactions can become blunted when targets suppress, blunt, or dissociate over time to escape the emotional pain involved. Memories and associated emotions change over time and individual adaptations take place to accommodate and dampen them. We argue that studies on bullying confirm the subjective experience of this as extremely threatening and that the narrowing or widening of the stressor criterion [Criterion A, see (4)] would make little difference as to whether bullying is a stress related disorder.

Danzi and La Greca (130, 131) have shown that ICD-11 identifies more children with PTSD than DSM-5. However, the DSM systems identified children with complex symptom presentations with non-core symptoms, while ICD-11 identifies children with more severe core PTSD symptoms. It is evident that inclusion of stressors and different symptoms can impact the rates of PTSD and complex PTSD that will be reported in future studies. Although the ICD-11 tries to reduce the number of PTSD symptoms to a smaller number of core elements to ease diagnosis and reduce comorbidity, the DSM-5 has added to the number of symptoms. The DSM-5 definition of PTSD places it somewhere between ICD-11's PTSD and Complex-PTSD definitions (132).

NEUROBIOLOGY

From the empirical studies we have reviewed above, it follows that the consequences of bullying exposure in childhood and adolescence are characterized by complexity, revealing a symptomatology that fits with stress-related illnesses (43). It is thereby important to review studies that have linked changes in stress hormones and brain activity to bullying exposure to see whether this is in accordance with the complex sequelae of psychological and functional consequences that can occur in the aftermath of bullying within a conceptual framework of developmental interpersonal trauma. Exposure to child abuse has been related to dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis, suggesting this as an important factor in the development of stress-related disorders caused by interpersonal trauma (133). In this literature, child maltreatment has been linked to both high and low cortisol levels, although more typically, lower levels of cortisol [see meta-analysis by

Bernard et al. (134)]. Relatedly, exposure to bullying has also been associated with alterations in the HPA axis [see review by Vaillancourt and Palamarchuk (50)], particularly decreased levels (135–138).

These findings may suggest that long periods of higher cortisol levels caused by a hyperactive HPA axis responding to stress can be followed by hyposecretion as part of an adaptive process (139). However, peer rejection (140) and bullying victimization (102) have also been related to higher levels of cortisol. Vaillancourt et al. (138) found that sex to moderate the association between bullying exposure and cortisol secretion in that for boys, occasional exposure to bullying was associated with higher levels of cortisol, while for girls it was associated with lower levels. Although Vaillancourt et al. (138) interpreted the sex differences to the possibility of higher social goals among girls—having a higher stress perception in relation to being bullied, they also suggest that more severe or chronic stress can result in hyposecretion when compared to occasional stress. These findings underscore that the association between dysregulations of the HPA axis and stress exposure is a complicated process that requires more research (138, 141). For example, in a recent study of preschool aged children, Vaillancourt et al. (142) found an intricate interplay between the social environment and the biobehavioral system of children, suggesting differential susceptibility is at play. Specifically, they found that for boys and not girls, higher levels of bullying victimization was associated with higher levels of physical aggression at lower levels of basal cortisol, while at higher levels of basal cortisol, higher bullying victimization was associated with lower levels of physical aggression. The results were the reverse at lower levels of bullying.

We also remind readers about the findings related to criterion C1 where fMRI studies demonstrated associations with increased neural responses to being socially excluded (87–89), and greater activation than controls in the amygdala, orbitofrontal cortex, and ventrolateral prefrontal cortex when viewing video clips of facial expressions that depicting negative interpersonal feedback.

CAUSALITY, MULTIPLE VICTIMIZATION, AND DEVELOPMENTAL PSYCHOPATHOLOGY

Although the central question for the present review is whether bullying exposure in childhood and adolescence can be interpreted as an interpersonal trauma resulting in complex symptomatology as conceptualized in the proposed diagnosis of DTD (9), we cannot ignore empirical findings showing that exposure to one type of interpersonal trauma increases the risk of exposure to other kinds of victimization (143). Victimization is not randomly distributed, and can for some children, result in what is called "polyvictimization" (144, 145). Finkelhor et al. (144) defined polyvictimization as having experienced multiple types of victimizations, such as exposure to family violence, physical abuse, sexual abuse, and bullying. They found that polyvictims scored higher than one standard deviation above targets of a single type of abuse even though the exposure was chronic/repeated over time (143, 144). For example two longitudinal studies carried out on the UK (144) and USA (64) found that 7% (UK) and 10% (USA) of the children studied were exposed to childhood maltreatment by a caregiver and bullying by peers. In both studies, maltreated children were more likely to be bullied by their peers than children who were not maltreated. The researchers suggested that polyvictimization could signal a more generalized vulnerability for cumulative victimization exposure and that this underscored the need for studies of bullying exposure to assess a broader range of victimization experiences. Because polyvictimization has a high degree of stability (144), the need to investigate bullying exposure within a developmental perspective is further emphasized. Shields and Cicchetti (83) found that early maltreatment within the family increased the chance of being exposed to subsequent bullying victimization. They related this to evidence describing targets of bullying as more aroused and anxious than non-abused children. They suggested that emotion dysregulation as a result of early maltreatment puts children at risk for subsequent bullying. This cumulative process could be understood as a mechanism for polyvictimization and is in line with developmental perspectives suggesting early poor caregiving experiences as causes of later negative peer interactions.

For some children and adolescents, there is stability in victimization through the accumulation of exposures across time; however, longitudinal research suggests that the experience of being bullied does not result in the same symptom pattern over time. Rather, there is marked variability in terms of outcomes [i.e., multi finality; (43, 133, 146)]. It is not clear why exposure to bullying has more impact on some children than others. So far the focus has been mostly on environmental characteristics like family and school. For instance, Bowes et al. (59) found that warm family relationships (i.e., maternal warmth, sibling warmth) and positive home environments helped buffer children from the negative outcomes associated with being bullied. Other studies suggest that genetic mechanisms can moderate the associations between bullying exposure and health outcomes (66, 146). As stated in a report published by the American Academy of Pediatrics "many adult diseases should be viewed as developmental disorders that begin early in life and that persistent health disparities associated with poverty, discrimination, or maltreatment could be reduced by the alleviation of toxic stress in childhood" [(147), p. 323].

CONCLUDING REMARKS—CAN THE CONCEPTUAL FRAMEWORK OF DEVELOPMENTAL TRAUMA DISORDER BE APPLIED TO BULLYING?

We agree that the provisional cluster for DTD as a construct adds to PTSD. One, because of the specifications in the criterion A, where DTD captures the ongoing nature of many traumatic experiences and includes interpersonal violence and the concomitant disruptions in caregiving. Two, because of the consequences that are characterized by an array of symptoms

that are much more comprehensive than the clusters of PTSD. van Der Kolk et al. (47) demonstrated that DTD cannot simply be seen as a variant of PTSD nor just a combination of PTSD plus psychiatric comorbidities. Rather, these authors have argued that the evidence-based treatments for PTSD do not address the developmental impairments that many of these children suffer from, even though they may lead to a reduction in PTSD symptoms.

From our review of the literature it is clear that exposure to bullying is associated with a more complex sequelae than what is captured in traditional PTSD criteria. We suggest that DTD, proposed but not included in the DSM-5, and complex PTSD (ICD-11), capture the symptoms' complexity to a better extent than the DSM-5 PTSD criteria. However, we remind readers that our review is far from exhaustive. Even though DTD provides a better understanding of the consequences of bullying, it still does not represent a complete understanding. Not all the criteria proposed for DTD are linked to bullying and we are unsure whether they would be even if empirical studies existed. DTD was suggested based on studies of child sexual abuse and exposure to family violence that often take part in children's life from very early on. Bullying tends to occur more frequently at a later age (16), and when perpetrated by peers, does not implicate major attachment figures. Still, it is important to understand how exposure to interpersonal traumas interact with development at different ages when addressing consequences and designing interventions. We hope our work will inspire further investigations into the complexities of the consequences of bullying exposure within frameworks like DTD and complex PTSD.

LIMITATIONS

This is not a systematic review and/or meta-analysis but rather a theoretical and conceptual review.

Implications for Research and Practice

Before we talk about directions related to the consequences of bullying, we think it is important to make it clear that it is crucial that the bullying stops. There will be no effective treatment for those who are bullied until the exposure has come to an end. Effective strategies to stop bullying has been implemented in anti-bullying programs and is described elsewhere for those interested (2, 11).

The complexity and severity of the consequences following bullying are likely related to the intensity and duration of the exposure that interact with a range of risk and protective factors. Treatment of bullied children within the conceptual framework of DTD should acknowledge the importance of a dysregulated stress-response system and problems related to emotion regulation. A first step should be to help children feel safe and support them in how to regulate their arousal (27, 44). A core issue in the treatment of developmental trauma is the focus on how to change the environments from fear-inducing relationships with others into safe environments for healthy development. For treatment, we recommend that a thorough mapping/assessment of the potential traumatic relationships the child has experienced be conducted (criteria A1 and A2), along with the ongoing stressors they face, and the broad array of potential moderators present (e.g., age, gender, genetic vulnerabilities, and access to social support). Assessment must reflect the complexity of interacting factors, as they can contribute to potential multi finality (diversity) of developmental outcomes (148). The treatment should also be tailored to the specific child. After stopping the bullying, increasing the number of healthy relationships is helpful for healing traumatized children. They should be given the opportunity to be involved in positive, nurturing, and caring interactions with peers, teachers, and other caregivers (27, 149). Idsoe et al. (27) accentuate how the many daily hours children spend in schools put educators and school staff in a unique position to support traumatized children. Educators can create trauma-sensitive environments and help traumatized children to feel safe and calm down. If teachers and school staff manage to calm dysregulated children, this will most likely help them with concentration and learning and improve mental health. Educators should also try to identify and be aware of potential triggers children associate with bullying episodes from the past, because if still present, they may elicit fear reactions in bullied children. If necessary, learning environments should be adjusted so that they are better tailored to the needs of the bullied children. However, teachers need to know when they should refer these children to a specialist. This makes it reasonable to assume that treatments must be developed at several tiers so that the interventions can be tailored according to severity. Within schools, three-tier interventions may be a fruitful solution. Then proper interventions can be implemented at the universal tier (for the majority of students), combined with more comprehensive and intensive strategies for students showing moderate problems (selected level), and finally the ones showing high levels of consequences (indicated level). This allows for different combinations of treatments for bullied children and for implementing interventions targeting environmental factors.

AUTHOR CONTRIBUTIONS

TI conceptualized and drafted the manuscript and conducted critical revisions. TV, AD, KH, TO, and AN contributed to the conception, drafting of the work, and conducted critical revisions. All authors contributed to the article and approved the submitted version.

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The Mediating Role of Bullying and Victimisation on the Relationship Between Problematic Internet Use and Substance Abuse Among Adolescents in the UK: The Parent–Child Relationship as a Moderator

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Over the last decade, research into the negative effects of problematic internet use has greatly increased. The current study adopted a mediation-moderation model in exploring the relationship between problematic internet use and substance abuse (drinking, drug use, and smoking tobacco cigarettes) among 1,613 adolescents (aged 10–16) in the UK. The findings of the study revealed a significant positive correlation between problematic internet use and substance abuse, which is mediated by traditional and cyber bullying and victimisation. Furthermore, the parent–child relationship was found to be a protective factor that moderated the correlation between problematic internet use and substance abuse and the correlation between problematic internet use and traditional bullying. The study emphasises the critical need to reduce problematic internet use among adolescents as a risk factor for involvement in bullying as perpetrators and victims, in addition to substance abuse. Furthermore, the findings of the study highlight the importance of a good parent–child relationship as a protective factor among adolescents. In light of the findings of the study, interventions for reducing problematic internet use taking into account bullying and the parent–child relationship are needed among adolescents.

Keywords: parent-child relationship, parenting, victimisation, bullying, cyberbullying, addiction, problematic internet use, substance (ab)use (drugs, alcohol, smoking)

INTRODUCTION

The Internet has become an integral part of adolescent's lives as a communication tool for establishing relationships and participating in social groups (1). However, there are some risks and problems that adolescents may face while using the internet (2, 3). Problematic Internet Use (PIU) is described as a general behavioural addiction, which refers to cognitive

preoccupation with the internet, psychological dependence on it, and an inability to control time spent on the network (4, 5). Research studies indicated that PIU is a growing problem among adolescents (6). A study of 11,956 adolescents from 11 different countries showed that the average prevalence of PIU is 4.4% (7), while it is 5.2% amongst British adolescents (aged 11–18) (8). Previous studies showed that PIU is correlated with a broad array of adverse social and psychological outcomes, such as depression, bullying, drinking and drug use (9–12).

Problematic Internet Use (PIU) and Substance Abuse: The Mediating Role of Bullying Involvement

Problem Behaviour Theory (13, 14) suggests that problem behaviours tend to correlate and co-occur among adolescents. In other words, adolescents that are involved in one problem behaviour would be more likely to be involved in others. In line with this theory, several studies revealed a positive association between PIU and substance use among adolescents (15, 16). For example, a study conducted among 3,067 adolescents in Switzerland found that problematic internet use is an important predictor of substance use, including tobacco smoking, drinking alcohol, and consumption of drugs (17). In a similar vein, a study of 1,325 Italian adolescents (aged 11–13) found a positive correlation between problematic social networking usage and substance use (18).

While previous studies emphasised the direct association between problematic internet use and substance use, to the best of our knowledge, no research to date has explored the mediating effect of bullying and victimisation on the relationship between PIU and substance use. Bullying is defined as a specific type of aggressive behaviour that is intentional, repeated over time, and involves an imbalance of power between the bully and the victim (19). Bullying can be physical (e.g., hitting, pushing, and kicking), verbal (e.g., name calling, teasing), or relational (e.g., spread rumours, gossiping). In addition to these traditional types, bullying can also take place in electronic contexts (e.g., email, cell phones, text messages, and internet sites), which is defined as "cyber" bullying (20). Prior studies showed a significant correlation between PIU and involvement in bullying and victimisation (5, 12, 21, 22). For example, a study conducted among 6,237 Hungarian middle school adolescents revealed a significant association between PIU and involvement in traditional and cyber bullying as perpetrators and victims (23).

The few studies that examined the correlation between involvement in bullying and substance use have consistently found a link between involvement in bullying and substance use (24–27). For instance, a study conducted among middle-school adolescents in Florida found that students involved in different types of bullying as perpetrators or victims were significantly more likely to be engaged in substance use than those not involved in bullying (28).

According to Agnew's General Strain Theory (29), involvement in bullying is one type of strain that increases the likelihood of involvement in crime and anti-social behaviours (e.g., substance use), as a way to cope with the negative emotions that result from the strain.

Based on these theories (14, 29), we assume that adolescents who use the internet in problematic ways are at higher risk for involvement in bullying and/or victimisation, which may in turn lead to substance use (30, 31).

The Moderating Role of Parent–Child Relationship

Problem Behaviour Theory (14) focused on the social perceived environment (e.g., parental factors) as a protective factor that could have a buffer effect on risky behaviours. The theory suggests that adolescents who have healthy positive relationships with their families are expected to maintain fewer problematic and risky behaviours. Previous studies showed a negative association between positive parenting and risky behaviours (e.g., problematic internet use and substance use) (32–35). For example, a study of 4,925 adolescents from France and the UK (aged 15–16) found that adolescents who were not satisfied with their relationships with their parents were more likely to be heavy substance users than others (36). Another study of 3,662 high school students in Taiwan found that a conflictual parent–child relationship was linked positively with both problematic internet use and substance use (37).

Prior studies also showed a negative association between healthy parent–child relationships and involvement in bullying as perpetrators and victims (32, 38–40). For instance, a study conducted among school students (aged 13–17) revealed that all adolescents that were victims of bullying had lower levels of social connexions with their parents (41). A meta-analysis study also found that victimisation was related to higher negative parenting (abuse and neglect, maladaptive parenting, and overprotection) and lower positive parenting (authoritative, communication, parental involvement and support, supervision, warmth, and affection) (39). In healthy and positive parent–child relationships, children tend to share their experiences of bullying with their parents and ask them for help, which protects them from further involvement in bullying (32).

Although previous studies focused on the direct effect between PIU, substance abuse, and parental factors, to the best of our knowledge, no study has explored the moderating effect of the parent–child relationship on this association, including bullying and victimisation as mediators.

Aims of the Study

The current study examines the relationship between PIU and substance abuse (including drug use, smoking tobacco cigarettes, and drinking alcohol) among adolescents in the UK, and explores whether this association is mediated by involvement in traditional and cyber bullying and victimisation. Furthermore, we will examine the moderating effect of the parent–child relationship on the relationship between PIU and involvement in bullying, and the relationship between involvement in bullying and substance abuse (see **Figure 1**).

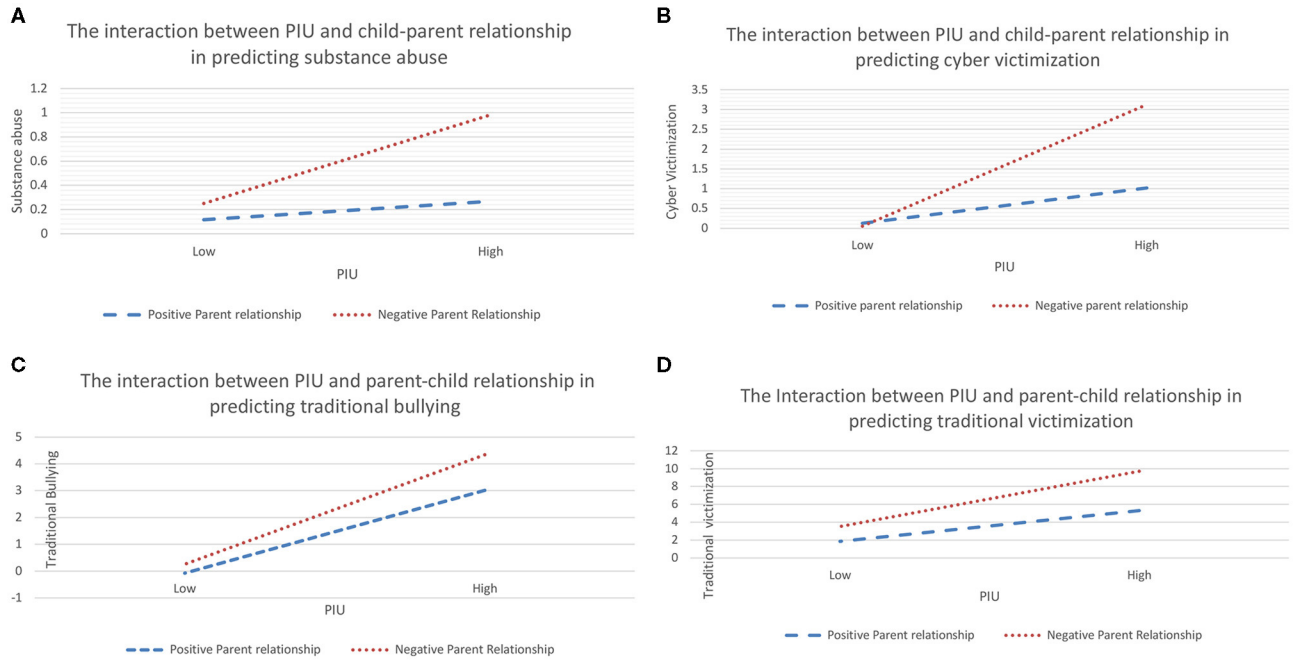

FIGURE 1 | (A) Simple slope analysis shows that parent–child relationship moderated the relation between PIU and substance abuse. The function was graphed for two levels of independent variable and moderator: 1 SD above the mean and 1 SD below the mean. **(B)** Simple slope analysis shows that parent–child relationship moderated the relation between PIU and cybervictimisation. The function was graphed for two levels of independent variable and moderator: 1 SD above the mean and 1 SD below the mean. **(C)** Simple slope analysis shows that parent–child relationship moderated the relation between PIU and traditional bullying. The function was graphed for two levels of independent variable and moderator: 1 SD above the mean and 1 SD below the mean. **(D)** Simple slope analysis shows that parent–child relationship moderated the relation between PIU and traditional victimisation. The function was graphed for two levels of independent variable and moderator: 1 SD above the mean and 1 SD below the mean.

MATERIALS AND METHODS

Design and Participants

A cross-sectional research design was adopted. In total, six public secondary schools across the UK agreed to take part in the study, representing northern and central UK. The original sample included 1,969 participants; however, 155 questionnaires were deemed invalid or incomplete. The final sample that included valid data for the main variables consisted of 1,613 participants who completed all related variables. Independent *t*-test analysis showed that in comparison to those who filled the full questionnaire, the participants that have not completed the question on substance abuse and thus were not included in the final analysis were more likely to be involved in cyber victimisation (Incomplete: N: 117; $M = 2.74$, $SD = 8.10$; complete: $M = 0.84$, $SD = 2.80$, $p < 0.05$), cyber bullying (Incomplete: N: 135; $M = 2.16$, $SD = 7.98$; complete: $M = 0.31$, $SD = 2.09$, $p < 0.05$), traditional victimisation (Incomplete: N: 135; $M = 8.04$, $SD = 12.35$; complete: $M = 4.46$, $SD = 6.82$, $p < 0.01$), and traditional bullying (Incomplete: N: 127; $M = 5.39$, $SD = 11.82$; complete: $M = 1.68$, $SD = 4.08$, $p < 0.01$). On the other hand, those who filled the question on substance abuse were more likely to have higher total internet use score (Complete: $M = 8.38$, $SD = 8.62$; incomplete: N: 20; $M = 3.55$, $SD = 5.10$, $p < 0.001$) and positive parent–child relationships (complete: $M = 5.26$, $SD = 1.12$; incomplete: N: 156; $M = 4.86$, $SD = 1.41$, $p < 0.01$). The participants age ranged from 10 to 16 years ($M = 12.6$, $SD = 1.3$); 53% males ($M = 12.5$, $SD = 1.0$) and 47% females ($M = 12.7$, $SD = 1.4$). All participants completed structured anonymous self-report questionnaires (hardcopy or an online version of the questionnaires). Most of the participants were white British (83.2%), 7.6% were (mostly Southern Asia), and the rest (9.2%) are non-British of different ethnic groups (e.g., Black African, White Europeans, Mixed, etc.). In addition, the participants were mostly living with both parents (75.7%), while 16.7% were living only with the mother, 1.8% only with the father and 5.8% with other people (e.g., mother and stepdad, grandparents, etc.). The mean number of siblings was 1.79 (SD: 1.37).

Measurements

Parent–Child Relationship

Participants were asked to evaluate their relationship with their mothers and fathers (How would you describe your relationship with your mother; How would you describe your relationship with your father?) ranging from not good at all (0) to very good (3). The variable was constructed by adding up the two items and thus reflected the relationship with one or both parents.

Problematic Internet Use (PIU)

This questionnaire included 15 items ($\alpha = 0.89$) adapted from Demetrovics et al. (42), and included three subscales: *Obsession* (six items, $\alpha = 0.82$) (e.g., How often do you daydream about the

Internet?); *Neglect* (six items, $\alpha = 0.80$) (e.g., How often do you neglect school work to spend more time online?); and *Control Disorder* (three items, $\alpha = 0.67$) (e.g., How often do you try to limit the amount of time spent online?). Responses ranged from never (0) to most days (4). Total Problematic Internet Use (PIU) constituted the sum of the 15 items. The total PIU and its subscales were validated using the same sample [see (9)]. In this study, the total PIU will be used.

Substance Use and Cigarette Smoking

This variable was assessed using a Brief Screening Test for Adolescent Substance Abuse using six Yes\No questions ($\alpha = 0.85$) adapted from the CRAFT Screening Interview (43). Participants were asked to report their experiences with alcohol and drug use (1. Have you ever ridden a car driven by someone (including yourself) who was "high" or had been using alcohol or drugs?; 2. Do you ever use alcohol or drugs to relax, feel better about yourself, or fit in?; 3. Do you ever use alcohol or drugs while you are by yourself, or alone?; 4. Do you ever forget things you did while using alcohol or drugs?; 5. Do your family or friends ever tell you that you should cut down on your drinking or drug use?; 6. Have you ever gotten into trouble while you were using alcohol or drugs?). In addition, one question was regarding smoking cigarettes (tobacco). Participants were asked about the frequency of smoking cigarettes. Responses for this question ranged from never smoked (0) to more than five times a week (4). The frequency of smoking was recoded into two categories; never smoked vs. smoked. Then the seven questions were added up to form a total substance abuse variable.

Bullying and Victimisation

This was assessed using 16 bullying items (total traditional and cyber bullying: $\alpha = 0.93$) and 16 items about victimisation (total traditional and cyber victimisation: $\alpha = 0.91$).

Traditional Bullying and Victimisation

This was assessed using eight items for bullying and eight items for victimisation from the Olweus Bullying Questionnaire (44).

Participants were asked to indicate how many times they had bullied others in the last 6 months. Four items were related to direct bullying (e.g., hit, kicked, pushed, or threatened someone; called someone bad or nasty names) and four items were related to relational bullying (e.g., told someone I did not want to be their friend anymore; I excluded someone from groups and activities). These eight items were put together to construct a *traditional bullying variable* ($\alpha = 0.92$).

Participants were also asked to indicate how many times they had experienced bullying from others as victims, in the last 6 months. Four items were related to direct victimisation (e.g., I was hit, kicked, or threatened; I was tricked in a nasty way) and four items were related to relational victimisation (e.g., other children told lies or nasty storeys about me; I was excluded from groups and activities). These eight items were put together to construct a *traditional victimisation variable* ($\alpha = 0.91$).

Cyber Bullying and Victimisation

This was assessed using items from Smith et al. (45). Participants were asked whether they send or receive rude, offensive, cruel, or mean messages, pictures, video and comments through text messages, iMessages (e.g., WhatsApp), Emails, phone/mobile or video calls (e.g., Skype), Chat rooms (e.g., normal chat rooms, games chat rooms), Websites, Social Networks (e.g., Facebook, Twitter), or other. This could take the form of bullying others (being a bully) ($\alpha = 0.96$) or being bullied by others ($\alpha = 0.92$).

Responses for both traditional and cyber bullying items ranged from 0 (never) to 4 (several times a week).

Ethical Consideration

The study was approved by the Ethical Committee of Kingston University London, U.K., according to the British Psychological Society's ethical standards and regulations. All parents gave written informed consent for their children and adolescents to participate in the study.

Procedure

Following ethical approval from Kingston University London, schools were sent parental consent forms and obtained an agreement from the entire sample. The questionnaires were available either online (in a designated school IT room) or as a hardcopy in the classroom; 70% of the children completed the online questionnaire (*via* Qualtrics.com) and 30% completed the hardcopy. In both cases, the researcher gave instructions and help on how to fill in the questionnaires. Children were told that participation was voluntary and that they could withdraw at any time without explanation. Children were encouraged to provide as accurate information as possible and to talk to the school counselling team if they felt uncomfortable because of their participation.

Data Analysis

First, descriptive statistics were examined regarding the variables of the study. Second, bivariate analyses were conducted to test the relationships between the research variables using Pearson's correlations. Third, we performed a PROCESS mediation-moderation analysis using SPSS 26 [PROCESS-Model #59 developed by Preacher and Hayes (46)], which simultaneously explores mediation and moderation, to test the mediating role of bullying and victimisation (traditional and cyber) on the relationship between total PIU and substance abuse (model 4). In addition, we explored the moderating effect of the child–parent relationship on three paths: The direct relationship between PIU and substance abuse; the relationship between PIU with the mediators (traditional and cyber bullying and victimisation), and the relationship between the mediators (bullying and victimisation) and substance abuse (model 59).

The mediation path and the direct effects are assumed to be moderated by the child–parent relationship. The 95% confidence interval obtained with 1,000 bootstrap resamples was used (46). Once a bootstrap sample of the original data is generated, the regression coefficients for the statistical model are estimated. This procedure yields an upper and lower bound of the confidence interval on the likely value of the indirect effect for the three cut points of the moderating factor (mean, +-SD). If the confidence interval does not straddle zero, this leads to the inference that the

TABLE 1 | Descriptive statistics and correlations among the main variables (N = 1,613).

Variable	Mean	SD	1	2	3	4	5	6	7
1. Substance abuse	0.331	1.07	1						
2. Total PIU	8.32	8.60	0.199*	1					
3. Traditional bullying	1.94	5.14	0.355**	0.344**	1				
4. Cyber bullying	0.42	2.86	0.364**	0.238**	0.644**	1			
5. Traditional victimisation	4.73	7.44	0.261**	0.280**	0.617**	0.533**	1		
6. Cyber victimisation	0.97	3.44	0.310**	0.302**	0.577**	0.806**	0.653**	1	
7. Parent–child relationship	5.23	1.15	−0.152**	−0.117**	−0.217**	−0.149**	−0.265**	−0.216	1

*$P < 0.05$; **$P < 0.01$.

indirect effect is not zero and that there is a significant mediation. The means of all the variables were centred.

RESULTS

Descriptive Statistics

The descriptive statistics for each variable (mean, s.d.) are given in **Table 1**. Regarding the items of substance abuse, 8% of the adolescents reported that they rode in a car driven by someone who had been using alcohol or drugs, 4.9% reported that they used drugs or alcohol to relax or feel better about themselves, 3.6% reported that they used drugs or alcohol while they are alone, 3.1% reported that their families or friends tell them that they should cut down on their drinking or drug use, and 3.8% reported they gotten in trouble while they are using alcohol or drugs. In addition, 2.7% of adolescents reported that they smoke cigarettes 1–5 times in the last 6 months, 0.6% 1–5 times a month, 0.6% 1–5 times a week, and 1.4% more than 5 times a week. This was categorised into smoked a cigarette at least once in the last 6 months (5.2%) vs. none. Substance abuse was then constructed of the above seven items (six on drugs and alcohol and one on smoking) ranging from 0 to 7; the higher the number the more frequent the substance abuse behaviour.

The independent samples t-test showed that those who do not live with both parents (mother only, father only or other) were more likely to be involved in substance abuse behaviour [$t_{(1,622)} = -2.78$, $p < 0.01$], to be traditional victims [$t_{(1,748)} = -2.67$, $p < 0.01$] and cyber victims [$t_{(1,726)} = -3.65$, $p < 0.001$], and to have negative parent–child relationship [$t_{(1,761)} = -12.09$, $p < 0.001$].

Bivariate Analysis: Relationship Between PIU, Substance Abuse, and Bullying/Victimisation

The correlational findings in **Table 1** show that total PIU was significantly correlated positively with substance abuse, bullying, and victimisation (traditional and cyber). In addition, bullying and victimisation (traditional and cyber) were correlated positively with substance abuse. On the other hand, parent–child relationship was significantly correlated negatively with substance abuse, PIU total, bullying, and victimisation (except for cybervictimisation) (see **Table 1**).

Mediation Effect Analysis

Model 4 is a simple mediating model in the SPSS macro PROCESS compiled by Hayes (47). This was adopted to test the mediating effect of bullying/victimisation on the relationship between PIU and substance abuse. The results are shown in **Table 2**. Model 1 of **Table 2** shows that the positive predictive effect of PIU on substance abuse was significant (B = 0.02, t = 7.49, $p < 0.001$). Model 2 of **Table 2** shows that PIU had a significant positive predictive effect on both forms of bullying and victimisation (traditional and cyber). In turn, bullying and victimisation (both forms) had a significant positive predictive effect on substance abuse. Moreover, when mediating variables were added, the direct predictive effect of PIU on substance abuse was still significant, as shown in Model 3 of **Table 2** (see **Table 2**).

In addition, the upper and lower bounds of the bootstrapped 95% CI for the direct effect of PIU on substance abuse and the mediating effect of bullying and victimisation (both forms) did not include 0, indicating that the mediating effect was significant [Traditional bullying: indirect effect = 0.014, SE = 0.004, 95% CI = (0.005, 0.023); Cyberbullying: indirect effect = 0.010, SE = 0.005, 95% CI = (0.002, 0.019); Traditional victimisation: indirect effect = 0.008, SE = 0.003, 95% CI = (0.003, 0.014); Cybervictimisation: indirect effect = 0.011, SE = 0.004, 95% CI = (0.004, 0.019)]. Of the total effect, the mediation effect accounted for 13.2% for traditional bullies, 14.4% for cyberbullies, 8.5% for traditional victims, and 10.9% for cybervictimisation, which suggests that bullying and victimisation played a partial mediating role in the relationship between PIU and substance abuse.

Moderated Mediation Effect Analysis

To test the moderated mediation model, we used Model 59 of the SPSS macro PROCESS compiled by Hayes (47). The results of the child–parent relationships moderation test are shown in **Table 3**. After putting child–parent relationships into the model, the product (interaction term) of PIU and child–parent relationships had a significant negative predictive effect on substance abuse, as shown in Model 1 of **Table 3** (B = −0.011, t = −5.28, $p < 0.001$) (see **Table 3** and **Figure 1A**). In addition, the interaction term of PIU and child–parent relationships had a significant negative predictive effect on traditional bullying and victimisation and cybervictimisation

TABLE 2 | Regression model summary of the mediating effect of bullying/victimisation (traditional and cyber) on the relationship between PIU and substance abuse (Model 4) ($N = 1,613$).

Predictors (IV)	Model 1 (DV: substance use)			Model 2 (DV: traditional bullies)			Model 3 (DV: substance use)		
	B	SE	*t*	B	SE	*t*	B	SE	*t*
PIU	0.02***	0.003	7.49	0.16*	0.01	14.78	0.011***	0.003	3.51
Traditional bullies							0.089***	0.007	13.06
R^2	0.034			0.12			0.131		
F	56.18***			218.52***			121.96***		
				Model 2 (DV: cyberbullies)			Model 3 (DV: substance use)		
PIU				0.06***	0.006	9.78	0.013***	0.003	4.33
Cyberbullies							0.17***	0.012	14.24
R^2				0.057			0.144		
F				95.73***			133.11***		
				Model 2 (DV: traditional victimisation)			Model 3 (DV: substance use)		
PIU				0.21***	0.018	11.87	0.017***	0.003	5.48
Traditional victimisation							0.036***	0.004	8.98
R^2				0.079			0.085		
F				141.05***			75.33***		
				Model 2 (DV: cybervictimisation)			Model 3 (DV: substance use)		
PIU				0.099***	0.008	12.91	0.014***	0.003	4.64
Cybervictimisation							0.107***	0.009	11.28
R^2				0.093			0.109		
F				166.66***			99.63***		

*$P < 0.05$; ***$P < 0.001$.

(but not on cyberbullies), as shown in Model 2 of **Table 3** (see **Table 3** and **Figures 1B–D**).

Model 3 of **Table 3** shows that only traditional bullying and parent–child relationships interaction had a significant predictive effect on substance abuse ($B = 0.01$, $t = 2.66$, $p < 0.01$).

These results suggest that parent–child relationships played a moderating role in the relationships between PIU and substance abuse (model 1), between PIU and bullying and victimisation (except for cyberbullies) (model 2), and between traditional bullying and substance abuse (model 3) (see **Figures 2A–D**).

This indicates that for individuals with low levels of parent–child relationships, higher levels of PIU were associated with higher levels of substance abuse. In addition, bullying significantly predicted substance abuse in low-level child–parent relationships.

Of the total effect, the mediation moderation effect accounted for 14.9% for traditional bullies, 15.5% for cyberbullies, 10.7% for traditional victims, and 12.7% for cybervictimisation, which suggests that bullying and victimisation and the interaction with child–parent relationships played a partial mediating role in the relationship between PIU and substance abuse.

DISCUSSION

The current study explored the mediation effect of involvement in traditional and cyber bullying and victimisation on the relationship between PIU and substance abuse amongst adolescents in the UK. The findings of the study revealed that the correlation between PIU and substance abuse among adolescents is partially mediated by involvement in bullying as perpetrators and victims. In addition, the parent–child relationship was specifically found as a significant moderator on the relationship between PIU and traditional bullying and victimisation and cybervictimisation. It has also moderated the relationship between traditional bullying and substance abuse.

Involvement in Bullying and Victimisation as Mediators Between PIU and Substance Abuse

In accordance with previous studies (15, 16, 48), the findings of the current study indicated that adolescents who reported higher levels of PIU were more likely to be engaged in substance abuse. This finding is in line with the Problem Behaviour Theory (14) that suggests that risky behaviours can co-occur

TABLE 3 | Regression model summary of the moderation-mediation model predicting substance abuse.

Predictors (IV)	Model 1 (DV: substance use)			Model 2 (DV: traditional bullies)			Model 3 (DV: substance use)		
	B	SE	*t*	B	SE	*t*	B	SE	*t*
PIU	0.02***	0.003	7.15	0.15***	0.01	13.99	0.009**	0.003	2.99
Parent–child relationships	−0.10***	0.023	−4.57	−0.34***	0.08	−4.02	−0.083***	0.022	−3.72
PIU × Parent–child relationships	−0.011***	0.002	−5.28	−0.033***	0.007	−4.34	−0.012***	0.003	−4.95
Traditional bullies							0.081***	0.007	11.70
Traditional bullies × parent–child relationships							0.010**	0.004	2.66
R^2	0.075			0.148			0.149		
F	43.84***			92.483***			55.74***		
				Model 2 (DV: cyberbullies)			**Model 3 (DV: substance use)**		
PIU				0.06***	0.005	10.18	0.012***	0.003	3.98
Parent–child relationship				−0.022	0.046	−0.47	−0.099***	0.022	−4.49
PIU × Parent–child relationships				0.002	0.005	0.546	−0.010***	0.002	−4.24
Cyberbullies							0.160***	0.012	13.25
Cyberbullies × Parent–child relationship							0.004	0.01	0.32
R^2				0.063			0.155		
F				35.16***			57.82***		
				Model 2 (DV: traditional victimisation)			**Model 3 (DV: substance use)**		
PIU				0.19***	0.018	10.67	0.015***	0.003	5.04
Parent–child relationships				−1.15***	0.14	−8.27	−0.076**	0.023	−3.24
PIU × Parent–child relationships				−0.038**	0.002	−4.88	−0.011***	0.002	−4.88
Traditional victimisation							0.031***	0.004	7.48
Traditional victimisation × Parent–child relationships							0.003	0.002	1.34
R^2				0.128			0.107		
F				79.04***			38.45***		
				Model 2 (DV: cybervictimisation)			**Model 3 (DV: substance use)**		
PIU				0.090***	0.008	11.85	0.013***	0.003	4.28
Parent–child relationships				−0.190**	0.060	−3.18	−0.091***	0.023	−4.04
PIU × Parent–child relationships				−0.034***	0.005	−6.30	−0.010***	0.002	−4.26
Cybervictimisation							0.096***	0.010	9.68
Cybervictimisation × Parent–child relationships							0.010	0.005	1.88
R^2				0.128			0.127		
F				78.61***			46.69***		

*The mediation effect of bullying and victimisation (traditional and cyber) on the relationship between PIU and substance abuse and the effect of parent-child relationship as a moderator (Model 59) (N = 1,613). **P < 0.01; ***P < 0.001.*

and that adolescents who are engaged in one risky behaviour are more likely to be involved in other risky behaviours. This may also suggest that the two behaviours are similar because they both may lead to addiction. It is of interest that addictive behaviours concerning both drug usage and non-drug usage are related to neuro-bio-cognitive disruption of one or a combination of three key neural systems that are responsible for willpower. The proposed model suggests a disruption of the impulsive amygdala regulated system, the reflective prefrontal regulated system and/or the feeling insula regulated system (49). It is possible that the lack of control of risky PIU, substance abuse, and bullying behaviours are also related to this neuro-bio-cognitive impairment and future research ought to investigate this.

In addition to this direct correlation, the findings of the current study showed that the correlation between PIU and substance abuse is partially mediated by involvement in traditional and cyber bullying. Adolescents who spend more time on the internet were at greater risk for involvement in bullying as perpetrators and victims, which in turn increases their likelihood to be involved in substance abuse. Those who are unable to control their internet use could have difficulty in controlling their behaviours as well, which as a result may increase the risk for acting aggressively (24, 50).

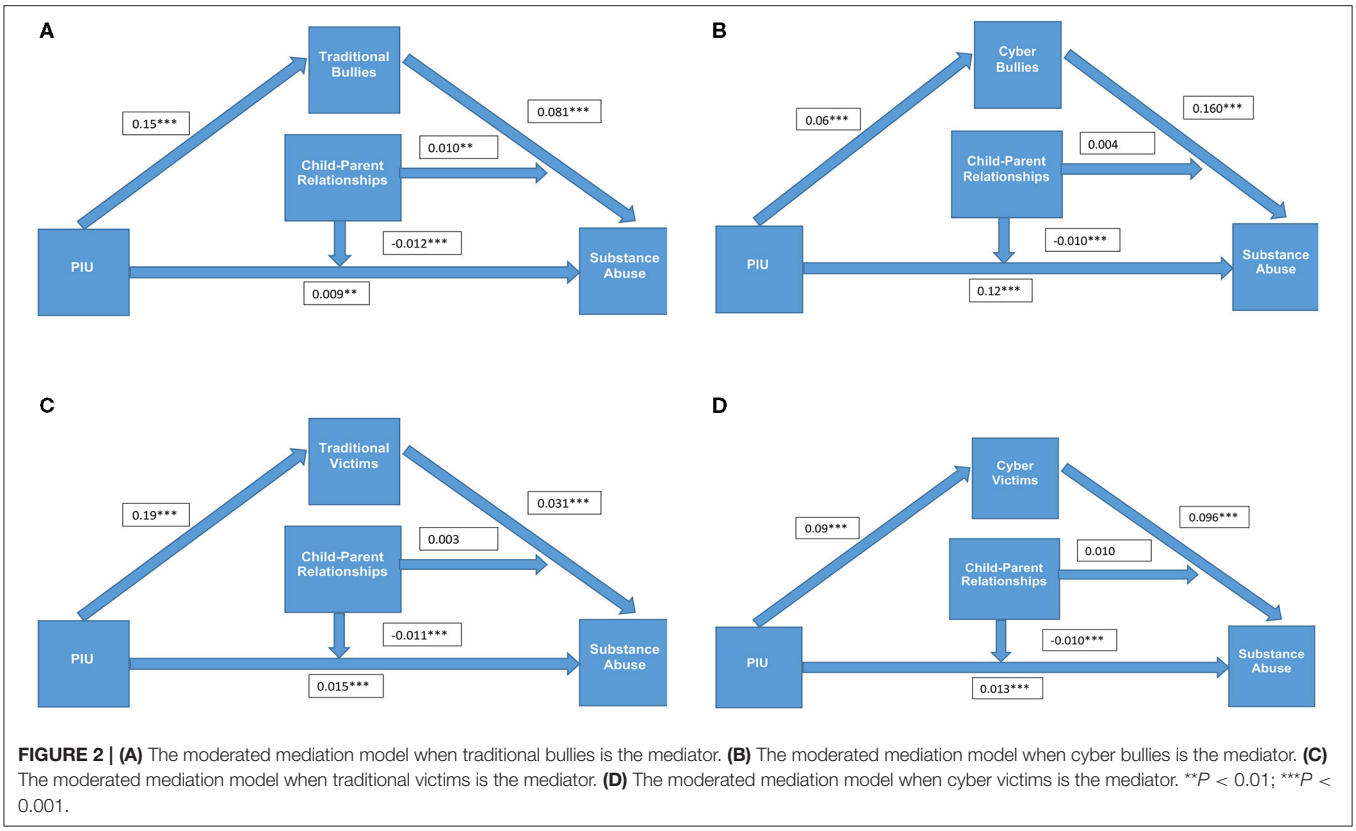

FIGURE 2 | (A) The moderated mediation model when traditional bullies is the mediator. **(B)** The moderated mediation model when cyber bullies is the mediator. **(C)** The moderated mediation model when traditional victims is the mediator. **(D)** The moderated mediation model when cyber victims is the mediator. $^{**}P < 0.01$; $^{***}P < 0.001$.

We can understand this mediation process in light of the General Strain Theory of Agnew (29). According to this theory, substance abuse among adolescents is a coping mechanism for relieving negative feelings, such as stress, frustration, and depression, caused by the strain of being involved in bullying. With limited support and skills, adolescents who are involved in bullying may resort to substance abuse and self-injury behaviours to escape and cope (51).

An additional explanation could be related to the adolescent's desire to gain social status and to be perceived as cool; and attractive. For adolescents, smoking and drinking is a behaviour that contributes to the social image of the individual and can be well-used for this purpose (52).

Consistent with previous studies, bullies may be more vulnerable to substance abuse than others (28). The findings of the study showed a positive association between involvement in bullying and substance abuse, but this correlation was stronger among bullies than victims, particularly in traditional bullying. This indicates that bullies are more susceptible to risky behaviours than victims.

Additionally, PIU includes neglect of daily activities and social interactions. This may lead to a lack of skills relating to social peer relationships and thus increase the risk of getting involved in bullying in one way or another.

Parent–Child Relationship: Direct and Interactive Effects

In line with previous studies that emphasised the parent–child relationship as a protective factor among adolescents (36, 37, 53), the findings of the current study revealed a negative correlation between parent–child relationship in one hand and PIU and substance abuse on the other hand. Adolescents who described their relationships with their parents as positive, reported lower levels of PIU and substance abuse. We can understand the protective effect of the parent–child relationship in light of the Social Bond Theory of Hirschi (54). This theory suggests that adolescents, who are close to their parents, feel obligated to act in non-deviant ways to please their parents, so they are less likely to be involved in risky behaviours, such as substance abuse.

Our findings also showed that a good parent–child relationship serves as a moderator of the relationship between PIU with traditional bullying and victimisation and cybervictimisation (but not of cyberbullies). In addition, the parent–child relationship moderates the relationship between traditional bullying and substance abuse but not cyberbullying. These findings can be explained by the significant relationship that was found between not living with both parents on one hand and victimisation, substance abuse, and a negative parent–child relationship on the other. This indicates that those who do not live with both parents are more at risk of developing behavioural problems (55), including internalising and externalising behaviours (e.g., substance abuse) (56, 57).

To the best of our knowledge, no research to date has explored the moderating effect of the parent–child relationship on these correlations. These findings emphasise that a good relationship between adolescents and their parents protects them from involvement in risky behaviours (bullying and substance abuse), despite their involvement in other risky behaviour (such as PIU). Positive and supportive communication helps children acquire

adapting coping strategies, which reduce their engagement in risky behaviours (58).

These findings are also consistent with prior research suggesting that high support and warm relationships between parents and children are most likely to protect adolescents against involvement in bullying and victimisation (39). This moderation can be explained by Regulation Theory (59), which argues that sensitive parents could help their children regulate their emotions and behaviours. When parents fail to provide enough guidance and support through communication with their children, the children will have difficulty regulating their emotions effectively, which may increase their vulnerability to being involved in bullying as means of dealing with distress (60). Through conversation and open communication, parents can help their children develop behavioural schemes based on their experiences and perceptions. This in turn could help them to cope and avoid victimisation and bullying by internalising positive conflict-solving skills (32, 40, 61). However, the findings of the study showed that only the correlation between traditional bullying and substance abuse was moderated by the parent–child relationship, but not cyber bullying and victimisation and traditional victimisation. This could be because traditional bullying is a "visible" behaviour compared to cyber bullying and victimisation, which gives parents the ability to identify problems in their children's lives and deal with them. Also, this may indicate that victims usually suffer in silence (62, 63) and thus are in need of more support. Parents need to look at possible risks and engage more with their children to be able to recognise these behaviours.

Conclusions and Implication for Practise

The findings of the current study indicated that PIU is a major risk factor for substance abuse amongst adolescents. This is mediated by involvement in traditional and cyber bullying and victimisation. Furthermore, a good parent–child relationship was found to be an important protective factor that buffers the risk for involvement in substance abuse. This emphasises the importance of examining adolescents' behaviours in the context of their relationships and examining both risk and protective factors. To strengthen the reliability of the findings and to examine this problem from several points of view, future research needs to include additional informants such as parents and teachers. In addition, future studies should use longitudinal designs to determine cause-and-effect relationships between the independent variables and the outcome variable. In this study, not all children completed the substance abuse questionnaire and thus were excluded from the analysis. Children and adolescents who were involved in cyber and traditional bullying and victimisation were more likely to be excluded from the study. However, the participants who were included were more likely to have higher total internet use scores and positive parent–child relationships. Nevertheless, empirical evidence and simulations indicate that regression models validity is only marginally affected even after selective dropout. That is, the relation between predictors and outcome is unlikely to be substantially altered by selective dropout (64).

The substance abuse variable constitutes seven questions, which may not reflect the quantity of alcohol and drugs as the question on smoking. However, the questions reflect lifestyle rather than only the current situation and gives a good indication of being involved in risky behaviours in general. In addition, the described behaviour in question number one (Have you ever ridden a car driven by someone (including yourself) who was "high" or had been using alcohol or drugs?) may be related directly to other people's behaviour (e.g., parents, siblings, and friends) rather than directly to the respondent. Nevertheless, the question may indicate that the surrounding proximal environment of the targeted adolescent is a predisposition of toxic stress that may form a risk factor for their behaviour and physical and mental health (65). In that sense, children do not develop in isolation but develop in an environment of relationships (66, 67), and while a negative stressful environment may lead to behaviour and mental problems, supportive nurturing and safe relationships and environments, on the other hand, can buffer the response to toxic stress and thus lead to improved outcomes of physical and mental health (68, 69).

Therefore, we recommend that future research explores additional aspects of parenting, such as parenting styles and parental involvement to understand the exact parental behaviour that can affect these relationships. In addition, it is necessary to explore risk factors for problematic internet use among adolescents, at the level of the individual, the family, and the social context.

The findings of the study have several implications for practise. In light of the findings, it is important that mental health and psychology professionals develop programs for preventing problematic internet use among adolescents in addition to behavioural interventions with adolescents who use the internet in problematic ways. Professionals need to take into account bullying and victimisation as possible mediators for the relationships between problematic internet use and substance abuse (70, 71). In addition, practitioners who work with adolescents should include parents in their intervention programs with the aim of improving parent–adolescent relationships. Interventions may also include improving peer and sibling relationships (72, 73) and face-to-face or online therapies (74).

DATA AVAILABILITY STATEMENT

The dataset for this manuscript are not publicly available because they are used in other ongoing studies for publication. Requests to access the datasets should be directed to the corresponding author of the manuscript (Muthanna Samara: m.samara@kingston.ac.uk).

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethical Committee, Kingston University London, UK. Written informed consent to participate in this

study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

MS, PS, and HM contributed to the conception and design of the study. MS, AE-A, AM, and SH organised the database, performed the statistical analysis, contributed to the acquisition, and interpretation of data for the work. All authors drafted the work and revised it critically for important intellectual content and approved the submitted version.

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