Mental health comorbidities following peer victimization across childhood and adolescence: a 20-year longitudinal study

Running title: Peer victimization and mental health

Sînziana I Oncioiu, Michel Boivin, Marie-Claude Geoffroy, Louise Arseneault, Cédric Galéra, Marie C Navarro, Mara Brendgen, Frank Vitaro, Richard E Tremblay, Sylvana M Côté*, Massimiliano Orri*

* Drs. Côté and Orri are co-senior authors of this article.

Authors and Affiliations: Sînziana I Oncioiu, PhD, Cédric Galéra, MD, PhD, Marie C Navarro, MPH, Sylvana M Côté, PhD, Massimiliano Orri, PhD are with Bordeaux Population Health Research Centre, INSERM U1219, University of Bordeaux, Bordeaux, France; sinziana.oncioiu@gmail.com; cedric.galera@u-bordeaux.fr; marie.navarro@u-bordeaux.fr; sylvana.cote.1@umontreal.ca; massimiliano.orri@mail.mcgill.ca;

Michel Boivin, PhD is with Laval University, Quebec, Canada; michel.boivin@psy.ulaval.ca;

Marie-Claude Geoffroy, PhD and Massimiliano Orri, PhD are with McGill University, Montreal, Canada and Douglas Mental Health University Institute, Montreal, Canada. marieclaude.geoffroy@mcgill.ca;

Louise Arseneault, PhD is with King's College London, London, United Kingdom. louise.arseneault@kcl.ac.uk;

Mara Brendgen, PhD is with University of Quebec in Montreal, Montreal, Canada.

brendgen.mara@uqam.ca;

Sylvana M Côté, PhD, Frank Vitaro, PhD and Richard E Tremblay, PhD are with University of Montreal, Montreal, Canada. frank.vitaro@umontreal.ca and richard.ernest.tremblay@umontreal.ca;

Richard E Tremblay, PhD is also with University College Dublin, Dublin, Ireland.

Corresponding Author: Sylvana M Côté, Sainte-Justine Research Center, University of Montreal, 3175, Chemin Côte Ste-Catherine, Montréal, QC H3T 1C5, Canada. Electronic mail may be sent to sylvana.cote.1@umontreal.ca. Phone Number: 1-514-345-2175.

Acknowledgements - The authors thank the children and parents of the Québec Longitudinal Study of Child Development (QLSCD) and the participating teachers and schools, the Québec Statistics Institute and the Research Unit on Children's Psychosocial Maladjustment (GRIP) for their support in data collection and management.

This research was supported by the Quebec Government Ministry of Health, the Canadian Institute of Health Research; the Quebec's Health Research Fund; the Canadian Social Science and Humanities Research Council; Ste-Justine Hospital's Research Center, the University of Montreal; the University of Bordeaux via the grant IDEX 'Origin' (Investissements d'avenir). Massimiliano Orri receives a grant from the European Union's Horizon 2020 research and innovation program (#793396). Michel Boivin is supported by the Canada Research Chair Program. Louise Arseneault is the Mental Health Leadership Fellow for the UK Economic and Social Research Council (ESRC).

The authors have no financial relationships relevant to this article to disclose. The authors have no conflicts of interest relevant to this article to disclose.

Keywords – peer victimization trajectories; mental health comorbidities; childhood and adolescence; young adulthood; longitudinal study; internalizing problems; externalizing problems

ABSTRACT

Background

Peer victimization is associated with a wide range of mental health problems in youth, yet few studies described its association with mental health comorbidities.

Methods

To test the association between peer victimization timing and intensity and mental health comorbidities, we used data from 1216 participants drawn from the Quebec Longitudinal Study of Child Development, a population-based birth cohort. Peer-victimization was self-reported at ages 6-17 years, and modeled as four trajectory groups: low, childhood-limited, moderate adolescence-emerging and high-chronic. The outcomes were the number and the type of co-occurring self-reported mental health problems at age 20 years. Associations were estimated using negative binomial and multinomial logistic regression models and adjusted for parent, family, and child characteristics using propensity score inverse probability weights.

Results

Youth in all peer victimization groups had higher rates of co-occurring mental health problems and higher likelihood of comorbid internalizing-externalizing problems (odds ratios ranged from 2.06, 95% CI=1.52-2.79 for childhood-limited to 4.34, 95% CI=3.15-5.98 for high-chronic victimization) compared to those in the low victimization group. The strength of these associations was highest for the high-chronic group, followed by moderate adolescence-emerging and childhood-limited groups. All groups also presented higher likelihood of internalizing-only problems relative to the low peer victimization group.

Conclusions

Irrespective of timing and intensity, self-reported peer victimization was associated with mental health comorbidities in young adulthood, with the strongest associations observed for high-chronic peer victimization. Tackling peer victimization, especially when persistent over time, could play a role in reducing severe and complex mental health problems in youth.

INTRODUCTION

Psychiatric comorbidity, the co-occurrence of more than one mental health problem, is the rule rather than the exception in the general population (Andrews, Slade, & Issakidis, 2002; Caspi et al., 2020; Kessler, Chiu, Demler, & Walters, 2005; Plana-Ripoll et al., 2020). More than 40% of adolescents and adults with at least one mental health problem will subsequently accumulate one or more additional lifetime diagnoses (Kessler et al., 2005; Merikangas et al., 2010; Plana-Ripoll et al., 2020). An increase in the number of comorbid mental disorders is associated with greater clinical severity (e.g., work disability, suicide attempt, use of psychiatric services)(Angst, Sellaro, & Ries Merikangas, 2002; Kessler et al., 2005) and a reduction in life expectancy (Plana-Ripoll et al., 2020; Weye et al., 2020). To date, we know little about how to prevent the development of comorbidity within mental disorders.

Peer victimization is a potentially modifiable factor associated with virtually all commonly occurring mental health problems, both on the internalizing (e.g., depression, anxiety, suicidality) and externalizing (e.g., antisocial personality, violence, criminal offending) spectra (Arseneault, 2018; Geel, Vedder, & Tanilon, 2014; Moore et al., 2017; Reijntjes et al., 2011; Reijntjes, Kamphuis, Prinzie, & Telch, 2010; Schoeler, Duncan, Cecil, Ploubidis, & Pingault, 2018; Ttofi, Farrington, & Lösel, 2012). Peer victimization is an umbrella term used to describe the experience of being the target of peers' hostile behaviors done intentionally to inflict harm upon another (Finkelhor, Turner, & Hamby, 2012). Peer victimization can take different forms, such as physical (e.g., hitting, kicking), verbal (e.g., name-calling) and relational (e.g., social exclusion, spreading false rumors or lies) victimization. Across cultures and countries, about 30% of children report having experienced peer victimization at some point during their schooling (Analitis et al., 2009; Craig et al., 2009; Jadambaa et al., 2019; Modecki, Minchin,

Harbaugh, Guerra, & Runions, 2014). Peer victimization is a heterogeneous experience which varies in terms of intensity (how frequently it happens), and timing (i.e., when it happens during development and for how long it lasts). For example, studies describing patterns of stability and change in peer victimization during school years identified groups of children for whom the experience of peer victimization was transitory (4.5-31%) as well as groups of children who reported chronic exposure (2-24%); the proportions varied depending on the developmental period studied, the length of the follow-up, and the statistical method used (Bowes et al., 2013; Goldbaum, Craig, Pepler, & Connolly, 2003; Ladd, Ettekal, & Kochenderfer-Ladd, 2017; Oncioiu et al., 2020; Smith, Talamelli, Cowie, Naylor, & Chauhan, 2004).

Most studies investigated separately the association of intensity (frequency) and chronicity of peer victimization with mental health problems. Firstly, frequent occurrence of peer victimization (e.g., at least a few times a month) was found to be associated with more symptoms of anxiety, depression and cigarette smoking (Bouman et al., 2012; Moore et al., 2017; van der Ploeg, Steglich, Salmivalli, & Veenstra, 2015). However, there is also evidence suggesting that less frequent occurrence of peer victimization (e.g., a few times during the past 12 months) is also associated with higher likelihood of mental health problems relative to no exposure to bullying victimization (Goldbach, Sterzing, & Stuart, 2018; Gower & Borowsky, 2013; Klomek, Marrocco, Kleinman, Schonfeld, & Gould, 2008). Secondly, regarding timing, robust evidence indicates that chronic exposure to peer victimization is associated with serious short- and long-term mental health problems (Arseneault, 2018; Geoffroy et al., 2018). However, studies about mental health outcomes following transient experience of peer victimization are scarce and have conflicting results, showing either lingering negative effects on mental health (Bogart et al., 2014; Bowes et al., 2013; Hoffman, Phillips, Daigle, & Turner, 2016) or no increased risk

compared to non-exposed peers (Smith et al., 2004). Finally, evidence from studies describing developmental trajectories of peer victimization which characterize simultaneously the timing and intensity of peer victimization have shown that children who experienced high intensity peer victimization only during childhood did not exhibit more mental health problems than non-victimized children (Goldbaum et al., 2003; Ladd, Ettekal, & Kochenderfer-Ladd, 2019). Conversely, adolescence-emerging peer victimization showed similar associations with mental health problems as chronic peer victimization (Goldbaum et al., 2003; Smith et al., 2004).

Furthermore, to date, evidence about the association of peer victimization with comorbid presentation of mental health problems is scarce. Studies looking at internalizing-only problems (e.g., depression, anxiety), found associations between peer victimization and internalizing comorbidities (Forbes, Fitzpatrick, Magson, & Rapee, 2019; Ranta, Kaltiala-Heino, Pelkonen, & Marttunen, 2009; Stapinski et al., 2014). We identified five studies which analyzed the relationship between peer victimization and latent patterns of internalizing and externalizing (e.g., aggression, inattention, delinquency) problems in childhood (Hanish & Guerra, 2002) and adolescence (Eastman et al., 2018; Forbes, Magson, & Rapee, 2020; Kretschmer, Barker, Dijkstra, Oldehinkel, & Veenstra, 2015; Rijlaarsdam, Cecil, Buil, van Lier, & Barker, 2021). These studies reported associations between peer victimization and patterns of mental health problems characterized predominantly by internalizing symptoms (Kretschmer et al., 2015), as well as associations between transient peer victimization and mental health profiles with predominant externalizing symptoms (Hanish & Guerra, 2002), or between persistent (Hanish & Guerra, 2002) and intense (Eastman et al., 2018) victimization with comorbid internalizing-externalizing symptoms. More recently, two studies showed that the association of peer victimization with internalizing or externalizing symptoms is non-specific, being accounted for

by a general factor for psychopathology (Forbes et al., 2020; Rijlaarsdam et al., 2021). However, such prior studies did not measure internalizing-externalizing comorbidities in young adulthood. The co-occurrence of mental health problems during young adulthood could be particularly detrimental, as this period lays the foundations for adaptation to adult roles, such as integration into workforce, financial independence, and the formation of lasting intimate partnerships or parenthood. Therefore, it is crucial to understand if experiences of peer victimization with different timing and intensity are associated with different mental health comorbidity profiles in this key life period.

The objective of this study was to examine the association between timing and intensity of peer victimization and number and type of comorbid mental health problems in young adulthood.

METHOD

Study Sample

We used data from the Quebec Longitudinal Study of Child Development (QLSCD), an ongoing population-based birth cohort established in 1997, conducted by the Institut de la Statistique du Québec. The study follows the development of 2,120 children born between October 1997 and July 1998 to mothers residing in the Canadian province of Quebec, who gave birth after 24 weeks and not later than 42 weeks' gestation, and who spoke English or French. The participants were selected from the Quebec Master Birth Registry through a stratified three-stage sampling design based on geographical location (remote/non-remote region) and the birth rate (low/high) of regional municipalities. The study website (https://www.jesuisjeserai.stat.gouv.qc.ca/default_an.htm) and previous publications contain

detailed information on the QLSCD (Jetté, 2002; Orri et al., 2020). The QLSCD protocol was approved by the Institut de la Statistique du Québec and the Sainte-Justine Hospital Research Center ethics committees. Written informed consent was obtained from all participating families at each assessment. For the current study, data were available for 1216 participants with at least one measure of peer victimization between 6 and 17 years who answered the mental health questionnaire at 20 years old: 517 boys (42.5 %) and 699 girls (57.5%). Compared to participants included in the study sample, nonincluded participants (i.e., excluded because of attrition) were more likely to be males, to come from non-intact and socioeconomically disadvantaged families and be exposed to higher levels of parental overprotection during early childhood. Nonincluded participants were also more likely to have parents with low education and mothers who were younger, had depressive symptoms and smoked during the entire pregnancy (**Table S1** available online). **Table 1** presents the characteristics of the participants included in this study.

Mental health outcomes at age 20 years

At age 20 years, participants reported on their mental health during the past year through confidential online questionnaires. We assessed symptoms of internalizing (i.e., depression, anxiety, eating disorders, suicide attempt/ideation), and externalizing problems (i.e., attention deficit disorder with/without hyperactivity (ADHD), antisocial behavior, alcohol abuse, daily cigarette smoking, cannabis use 3 times/week or more and occasional use of hard drugs). The classification of mental health problems into internalizing and externalizing was done in line with DSM-5 guidance and previous studies (e.g., Caspi et al., 2020; Schaefer et al., 2018). To identify participants with severe symptoms, we used standard cut-offs of the continuous scales for depression (Poulin, Hand, & Boudreau, 2005), anxiety (Spitzer, Kroenke, Williams, & Löwe, 2006) and alcohol use (WHO, 2001). When standard cut-offs (Kessler, Adler, et al., 2005;

Morgan, Reid, & Lacey, 1999) led to a high proportion of participants being classified as presenting elevated symptoms (about 30%), we selected stricter cut-offs of the validated scales, i.e., eating disorders (Hill, Reid, Morgan, & Lacey, 2010) and ADHD (Kessler et al., 2007). However, analyses with standard cut-offs yield consistent results (data not shown). For categorical (i.e., cigarette smoking, cannabis use and hard drug use) and count (i.e., antisocial behavior) outcomes, we grouped response options to derive dichotomous variables that reflected severity while ensuring a reasonable sample size to perform the analyses (i.e., more than 5 participants in each trajectory group). A detailed description of the assessment instrument for each outcome as well as the cut-offs for severe symptomatology are presented in **Table 2**. Our primary outcomes were (1) the number of mental health problems with elevated symptoms in the past 12 months (count variable, range 0-10) and (2) the type of mental health comorbidities in the past 12 months, with 4 possible categories: (a) no mental health problems, (b) internalizing-only problem(s) – severe symptoms for one or more internalizing problems in the absence of externalizing problems, (c) externalizing-only problem(s) - severe symptoms for one or more externalizing problems in the absence of internalizing problems; and (d) internalizing-externalizing comorbidity- severe symptoms for at least one internalizing and one externalizing problem.

Exposure to peer victimization from age 6 to 17 years. When participants were aged 6, 7, 8, 10, 12, 13, 15, 17 years, we collected information on peer victimization using 6 items of a modified version of the Self-report victimization scale (Ladd & Kochenderfer-Ladd, 2002). Participants reported how often (0=never to 2= often) they experienced physical (i.e., being pushed, hit and/or kicked), verbal (i.e., being called names and/or insulted, being teased in a mean way), relational victimization (i.e., being excluded from a group) and property attacks (i.e.,

being forced to give personal belongings to be left alone). At each wave, we calculated the mean of the items (range 0-2) which was then rescaled (multiplied by 5) to range from 0 to 10. At each wave, the score of peer victimization described the intensity (the frequency) of peer victimization experienced in the past 6 months, with high scores indicating high intensity. Using these longitudinal data, we derived developmental trajectories which captured both the timing and intensity of peer victimization. We identified the following 4 trajectories: 1) low peer victimization across the entire period (n=415, 34.1%) (2) childhood-limited peer victimization, characterized by a relatively high level of victimization at age 6, followed by a progressive sharp decline from age 6 to 17 years, and no victimization at age 17 (n=310, 25.5%)); (3) moderate adolescence-emerging peer victimization, characterized by steady levels of victimization from age 6 to 12 years and the second highest level of victimization across adolescence (n=360, 29.6%); and (4) high-chronic peer victimization, characterized by persistently higher levels of victimization relative to the other groups, despite a decline from age 6 to 17 years (n=131, 10.8%) (**Figure 1**). It is worth noting that, due to the self-report assessment, the trajectories captured *perceived* peer victimization, i.e., a subjective account of the *actual* peer victimization experience. However, for the sake of simplicity throughout the text we will refer to it as 'peer victimization'. Further details about the estimation of these developmental trajectories of peer victimization can be found elsewhere (Oncioiu et al., 2020).

Background individual, familial, and behavioral characteristics. Children exposed to peer victimization substantially differ from those not exposed on a range of individual, familial, and behavioral characteristics (Cook, Williams, Guerra, Kim, & Sadek, 2010; Schoeler et al., 2019). These characteristics may confound the association between peer victimization and later mental health problems. Therefore, we considered a wide range of background characteristics

putatively associated with peer victimization, which were measured between 5 months and 5 years after birth: sex, socioeconomic status, family structure, maternal and paternal mental health (i.e., depression, anxiety and antisocial behavior) and parenting (i.e., positive and coercive), mother's alcohol use and cigarette smoking during pregnancy, and child's behavior problems rated by the mother and the father (i.e., overall aggression, hyperactivity, internalizing behavior - depression and anxiety symptoms, and social withdrawal), child's pre-school peer victimization and child's participation in childcare. For variables measured repeatedly, we calculated the mean across early childhood if information was available at minimally two waves. A detailed description of these measure is available in **Table S2** (available online).

Statistical analyses

We conducted two main analyses. First, we used a negative binomial regression to estimate the association between peer victimization trajectories and the number of severe mental health problems at 20 years old (count variable). Second, we used a multinomial logistic regression to estimate the association between peer victimization trajectories and type of comorbidity (reference group for the outcome: 'no mental health problems' category). In both regression models, the reference group for the exposure was the category 'low peer victimization'.

For each analysis, we reported both the crude and adjusted models. In adjusted models, we used propensity score (PS) inverse probability weighting (IPW)(Austin, Grootendorst, & Anderson, 2007; Stuart, 2010) to account for the differences in terms of early childhood characteristics across the four peer victimization trajectories. We proceeded as follows. First, we calculated the standardized mean difference (SMD) for each background variable between children in the four trajectories of peer victimization for all six possible subgroups comparisons

(e.g., low vs childhood-limited, moderate-emerging vs high-chronic etc.) (**Figure S1** available online). Variables showing a standardized mean difference >.10 in at least one of the six comparisons were included in the PS model. Second, the PS for peer victimization trajectories was estimated using multinomial regression (R package MatchThem). Third, we assessed the success of the PS in reducing background differences between children in the different peer victimization trajectories by comparing SMD in the weighted and non-weighted datasets. The IPW significantly reduced the differences in terms of background characteristics across the 4 peer victimization trajectories, thus increasing their comparability (**Figure S1** available online). Finally, we applied the PS weights to the outcome model using the IPW procedure. Despite a general reduction in the SMDs, the following variables were left unbalanced (i.e., SMD> .10) after the use of the PS IPW: socioeconomic disadvantage, maternal and paternal anxiety and hyperactivity rated by the father. To account for this unbalance, these variables were additionally adjusted for by inclusion as adjustment factors in the PS IPW models. This additional adjustment, did not modify the results, therefore we presented only the results from PS IPW models. To account for missing data in the background variables (below 3% for the majority and between 10-17% for father parenting and father-rated early childhood behavior), associations were estimated across 50 multiple imputed datasets (R package mice) and the results pooled.

In complementary analyses, we re-ran the multinomial and negative binomial regressions, by changing the reference category for the exposure to test all possible contrasts (e.g., high-chronic versus moderate adolescence-emerging, high-chronic versus childhood-limited and childhood-limited versus moderate-emerging peer victimization). Also, to contrast comorbid internalizing-externalizing with internalizing-only and externalizing-only problems, we changed the reference group for the outcome from no mental health problems to externalizing-only and

internalizing-only problems (keeping the low peer victimization group as reference for the exposure). Additionally, we used binary logistic regression to estimate the association between peer victimization trajectories and severe symptoms for each specific mental health problem.

RESULTS

Peer victimization trajectories and rate of comorbid mental health problems in young adulthood

The number of participants reporting exactly 1, 2, or 3 or more severe mental health problems was 250 (20.6%), 147 (12.1%), and 129 (10.6%), respectively. As shown in **Figure 2**, 20 (4.8%) of the participants in the low peer victimization group, 31 (10.0%) in the childhood-limited, 48 (13.3%) in the moderate-emerging, and 30 (22.9%) in the high chronic group presented high levels of symptoms for 3 or more mental health problems. Relative to low peer victimization, any other experience of peer victimization increased the rate of comorbid mental health problems both in the crude and adjusted models - in which familial and parental factors as well as child behavior in early childhood were taken into account. In adjusted models, over a period of 12 months in young adulthood, youth in the childhood-limited, moderate-emerging and high-chronic trajectories presented an increase of 49% (Risk Ratio (RR)=1.49, 95% CI=1.31-1.70), 71% (RR=1.71, 95% CI=1.51-1.94) and 135% (RR=2.35, 95% CI=2.04-2.70) in the rate of comorbid mental health problems, respectively, relative to participants in the low peer victimization trajectory (**Table 3**).

Peer victimization trajectories and type of comorbid mental health problems in young adulthood

A total of 165 (13.6%) participants presented internalizing-only problem(s), 218 (17.9%) externalizing-only problem(s) and 143 (11.8%) comorbid internalizing-externalizing problems. A description of the type of mental health problems in the overall sample and by peer victimization trajectory is presented in **Table 1**. Relative to low peer victimization, all the other experiences were associated with increased likelihood of comorbid internalizing-externalizing, internalizing-only and externalizing-only problems both in the crude and adjusted models, but not all associations reached statistical significance. In adjusted models, relative to children in the low peer victimization trajectory, those in the childhood-limited, moderate adolescence-emerging and high-chronic trajectories had a two-fold (Odds Ratio (OR)=2.06, 95% CI=1.52-2.79), three-fold (OR=3.01, 95% CI=2.25-4.03) and four-fold (OR=4.34, 95% CI=3.15-5.98) increase in the likelihood of presenting comorbid internalizing-externalizing problems relative to no mental health problems, respectively. In adjusted models, relative to low peer victimization, all other experiences increased the likelihood of internalizing-only (OR ranging from 1.39, 95% CI=1.07-1.80 for childhood-limited to 2.23, 95% CI=1.64-3.03 for high-chronic victimization) and externalizing-only (OR ranging from 1.17, 95% CI=0.93-1.46 for moderate adolescence-emerging to 1.45, 95% CI=1.17-1.80 for childhood-limited victimization) problems; for externalizing-only problems the association with moderate adolescence-emerging peer victimization was not statistically significant (**Table 3, Figure 3**).

Complementary analyses

The strength of the association for the rate of comorbid mental health problems (**Table S3)** and the likelihood of presenting comorbid internalizing-externalizing problems (**Table S3, Figure 3**) increased from childhood-limited to moderate adolescence-emerging and high-chronic peer victimization. Moreover, all peer victimization groups (versus the low group) were more

likely to present comorbid internalizing-externalizing problems relative to externalizing-only symptoms. The moderate adolescence-emerging and high-chronic groups had higher likelihood of presenting internalizing-only problems relative to externalizing-only problems (**Table S4**). The results of the association of peer victimization trajectories with each severe mental health problem separately were consistent with the main analyses. Of note, after accounting for early childhood factors, children in the childhood-limited group relative to those in the low trajectory presented higher likelihood of reporting suicidal ideation/attempt and smoking several cigarettes/day, while children in the moderate adolescence-emerging and high-chronic groups presented higher likelihood for several separate outcomes both on the internalizing and externalizing spectra (**Table S5** available online).

DISCUSSION

This study investigated the association of different timing and intensity of peer victimization experiences across childhood and adolescence with mental health comorbidity in young adulthood. Three main findings emerged.

First, we showed that participants who experienced peer victimization, compared to those who did not, reported higher rates of comorbid mental health problems in young adulthood and were more likely to present a pattern of comorbid internalizing-externalizing problems, regardless of the intensity and timing of peer victimization exposure - i.e., moderate or high intensity; during childhood and/or adolescence. Furthermore, we showed that children who experienced peer victimization, were more likely to present externalizing problems in combination with internalizing problems, rather than externalizing-only problems. These results are in line with studies showing that peer victimization (Forbes et al., 2020; Kretschmer et al., 2015; Rijlaarsdam et al., 2021), as well as other forms of interpersonal violence (e.g., domestic

violence, sexual abuse)(Schaefer et al., 2018) are associated with general psychopathology, rather than specific mental health problems. This may indicate that peer victimization, similar to other forms of childhood maltreatment (McLaughlin, Colich, Rodman, & Weissman, 2020), is a transdiagnostic risk factor, associated with problems across the entire spectrum of psychopathology. Importantly, we showed that the persistence and intensity of peer victimization influence the strength of the association with serious mental health problems, such as the internalizing-externalizing comorbidities. We found that persistent peer victimization of high intensity (i.e., high-chronic group) had the highest rate of comorbid mental health problems and strongest associations with comorbid internalizing-externalizing problems, followed by persistent peer victimization of moderate intensity (i.e., moderate adolescence-emerging group) and childhood-limited peer victimization. These findings corroborate those pointing out that persistent and high intensity peer victimization experiences have the most pervasive impact on mental health (Arseneault, 2018; Geoffroy et al., 2018; Hanish & Guerra, 2002; Hong, Wang, Pepler, & Craig, 2020; Moore et al., 2017). Moreover, the relative weak association of childhood-limited peer victimization with mental health comorbidities could be interpreted as a dissipation over time of the effect of transient peer victimization on mental health, which has already been documented separately for externalizing and internalizing symptoms in recent quasi-experimental studies (Schoeler et al., 2019; Singham et al., 2017). However, it is possible that this association of childhood-limited peer victimization with lingering mental health comorbidities may have been observed in our study due to residual confounding (i.e., genetic and unmeasured environmental factors).

Second, our results indicated that youth who reported persistent (i.e., moderate adolescence-emerging and high-chronic) and childhood-limited peer victimization experiences

had different profiles in terms of internalizing-only and externalizing-only symptoms. We showed that the similarities between moderate adolescence-emerging and high-chronic peer victimization groups, reported in previous studies in relationship with anxiety (Goldbaum et al., 2003; Hoffman et al., 2016; Ladd et al., 2019; McDougall & Vaillancourt, 2015), extend broadly to internalizing-only problems as well as to externalizing-only problems. On the other hand, relative to youth reporting persistent peer victimization, those in the childhood-limited peer victimization group were protected against internalizing-only problems, in line with studies showing decreasing levels of anxiety associated with desisting trajectories of peer victimization (Ladd et al., 2019; McDougall & Vaillancourt, 2015; Hoffman et al., 2016). However, childhood-limited peer victimization was associated with higher likelihood of externalizing-only problems relative to low peer victimization. A closer look at the association with each mental health outcome separately, showed that childhood-limited peer victimization was associated with suicidal ideation/attempt and cigarette smoking relative to low peer victimization, after accounting for early childhood factors. These results mirror those from studies showing associations with higher rates of substance abuse, violence and instances of arrests for childhood peer victimization (McDougall & Vaillancourt, 2015; Hoffman et al., 2016; Hanish & Guerra, 2002). Although the mechanisms of these associations should be better investigated, it is possible that negative environmental experiences such as exposure to peer victimization in childhood may increase individual pre-existing vulnerabilities (e.g., impulse-control deficits) and eventually manifest in later mental health problems (Forte et al., 2021).

Third, we showed that pre-existent vulnerabilities only accounted for part of the association between the trajectories of peer victimization and later mental health comorbidities. When covariates were taken into account in our models, the largest changes in the associations

were observed for the high-chronic victimization group across the majority of the outcomes. Previous studies have shown that liability for psychopathology accounted for a part of the association between peer victimization and later mental health problems, but did not explain it totally (Bowes et al., 2013; Schoeler et al., 2019).

This study has implications for prevention. We showed that the experiences of peer victimization most strongly associated with complex mental health comorbidities in young adulthood, i.e. persistent peer victimization, start early in childhood. Therefore, parents, educators and health professionals should monitor the persistence and severity of peer victimization since school entry. Early identification of such experience of persistent peer victimization may create opportunities for the prevention of future mental health problems which share many early risk factors with peer victimization, but usually have their onset in adolescence. Moreover, our findings suggest that future prevention efforts should take into account the diversity of the perceived peer victimization experiences and their risk factors (Oncioiu et al., 2020) to personalize interventions. For example, complementing universal bullying prevention interventions, which show only modest effects in reducing mental health problems (Gaffney, Ttofi, & Farrington, 2019), with selective and indicated prevention on the basis of children' characteristics (Bradshaw, 2015; Salmivalli, Kärnä, & Poskiparta, 2011) may enhance intervention effectiveness.

This study has also implication for research. Future studies are needed to understand the mechanisms through which different peer victimization experiences lead to different mental health comorbidities in young adulthood. For instance, there is an indication in the literature that, together with genetic factors, shared-environmental factors explain chronic peer victimization, while non-shared environmental factors explain adolescence-emerging peer victimization

(Bowes et al., 2013). Importantly, future study should explore the factors enabling some children to escape early severe peer victimization. Finally, future studies should assess to what extent genetic factors explain the association between peer victimization timing and intensity and mental health comorbidity.

Limitations

Our findings should be considered in the context of the study's limitations. First, both the outcomes and the exposure were self-reported by the participants. Therefore, associations might be overestimated because of the same-rater bias. Although other raters' assessments may avoid this bias, subjective experience is a critical element in the evaluation of peer victimization as it captures experiences that other raters may have difficulties observing (because of its nature, e.g., relational victimization, or context, e.g., school yard, bus etc.) and offers an account of the experience as lived by the child/adolescent which is essential when studying psychosocial functioning. Evidence from maltreatment literature suggests that subjective experiences are more predictive of mental health outcomes than objective experiences (Danese & Widom, 2020). Second, although for the majority of the outcomes we used validated scales based on the symptoms described in the DSM 5, we did not have access to formal diagnoses. However, our internalizing-externalizing outcome most likely reflects severe mental health problems owing to both the strict cut-offs used and the diversity of the mental health outcomes analyzed (including substance use – see Plana-Ripoll et al., 2020).Third, by accounting for children's behavior prior to school entry, it is possible that behaviors which become apparent at older ages (e.g., internalizing behaviors) or proximal behaviors which entertain bi-directional relations with peer victimization (e.g., social isolation, friendlessness - Cantin, Brendgen, Dussault, & Vitaro, 2019), may still play a role in the investigated associations. However, since our exposure captured the

evolution of peer victimization from ages 6 to 17 years, we could not isolate the contribution of behaviors which are simultaneous. Fourth, because of attrition, our study was based on 57% of the original representative sample, hence generalizability to the whole Québec population must be prudent. Fifth, we did not exclude children who were bullies at any time point from our study, therefore bully-victims are represented in the trajectories, but we cannot be certain to which trajectories they belong. Additionally, it is very likely that over the course of the 12 years, some of the children have not been only exposed to victimization, but have also been perpetrators. Sixth, propensity score only account for measured confounding factors, therefore unmeasured factors (including genetic vulnerability) may still explain the observed association. This calls for cautious interpretations of the causal nature of our associations. Seventh, we did not have enough power to test sex differences.

Conclusion

Our study showed that transient and persistent peer victimization experiences across childhood and adolescence were associated with mental health comorbidities in young adulthood, with the strongest associations observed for persistent peer victimization of high intensity. Youth who experienced persistent peer victimization of any intensity had a particularly high likelihood of presenting internalizing problems with or without externalizing problems. These findings suggest that peer victimization, especially when persistent over time should be considered as a potential intervention target when addressing severe and complex mental health problems in youth.

References

Analitis, F., Velderman, M. K., Ravens-Sieberer, U., Detmar, S., Erhart, M., Herdman, M., … European Kidscreen Group. (2009). Being bullied: Associated factors in children and adolescents 8 to 18 years old in 11 European countries. *Pediatrics*, *123*(2), 569–577. doi: 10.1542/peds.2008-0323

Andrews, G., Slade, T., & Issakidis, C. (2002). Deconstructing current comorbidity: Data from the Australian National Survey of Mental Health and Well-Being. *The British Journal of Psychiatry: The Journal of Mental Science*, *181*, 306–314. doi: 10.1192/bjp.181.4.306

Angst, J., Sellaro, R., & Ries Merikangas, K. (2002). Multimorbidity of psychiatric disorders as an indicator of clinical severity. *European Archives of Psychiatry and Clinical Neuroscience*, *252*(4), 147–154. doi: 10.1007/s00406-002-0357-6

Arseneault, L. (2018). Annual Research Review: The persistent and pervasive impact of being bullied in childhood and adolescence: implications for policy and practice. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *59*(4), 405–421. doi: 10.1111/jcpp.12841

Austin, P. C., Grootendorst, P., & Anderson, G. M. (2007). A comparison of the ability of different propensity score models to balance measured variables between treated and untreated subjects: A Monte Carlo study. *Statistics in Medicine*, *26*(4), 734–753. doi: 10.1002/sim.2580

Bogart, L. M., Elliott, M. N., Klein, D. J., Tortolero, S. R., Mrug, S., Peskin, M. F., … Schuster, M. A. (2014). Peer Victimization in Fifth Grade and Health in Tenth Grade. *Pediatrics*, *133*(3), 440–447. doi: 10.1542/peds.2013-3510

Bouman, T., van der Meulen, M., Goossens, F. A., Olthof, T., Vermande, M. M., & Aleva, E. A. (2012). Peer and self-reports of victimization and bullying: Their differential association with internalizing problems and social adjustment. *Journal of School Psychology*, *50*(6), 759–774. doi: 10.1016/j.jsp.2012.08.004

Bowes, L., Maughan, B., Ball, H., Shakoor, S., Ouellet-Morin, I., Caspi, A., … Arseneault, L. (2013). Chronic bullying victimization across school transitions: The role of genetic and environmental influences. *Development and Psychopathology*, *25*(2). doi: 10.1017/S0954579412001095

Bradshaw, C. P. (2015). Translating research to practice in bullying prevention. *American Psychologist*, *70*(4), 322–332. doi: 10.1037/a0039114

Cantin, S., Brendgen, M., Dussault, F., & Vitaro, F. (2019). Transactional links between adolescents' and friends' victimization during the first two years of secondary school: The mediating role of likeability and friendship involvement. *Social Development*, *28*(3), 743–757. doi: 10.1111/sode.12355

Caspi, A., Houts, R. M., Ambler, A., Danese, A., Elliott, M. L., Hariri, A., … Moffitt, T. E. (2020). Longitudinal Assessment of Mental Health Disorders and Comorbidities Across 4 Decades Among Participants in the Dunedin Birth Cohort Study. *JAMA Network Open*, *3*(4), e203221–e203221. doi: 10.1001/jamanetworkopen.2020.3221

Cook, C. R., Williams, K. R., Guerra, N. G., Kim, T. E., & Sadek, S. (2010). Predictors of bullying and victimization in childhood and adolescence: A meta-analytic investigation. *School Psychology Quarterly*, *25*(2), 65–83. doi: 10.1037/a0020149

Craig, W., Harel-Fisch, Y., Fogel-Grinvald, H., Dostaler, S., Hetland, J., Simons-Morton, B., … Pickett, W. (2009). A cross-national profile of bullying and victimization among adolescents in 40 countries. *International Journal of Public Health*, *54*(Suppl 2), 216–224. doi: 10.1007/s00038-009-5413-9

Danese, A., & Widom, C. S. (2020). Objective and subjective experiences of child maltreatment and their relationships with psychopathology. *Nature Human Behaviour*, 1–8. doi: 10.1038/s41562-020-0880-3

Eastman, M., Foshee, V., Ennett, S., Sotres-Alvarez, D., Reyes, H. L. M., Faris, R., & North, K. (2018). Profiles of internalizing and externalizing symptoms associated with bullying victimization. *Journal of Adolescence*, *65*, 101–110. doi: 10.1016/j.adolescence.2018.03.007

Finkelhor, D., Turner, H. A., & Hamby, S. (2012). Let's prevent peer victimization, not just bullying. *Child Abuse & Neglect*, *36*(4), 271–274. doi: 10.1016/j.chiabu.2011.12.001

Forbes, M. K., Fitzpatrick, S., Magson, N. R., & Rapee, R. M. (2019). Depression, Anxiety, and Peer Victimization: Bidirectional Relationships and Associated Outcomes Transitioning from Childhood to Adolescence. *Journal of Youth and Adolescence*, *48*(4), 692–702. doi: 10.1007/s10964-018-0922-6

Forbes, M. K., Magson, N. R., & Rapee, R. M. (2020). Evidence that Different Types of Peer Victimization have Equivalent Associations with Transdiagnostic Psychopathology in Adolescence. *Journal of Youth and Adolescence*, *49*(3), 590–604. doi: 10.1007/s10964-020-01202-4

Forte, A., Orri, M., Turecki, G., Galera, C., Pompili, M., Boivin, M., … Geoffroy, M.-C. (2021). Identifying environmental pathways between irritability during childhood and suicidal ideation and attempt in adolescence: Findings from a 20-year population-based study. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*. doi: 10.1111/jcpp.13411

Gaffney, H., Ttofi, M. M., & Farrington, D. P. (2019). Evaluating the effectiveness of school-bullying prevention programs: An updated meta-analytical review. *Aggression and Violent Behavior*, *45*, 111–133. doi: 10.1016/j.avb.2018.07.001

Geel, M. van, Vedder, P., & Tanilon, J. (2014). Relationship Between Peer Victimization, Cyberbullying, and Suicide in Children and Adolescents: A Meta-analysis. *JAMA Pediatrics*, *168*(5), 435–442. doi: 10.1001/jamapediatrics.2013.4143

Geoffroy, M.-C., Boivin, M., Arseneault, L., Renaud, J., Perret, L. C., Turecki, G., … Côté, S. M. (2018). Childhood trajectories of peer victimization and prediction of mental health outcomes in

midadolescence: A longitudinal population-based study. *CMAJ: Canadian Medical Association Journal = Journal de l'Association Medicale Canadienne*, *190*(2), E37–E43. doi: 10.1503/cmaj.170219

Goldbach, J. T., Sterzing, P. R., & Stuart, M. J. (2018). Challenging Conventions of Bullying Thresholds: Exploring Differences between Low and High Levels of Bully-Only, Victim-Only, and Bully-Victim Roles. *Journal of Youth and Adolescence*, *47*(3), 586–600. doi: 10.1007/s10964-017-0775-4

Goldbaum, S., Craig, W. M., Pepler, D., & Connolly, J. (2003). Developmental Trajectories of Victimization. *Journal of Applied School Psychology*, *19*(2), 139–156. doi: 10.1300/J008v19n02_09

Gower, A. L., & Borowsky, I. W. (2013). Associations between frequency of bullying involvement and adjustment in adolescence. *Academic Pediatrics*, *13*(3), 214–221. doi: 10.1016/j.acap.2013.02.004

Hanish, L. D., & Guerra, N. G. (2002). A longitudinal analysis of patterns of adjustment following peer victimization. *Development and Psychopathology*, *14*(1), 69–89. doi: 10.1017/s0954579402001049

Hill, L. S., Reid, F., Morgan, J. F., & Lacey, J. H. (2010). SCOFF, the development of an eating disorder screening questionnaire. *The International Journal of Eating Disorders*, *43*(4), 344–351. doi: 10.1002/eat.20679

Hoffman, C. Y., Phillips, M. D., Daigle, L. E., & Turner, M. G. (2016). Adult Consequences of Bully Victimization: Are Children or Adolescents More Vulnerable to the Victimization Experience? *Youth Violence and Juvenile Justice*. (Sage CA: Los Angeles, CA). doi: 10.1177/1541204016650004

Hong, I. K., Wang, W., Pepler, D. J., & Craig, W. M. (2020). Peer victimization through a trauma lens: Identifying who is at risk for negative outcomes. *Scandinavian Journal of Psychology*, *61*(1), 6–16. doi: 10.1111/sjop.12488

Jadambaa, A., Thomas, H. J., Scott, J. G., Graves, N., Brain, D., & Pacella, R. (2019). Prevalence of traditional bullying and cyberbullying among children and adolescents in Australia: A systematic review and meta-analysis. *The Australian and New Zealand Journal of Psychiatry*, *53*(9), 878–888. doi: 10.1177/0004867419846393

Jetté, M. (2002). *Survey Description and Methodology – Part I – Logistics and Longitudinal Data Collections* (No. Vol. 2, No. 1). Québec, Canada: Institut de la statistique du Québec.

Kessler, R. C., Adler, L. A., Ames, M., Demler, O. V., Faraone, S., Hiripi, E., … Walters, E. E. (2005). The World Health Organization Adult ADHD Self-Report Scale (ASRS): A short screening scale for use in the general population. *Psychological Medicine*, *35*(2), 245–256. doi: 10.1017/S0033291704002892

Kessler, R. C., Adler, L. A., Gruber, M. J., Sarawate, C. A., Spencer, T., & Van Brunt, D. L. (2007). Validity of the World Health Organization Adult ADHD Self-Report Scale (ASRS) Screener in a representative sample of health plan members. *International Journal of Methods in Psychiatric Research*, *16*(2), 52–65. doi: 10.1002/mpr.208

Kessler, R. C., Chiu, W. T., Demler, O., & Walters, E. E. (2005). Prevalence, Severity, and Comorbidity of Twelve-month DSM-IV Disorders in the National Comorbidity Survey Replication (NCS-R). *Archives of General Psychiatry*, *62*(6), 617. doi: 10.1001/archpsyc.62.6.617

Klomek, A. B., Marrocco, F., Kleinman, M., Schonfeld, I. S., & Gould, M. S. (2008). Peer victimization, depression, and suicidiality in adolescents. *Suicide & Life-Threatening Behavior*, *38*(2), 166–180. doi: 10.1521/suli.2008.38.2.166

Kretschmer, T., Barker, E. D., Dijkstra, J. K., Oldehinkel, A. J., & Veenstra, R. (2015). Multifinality of peer victimization: Maladjustment patterns and transitions from early to mid-adolescence. *European Child & Adolescent Psychiatry*, *24*(10), 1169–1179. doi: 10.1007/s00787-014-0667-z

Ladd, G. W., Ettekal, I., & Kochenderfer-Ladd, B. (2017). Peer Victimization Trajectories From Kindergarten Through High School: Differential Pathways for Children's School Engagement and Achievement? *Journal of Educational Psychology*. doi: 10.1037/edu0000177

Ladd, G. W., Ettekal, I., & Kochenderfer-Ladd, B. (2019). Longitudinal Changes in Victimized Youth's Social Anxiety and Solitary Behavior. *Journal of Abnormal Child Psychology*, *47*(7), 1211–1223. doi: 10.1007/s10802-018-0467-x

Ladd, G. W., & Kochenderfer-Ladd, B. (2002). Identifying victims of peer aggression from early to middle childhood: Analysis of cross-informant data for concordance, estimation of relational adjustment, prevalence of victimization, and characteristics of identified victims. *Psychological Assessment*, *14*(1), 74–96.

McDougall, P., & Vaillancourt, T. (2015). Long-term adult outcomes of peer victimization in childhood and adolescence: Pathways to adjustment and maladjustment. *The American Psychologist*, *70*(4), 300–310. doi: 10.1037/a0039174

McLaughlin, K. A., Colich, N. L., Rodman, A. M., & Weissman, D. G. (2020). Mechanisms linking childhood trauma exposure and psychopathology: A transdiagnostic model of risk and resilience. *BMC Medicine*, *18*(1), 96. doi: 10.1186/s12916-020-01561-6

Merikangas, K. R., He, J., Burstein, M., Swanson, S. A., Avenevoli, S., Cui, L., … Swendsen, J. (2010). Lifetime Prevalence of Mental Disorders in US Adolescents: Results from the National Comorbidity Study-Adolescent Supplement (NCS-A). *Journal of the American Academy of Child and Adolescent Psychiatry*, *49*(10), 980–989. doi: 10.1016/j.jaac.2010.05.017

Modecki, K. L., Minchin, J., Harbaugh, A. G., Guerra, N. G., & Runions, K. C. (2014). Bullying prevalence across contexts: A meta-analysis measuring cyber and traditional bullying. *The Journal of Adolescent Health: Official Publication of the Society for Adolescent Medicine*, *55*(5), 602–611. doi: 10.1016/j.jadohealth.2014.06.007

Moore, S. E., Norman, R. E., Suetani, S., Thomas, H. J., Sly, P. D., & Scott, J. G. (2017). Consequences of bullying victimization in childhood and adolescence: A systematic review and meta-analysis. *World Journal of Psychiatry*, *7*(1), 60–76. doi: 10.5498/wjp.v7.i1.60

Morgan, J. F., Reid, F., & Lacey, J. H. (1999). The SCOFF questionnaire: Assessment of a new screening tool for eating disorders. *BMJ (Clinical Research Ed.)*, *319*(7223), 1467–1468. doi: 10.1136/bmj.319.7223.1467

Oncioiu, S. I., Orri, M., Boivin, M., Geoffroy, M.-C., Arseneault, L., Brendgen, M., … Côté, S. M. (2020). Early Childhood Factors Associated With Peer Victimization Trajectories From 6 to 17 Years of Age. *Pediatrics*. doi: 10.1542/peds.2019-2654

Orri, M., Boivin, M., Chen, C., Ahun, M. N., Geoffroy, M.-C., Ouellet-Morin, I., … Côté, S. M. (2020). Cohort Profile: Quebec Longitudinal Study of Child Development (QLSCD). *Social Psychiatry and Psychiatric Epidemiology*. doi: 10.1007/s00127-020-01972-z

Plana-Ripoll, O., Musliner, K. L., Dalsgaard, S., Momen, N. C., Weye, N., Christensen, M. K., … McGrath, J. J. (2020). Nature and prevalence of combinations of mental disorders and their association with excess mortality in a population-based cohort study. *World Psychiatry*, *19*(3), 339–349. doi: 10.1002/wps.20802

Poulin, C., Hand, D., & Boudreau, B. (2005). Validity of a 12-item version of the CES-D used in the National Longitudinal Study of Children and Youth. *Chronic Diseases in Canada*, *26*(2–3), 65–72.

Ranta, K., Kaltiala-Heino, R., Pelkonen, M., & Marttunen, M. (2009). Associations between peer victimization, self-reported depression and social phobia among adolescents: The role of comorbidity. *Journal of Adolescence*, *32*(1), 77–93. doi: 10.1016/j.adolescence.2007.11.005

Reijntjes, A., Kamphuis, J. H., Prinzie, P., Boelen, P. A., van der Schoot, M., & Telch, M. J. (2011). Prospective linkages between peer victimization and externalizing problems in children: A meta-analysis. *Aggressive Behavior*, *37*(3), 215–222. doi: 10.1002/ab.20374

Reijntjes, A., Kamphuis, J. H., Prinzie, P., & Telch, M. J. (2010). Peer victimization and internalizing problems in children: A meta-analysis of longitudinal studies. *Child Abuse & Neglect*, *34*(4), 244–252. doi: 10.1016/j.chiabu.2009.07.009

Rijlaarsdam, J., Cecil, C. A. M., Buil, J. M., van Lier, P. A. C., & Barker, E. D. (2021). Exposure to Bullying and General Psychopathology: A Prospective, Longitudinal Study. *Research on Child and Adolescent Psychopathology*, *49*(6), 727–736. doi: 10.1007/s10802-020-00760-2

Salmivalli, C., Kärnä, A., & Poskiparta, E. (2011). Counteracting bullying in Finland: The KiVa program and its effects on different forms of being bullied. *International Journal of Behavioral Development*, *35*(5), 405–411. doi: 10.1177/0165025411407457

Schaefer, J. D., Moffitt, T. E., Arseneault, L., Danese, A., Fisher, H. L., Houts, R., … Caspi, A. (2018). Adolescent Victimization and Early-Adult Psychopathology: Approaching Causal Inference Using a Longitudinal Twin Study to Rule Out Noncausal Explanations. *Clinical Psychological Science: A Journal of the Association for Psychological Science*, *6*(3), 352–371. doi: 10.1177/2167702617741381

Schoeler, T., Choi, S. W., Dudbridge, F., Baldwin, J., Duncan, L., Cecil, C. M., … Pingault, J.-B. (2019). Multi-Polygenic Score Approach to Identifying Individual Vulnerabilities Associated With the Risk of Exposure to Bullying. *JAMA Psychiatry*. doi: 10.1001/jamapsychiatry.2019.0310

Schoeler, T., Duncan, L., Cecil, C. M., Ploubidis, G. B., & Pingault, J.-B. (2018). Quasi-experimental evidence on short- and long-term consequences of bullying victimization: A meta-analysis. *Psychological Bulletin*, *144*(12), 1229–1246. doi: 10.1037/bul0000171

Singham, T., Viding, E., Schoeler, T., Arseneault, L., Ronald, A., Cecil, C. M., … Pingault, J.-B. (2017). Concurrent and Longitudinal Contribution of Exposure to Bullying in Childhood to Mental Health: The Role of Vulnerability and Resilience. *JAMA Psychiatry*, *74*(11), 1112–1119. doi: 10.1001/jamapsychiatry.2017.2678

Smith, P. K., Talamelli, L., Cowie, H., Naylor, P., & Chauhan, P. (2004). Profiles of non-victims, escaped victims, continuing victims and new victims of school bullying. *The British Journal of Educational Psychology*, *74*(Pt 4), 565–581. doi: 10.1348/0007099042376427

Spitzer, R. L., Kroenke, K., Williams, J. B. W., & Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder: The GAD-7. *Archives of Internal Medicine*, *166*(10), 1092–1097. doi: 10.1001/archinte.166.10.1092

Stapinski, L. A., Bowes, L., Wolke, D., Pearson, R. M., Mahedy, L., Button, K. S., … Araya, R. (2014). Peer victimization during adolescence and risk for anxiety disorders in adulthood: A prospective cohort study. *Depression and Anxiety*, *31*(7), 574–582. doi: 10.1002/da.22270

Stuart, E. A. (2010). Matching Methods for Causal Inference: A Review and a Look Forward. *Statistical Science*, *25*(1), 1–21. doi: 10.1214/09-STS313

Ttofi, M. M., Farrington, D. P., & Lösel, F. (2012). School bullying as a predictor of violence later in life: A systematic review and meta-analysis of prospective longitudinal studies. *Aggression and Violent Behavior*, *17*(5), 405–418. doi: 10.1016/j.avb.2012.05.002

van der Ploeg, R., Steglich, C., Salmivalli, C., & Veenstra, R. (2015). The Intensity of Victimization: Associations with Children's Psychosocial Well-Being and Social Standing in the Classroom. *PLoS ONE*, *10*(10). doi: 10.1371/journal.pone.0141490

Weye, N., Momen, N. C., Christensen, M. K., Iburg, K. M., Dalsgaard, S., Laursen, T. M., … Plana-Ripoll, O. (2020). Association of Specific Mental Disorders With Premature Mortality in the Danish Population Using Alternative Measurement Methods. *JAMA Network Open*, *3*(6), e206646. doi: 10.1001/jamanetworkopen.2020.6646

World Health Organization, (2001). *AUDIT: The Alcohol Use Disorders Identification Test : guidelines for use in primary health care*. Retrieved from https://apps.who.int/iris/handle/10665/67205

Table 1. Early childhood characteristics and mental health in young adulthood by peer victimization trajectories

		Peer victimization trajectories			
	Overall	**Low**	**Childhood-limited**	**Moderate adolescence-emerging**	**High-chronic**
n	1216	415	310	360	131
Mental health outcomes, No. (%)					
Type of mental health problems					
No problem	690 (56.7)	276 (66.5)	167 (53.9)	185 (51.4)	62 (47.3)
Internalizing problems only	165 (13.6)	49 (11.8)	40 (12.9)	58 (16.1)	18 (13.7)
Externalizing problems only	218 (17.9)	65 (15.7)	68 (21.9)	64 (17.8)	21 (16.0)
Internalizing-externalizing comorbidities	143 (11.8)	25 (6.0)	35 (11.3)	53 (14.7)	30 (22.9)
Internalizing problems, No. (%)					
Severe depression	77 (6.3)	14 (3.4)	14 (4.5)	31 (8.6)	18 (13.7)
Severe anxiety	64 (5.3)	17 (4.1)	11 (3.5)	21 (5.8)	15 (11.5)
Eating disorders	170 (14.0)	41 (9.9)	40 (12.9)	64 (17.8)	25 (19.1)
Suicidal ideation/Attempt	124 (10.2)	23 (5.5)	35 (11.3)	43 (11.9)	23 (17.6)
Externalizing problems, No. (%)					
ADHD	89 (7.3)	24 (5.8)	24 (7.7)	26 (7.2)	15 (11.5)
Conduct problems	57 (4.7)	9 (2.2)	16 (5.2)	23 (6.4)	9 (6.9)
High risk use of alcohol (AUDIT)	46 (3.8)	11 (2.7)	15 (4.8)	13 (3.6)	7 (5.3)
Several cigarettes/day	91 (7.5)	11 (2.7)	30 (9.7)	34 (9.4)	16 (12.2)
Cannabis use 3 times/week or more	121 (10.0)	24 (5.8)	30 (9.7)	45 (12.5)	22 (16.8)
Hard drugs occasional use	184 (15.1)	47 (11.3)	55 (17.7)	54 (15.0)	28 (21.4)
Early childhood characteristics, Mean (SD) or No. (%)					
Boy, No. (%)	517 (42.5)	143 (34.5)	127 (41.0)	169 (46.9)	78 (59.5)
First born, No. (%)	556 (45.7)	187 (45.1)	136 (43.9)	167 (46.4)	66 (50.4)
Socioeconomic disadvantage	3.89 (0.97)	3.82 (0.97)	3.95 (0.94)	3.86 (1.02)	4.05 (0.91)
Separated family, No. (%)	350 (28.8)	100 (24.2)	96 (31.0)	101 (28.1)	53 (40.5)
Childcare services participation, No. (%)	825 (67.8)	265 (63.9)	218 (70.3)	242 (67.2)	100 (76.3)
Parental age, mental health and parenting, Mean (SD) or No. (%)					
Maternal age	29.17 (5.04)	29.48 (4.92)	28.60 (4.96)	29.53 (5.10)	28.52 (5.31)
Paternal age	31.91 (5.52)	32.14 (5.29)	31.25 (5.84)	32.37 (5.35)	31.49 (5.79)

Table 1 (continued). Early childhood characteristics and mental health in young adulthood by peer victimization trajectories

		Peer victimization trajectories			
	Overall	**Low**	**Childhood-limited**	**Moderate adolescence-emerging**	**High-chronic**
n	1216	415	310	360	131
Maternal antisocial behavior, No. (%)	16 (18.3)	66 (16.3)	55 (18.3)	66 (18.8)	29 (23.0)
Paternal antisocial behavior, No. (%)	187 (17.2)	46 (12.3)	46 (16.5)	69 (21.5)	26 (22.8)
Maternal smoking (pregnancy) , No. (%)	230 (19.0)	61 (14.7)	59 (19.2)	79 (22.1)	31 (23.8)
Maternal alcohol use (pregnancy) , No. (%)	190 (15.7)	55 (13.3)	44 (14.2)	69 (19.3)	22 (16.9)
Maternal depression	1.33 (1.13)	1.22 (1.06)	1.32 (1.05)	1.42 (1.24)	1.45 (1.17)
Paternal depression	1.04 (0.99)	0.95 (0.94)	1.04 (1.00)	1.09 (1.01)	1.16 (1.09)
Maternal anxiety	1.21 (1.21)	1.17 (1.26)	1.22 (1.17)	1.20 (1.16)	1.37 (1.26)
Paternal anxiety	1.20 (1.21)	1.08 (1.12)	1.24 (1.18)	1.19 (1.21)	1.54 (1.48)
Mother positive parenting	6.55 (0.88)	6.61 (0.86)	6.54 (0.91)	6.50 (0.90)	6.57 (0.87)
Father positive parenting	6.09 (1.18)	6.20 (1.20)	6.08 (1.17)	5.98 (1.16)	5.99 (1.13)
Mother coercive parenting	2.90 (0.99)	2.73 (0.92)	2.95 (0.92)	2.93 (1.07)	3.19 (1.05)
Father coercive parenting	2.54 (1.02)	2.40 (0.98)	2.65 (1.02)	2.54 (1.03)	2.72 (1.10)
Child's early childhood behavior rated by the mother, Mean (SD)					
Aggression	1.85 (1.07)	1.68 (1.03)	1.88 (0.96)	1.94 (1.18)	2.09 (1.11)
Hyperactivity	3.82 (1.65)	3.45 (1.59)	3.94 (1.62)	3.90 (1.64)	4.49 (1.67)
Internalizing behavior	1.20 (0.93)	1.22 (0.95)	1.13 (0.89)	1.26 (0.95)	1.15 (0.85)
Social withdrawal	3.19 (1.77)	3.42 (1.78)	2.95 (1.65)	3.20 (1.81)	3.05 (1.83)
Pre-school peer victimization	1.47 (1.22)	1.34 (1.16)	1.45 (1.22)	1.53 (1.25)	1.73 (1.31)
Child's early childhood behavior rated by the father, Mean (SD)					
Aggression	1.86 (1.24)	1.68 (1.19)	1.92 (1.26)	1.94 (1.29)	2.08 (1.18)
Hyperactivity	3.58 (1.60)	3.22 (1.57)	3.73 (1.54)	3.62 (1.59)	4.27 (1.54)
Internalizing behavior	1.68 (1.26)	1.63 (1.25)	1.62 (1.28)	1.71 (1.23)	1.87 (1.37)
Social withdrawal	3.49 (1.52)	3.61 (1.51)	3.32 (1.46)	3.54 (1.56)	3.40 (1.58)
Pre-school peer victimization	1.13 (1.10)	0.99 (1.04)	1.23 (1.17)	1.20 (1.12)	1.18 (0.98)

Data were compiled from the final master file of the Québec Longitudinal Study of Child Development (1998–2018), ©Gouvernement du Québec, Institut de la statistique du Québec.

Table 2. Description of instruments used for the assessment of mental health at 20 years old

Outcome, Scale	No. items (examples)	Scale score and cut-offs for severe symptoms
Internalizing outcomes		
Depression		
CES-D short version CES-D-12-NLSCY	12 items referring to the past week, e.g., 'my appetite was poor', 'I could not shake off the blues', 'I felt depressed', 'I felt that people disliked me' Response options: 0=Rarely/less than 1 day to 3=Most of the time/5-7 days	Score range 0-36; (Poulin et al., 2005) 1=Very elevated symptoms (score >=21); 0=Otherwise.
Anxiety		
Generalized Anxiety Disorder-7 (GAD-7)	7 items referring to the past 2 weeks, e.g., 'feeling nervous, anxious or on edge', 'not being able to stop or control worrying', 'becoming easily annoyed or irritable' Response options: 0=Not at all to 3=Nearly every day	Score ranges from 0-21;(Spitzer et al., 2006) 1=Very severe symptoms (score>=15); 0=Otherwise.
Eating disorders		
SCOFF Questionnaire. (Morgan et al., 1999)	5 items referring to the past 12 months, e.g., 'I made myself sick for fear of gaining weight.' I believed myself to be too fat when others said I was too thin', 'I lost over 13 pounds (6 kilos)' Response options: 0=No; 1=Yes	Score ranges from 0-5; (Hill et al., 2010) 1=Response 'Yes' for 3 or more items, 0=Otherwise.
Suicidal ideation/attempt		
	2 questions referring to the past 12 months concerning suicide attempts and suicidal ideation Response options: 0=No; 1=Yes	1=Response 'Yes' for either suicide attempt or ideation; 0=No suicide attempt, nor ideation
Externalizing outcomes		
Attention deficit disorder with/without hyperactivity		
Adult ADHD Self-Report Scale Screener (ASRS-v1.1 Part A) Checklist (Kessler et al., 2005)	6 items referring to the past 6 months, e.g., 'do you have trouble wrapping up the final details of a project, once the challenging parts have been done', 'when you have a task that requires a lot of thought, do you avoid or delay getting started', 'do you fidget or squirm with your hands or feet when you have to sit down for a long time' Response options: 0=Never to 4=Very often	Score ranges from 0-24; (Kessler et al., 2007) 1=Very elevated symptoms (score >=18), 0=Otherwise

Table 2 (continued). Description of instruments used for the assessment of mental health at 20 years old

Outcome, Scale	No items (examples)	Scale score and cut-offs for severe symptoms
Conduct problems		Score range 0-7;
Self-reported Delinquency Questionnaire	7 items referring to the past 12 months, e.g., 'have you gone into a place without paying when payment was required', 'have you gotten into a fist fight with someone else', 'have you spread false rumours to destroy someone's reputation', 'have you been arrested and taken to a police station because you did something illegal' Response options: 0=No, 1=Yes	1=Response 'Yes' for 3 or more items, 0=Otherwise.
Alcohol abuse		
AUDIT Scale	10 items referring to the past 12 months, eg., 'How often have you been unable to remember what happened the night before because you had been drinking?';'How often have you found that you were not able to stop drinking once you started?' Response options: 0=Never to 4= Daily or almost daily	Score ranging from 0-20; (WHO, 2001) 1= Risky use (score >=16) 0=Otherwise.
Cigarette smoking several times/day – past month		
	1 question referring to the past month Response options: 0=Never to 4=Every day, several times/day	1=Response 'Yes' for the option 'Every day, several times/day', 0=Otherwise.
Cannabis use 3 time or more/week – past 12 months		
	1 question referring to the past 12 months Response options: 0=Never to 5= Every day	1= Response 'Yes' for the option '3 times or more times a week, but not every day' or other option with higher frequency; 0=Otherwise.
Occasional use of hard drugs – past 12 months		
	5 questions referring to past 12 months on the use of any of the following illicit drugs: cocaine, glue/solvents, hallucinogens, heroin, amphetamines/speed Response options: 0=Never, 1=Occasionally to 5= Every day	1= Response 'Yes' for the option 'occasionally' or other option with higher frequency; 0=Otherwise.

Table 3. Association of peer victimization trajectories for 6 to 17 years of age with mental health comorbidities at 20 years of age.*

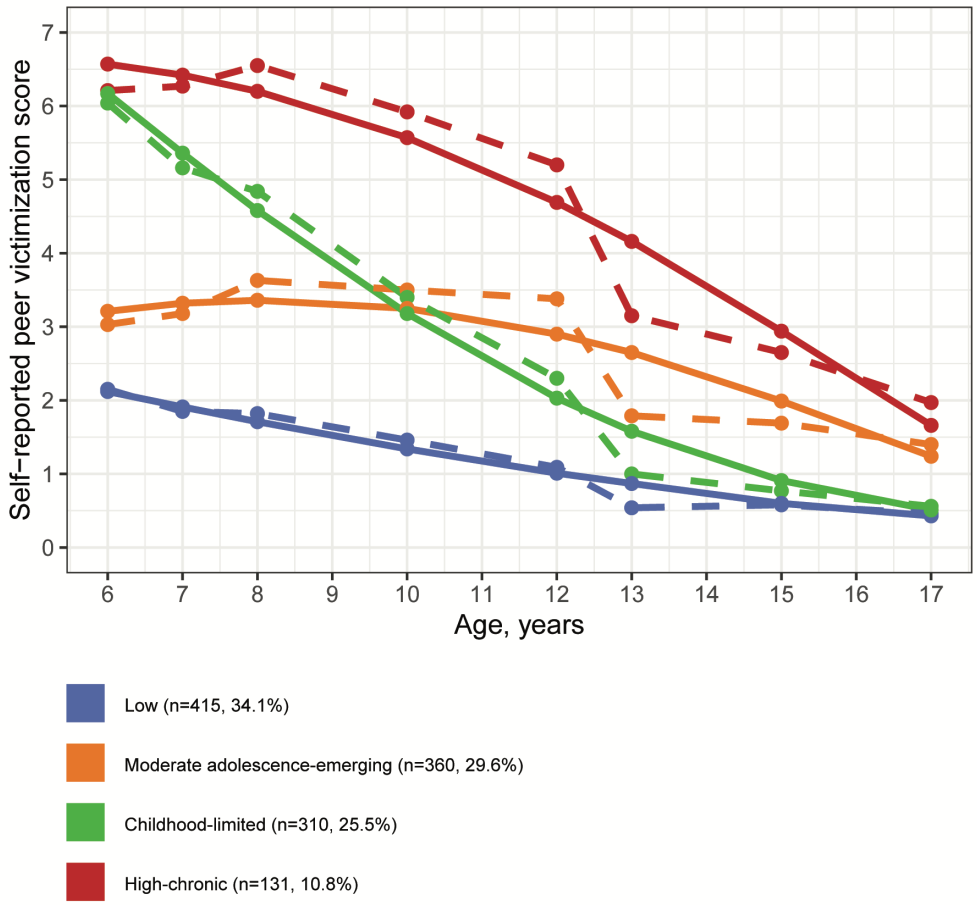
	Crude estimates			Adjusted estimates		
	Childhood-limited	**Moderate-emerging**	**High-chronic**	**Childhood-limited**	**Moderate adolescence-emerging**	**High-chronic**
Severe mental health problems count	**RR (95%CI)**	**RR (95%CI)**	**RR (95%CI)**	**RR (95%CI)**	**RR (95%CI)**	**RR (95%CI)**
	1.63 (1.30-2.08)	1.84 (1.48-2.32)	2.56 (1.93-3.39)	1.49 (1.31-1.70)	1.71 (1.51-1.94)	2.35 (2.04-2.70)
Type of mental health problems	**OR (95%CI)**	**OR (95%CI)**	**OR (95%CI)**	**OR (95%CI)**	**OR (95%CI)**	**OR (95%CI)**
No problem	ref	ref	ref	ref	ref	ref
Internalizing only	1.35 (0.85 -2.14)	1.77 (1.16-2.70)	1.64 (0.89-3.00)	1.39 (1.07-1.80)	2.00 (1.56-2.57)	2.23 (1.64-3.03)
Externalizing only	1.73 (1.17-2.56)	1.47 (0.99-2.17)	1.44 (0.82-2.53)	1.45 (1.17-1.80)	1.17 (0.93-1.46)	1.33 (1.02-1.72)
Comorbid	2.31 (1.34-4.00)	3.16 (1.90-5.27)	5.34 (2.94-9.71)	2.06 (1.52-2.79)	3.01 (2.25-4.03)	4.34 (3.15-5.98)

* Reference group for exposure: low peer victimization trajectory; Adjusted estimates for parent, family and child behavioral characteristics using propensity score inverse probability weights. Data were compiled from the final master file of the Québec Longitudinal Study of Child Development (1998–2018), ©Gouvernement du Québec, Institut de la statistique du Québec.

Figures Titles and Legends

Figure 1.

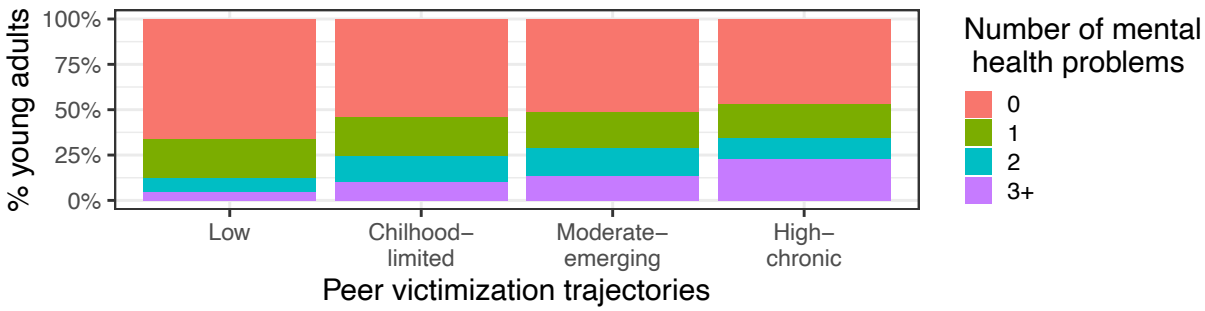
Title: Trajectories of self-reported peer victimization from 6 to 17 years of age. Reprinted from Oncioiu et al. (2020)



Footnote: Dashed lines represent trajectories for the observed values and solid lines represent trajectories as estimated by our model. To model the slope of the trajectories we used linear term for the low trajectory and quadratic terms for the other trajectories. Fit indices of the model include: Bayesian information criterion: -21168.9; entropy: median 0.75, range 0.66-0.80 (i.e., quality of the classification; adequate if >0.70) and odds of correct classification: median 7.3, range 4.7-31.7 (i.e., the model classifies the participants 7.3 times better than the classification by chance; adequate if >5.0). Please note color figures are available online. Data were compiled from the final master file of the Québec Longitudinal Study of Child Development (1998–2018), ©Gouvernement du Québec, Institut de la statistique du Québec.

Figure 2.

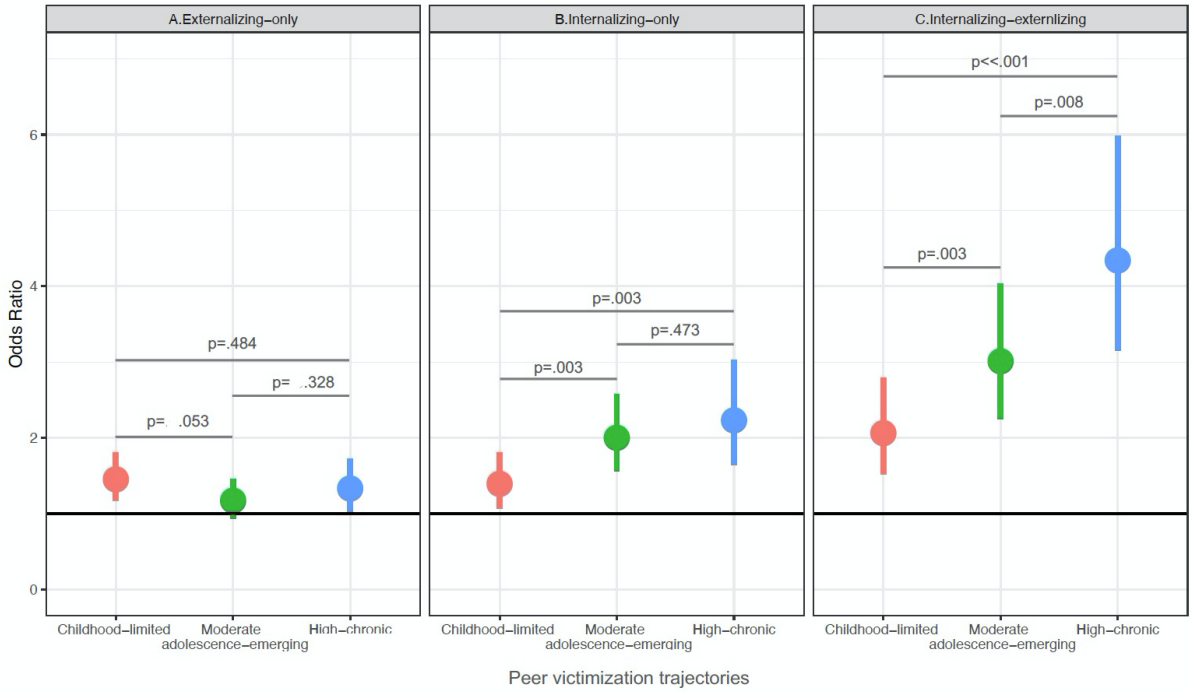
Title: Mental health comorbidities in young adulthood according to trajectories of peer victimization from 6 to 17 years of age



Footnote: The figure shows the proportion of participants (y-axis) reporting 0, 1, 2, 3+ severe mental health problems for each peer victimization trajectory (x-axis). Data were compiled from the final master file of the Québec Longitudinal Study of Child Development (1998–2018) ©Gouvernement du Québec, Institut de la statistique du Québec.

Figure 3.

Title: Association between peer victimization trajectories and type of mental health comorbidities at age 20 years



Footnote: The figure shows odds ratio and 95% confidence intervals (y-axis) for the association between peer victimization trajectories (x-axis) and type of mental health comorbidity (panels). Estimates are from the adjusted multinomial regression. The reference category for the exposure was the low peer victimization group, while the reference category for outcome was the group with no mental health problems. P-values refer to contrasts (OR and 95% CI) between the peer victimization groups available in Supplemental Material, Table S3. Data were compiled from the final master file of the Québec Longitudinal Study of Child Development (1998–2018), ©Gouvernement du Québec, Institut de la statistique du Québec.

Supplementary material

Table S1. Baseline characteristics among participants and non-participants

	Participants	**Non-participants**	**p-value**
n	1216	904	
Boy, No. (%)	517 (42.5)	563 (62.3)	<0.001
Maternal age	29.17 (5.04)	28.49 (5.44)	0.003
Paternal age	31.91 (5.52)	31.74 (5.81)	0.502
Maternal low education	181 (14.9)	204 (22.6)	<0.001
Paternal low education	236 (19.9)	227 (26.3)	0.001
Non-Canadian origins	429 (35.5)	336 (37.5)	0.365
First born	556 (45.7)	380 (42.0)	0.1
Maternal history of antisocial behavior	216 (18.3)	162 (18.9)	0.743
Paternal history of antisocial behavior	187 (17.2)	129 (17.9)	0.727
Maternal smoking during entire pregnancy	230 (19.0)	195 (21.7)	0.143
Paternal smoking during entire pregnancy	190 (15.7)	96 (10.7)	0.001
Maternal depressive symptoms	1.33 (1.13)	1.51 (1.22)	<0.001
Paternal depressive symptoms	1.04 (0.99)	1.12 (1.07)	0.078
Non-intact family	244 (20.1)	245 (27.2)	<0.001
Birth weight	3.403 (0.495)	3.404 (0.503)	0.951
Difficult temperament	2.54 (1.28)	2.61 (1.36)	0.241
Socioeconomic disadvantage	3.86 (0.98)	4.22 (0.97)	<0.001
Coercive mothering	2.21 (1.65)	2.08 (1.69)	0.063
Coercive fathering	2.31 (1.74)	2.24 (1.78)	0.381
Maternal overprotection	4.94 (2.19)	5.30 (2.16)	<0.001
Paternal overprotection	4.00 (2.12)	4.34 (2.18)	0.001

Note: Among the non-participants, 544 were excluded as they did not have measures of mental health at age 20 years old despite having at least one measure of peer victimization between ages 6 and 17 years. These 544 excluded participants were distributed across peer victimization trajectories as follows: low (n= 164, 28.3%), childhood-limited (n=151, 32.7%), moderate-emerging (n=165, 31.42%), high-chronic (n=64, 32.82%).

Table S2. Indices Used to Determine the Best Fitting Model Between Estimated Models with 2 to 8 Latent Clusters and Quadratic Age Term (N=1760)

Number of latent clusters	Bayesian Information Criterion (BIC)*	Size of the smallest cluster	Average posterior probability (APP)	Odds of correct classification (OCC)
		n (%)	Median (range)	Median (range)
2	-21348.4	869 (49.4)	0.88 (0.88, 0.89)	7.6 (7.2, 8)
3	-21255.5	227 (12.9)	0.81 (0.79, 0.84)	11.9 (2.9,29.4)
4	-21171.8	203 (11.5)	0.75 (0.67, 0.80)	7.8 (4.3, 30.8)
5	-21138.1	118 (6.7)	0.74 (0.67, 0.79)	14.6 (2.9; 44.3)
6	-21120.5	91 (5.2)	0.70 (0.64, 0.77)	13.1 (3.6; 62.7)
7	-21103.3	49 (2.8)	0.67 (0.59, 0.77)	18.6 (4.0, 117.9)
8	-21103.2	57 (3.2)	0.69 (0.60, 0.76)	31.7 (2.6; 93.3)

*In group-based trajectory modeling, the BIC is always negative and the model with the value of BIC closer to 0 fits better the data (i.e., being on the negative scale, this means the higher BIC, the better the model fit).

Note 1: All models are based on the maximum available sample n=1760.The BIC increased sharply from the 3- to the 4-group solution and then slightly from the 5- through the 7-group solution. The 4-group solution was selected as it was conceptually meaningful (revealed distinct features of the data that were substantively relevant from a conceptual point of view) and provided the best balance between the fit indices evaluated (increased BIC, size of the smaller cluster >5% of the sample, quality of the classification, APP >.70 and odds of correct classification, classifying participants better than classification by chance, OCC>5).

Note 2: We also derived the trajectories of peer victimization among all participants with at least 3 measures of peer victimization between ages 6 and 17 years (n=1551). We obtain the same trajectories in terms of number, shape, with the following proportions of the participants assigned to each trajectory: low (n=473, 30.5%), childhood-limited (n=393, 25.3%), moderate adolescence-emerging (n=495, 31.9%), high-chronic (n=190, 12.3%). The associations of these trajectories (based on at least 3 repeated measure of peer victimization) with early childhood factors and mental health comorbidities at age 20 years gave similar results to those of the trajectories with at least one measure of peer victimization between 6 and 17 years of age. Therefore, we decided to go further with the model estimated among participants with at least 1 measure of peer victimization from 6 to 17 years of age (n=1760) which maximizes the sample size.

Table S3. Description of the Measurement Instruments for Early Childhood Behavior and Family Characteristics (5 months – 5 years)*

Characteristics	Child age at measurement[a]	Range[b]	Example of items	Instrument and references
Familial and parental factors				
Socioeconomic disadvantage	5 m, 1½, 2½, 4½, 5 y	0-8	Standardized aggregate index of 5 items relating to annual gross income, parental education level, and occupational prestige	Index computed by Statistics Canada[37]
Separated family	5 m, 1½, 2½, 3½, 4½, 5 y		1= the child was living in a single-parent family or blended family, i.e., living with step siblings at minimum one time point; 0 = otherwise.	
History of antisocial behavior	5 m		5 items (mother), 4 items (father), e.g., *trouble with the police or arrested; get into fights that you had started*. Derived measure:1= engaged in 2 or more behaviors during adolescence, 0= otherwise.	Modified from NIMH-DIS [38]
Depressive symptoms	Mother:5 m, 1½y; father: 5 m	0-10	12 items, e.g., *did not feel like eating; felt lonely; had crying spells* (0=less 1 day/week to 3= 5-7days/week).	Short version of CES-D scale[39]
Anxiety	Mother & Father: 4½		10 items, e.g., *be afraid and avoid certain places; feel tension in the body; be disturbed by thoughts; daily life affected by memories* (0=never to 4= always).	
Smoking during pregnancy	5 m		1 item referring to the use of cigarettes during the entire pregnancy.	
Alcohol use during pregnanacy	5 m		1 item referring to the use of alcohol during the entire pregnancy.	
Positive parenting	Mother: 2½, 3½, 4½, 5 y; father: 3½, 4½, 5 y	0-10	5-9 items, e.g., *calmly discuss the problem; play sports activities or games together; praise the child* (0=never to 5= several times/day).	Parenting Practices Scale[40]
Coercive parenting	Mother: 2½, 3½, 4½, 5 y; father: 3½, 4½, 5 y	0-10	5-8 items, e.g., *use physical punishment, tell the child is not as good as others* (0=never to 5= several times/day).	

Table S3 (continued). Description of the Measurement Instruments for Early Childhood Behavior and Family Characteristics (5 months – 5 years)*

Characteristics	Child age at measurement[a]	Range[b]	Example of items	Instrument and references
Child behavior, peer victimization reported by the mother and the father and child care services attendance				
Pre-school peer victimization	Mother & Father: 3½, 4½, 5 y		10-12 items, e.g., *made fun of*; *hit or pushed; called names by other children* (0=never to 2=often).	
Aggression	Mother: 1½, 2½, 3½, 4½, 5 y Father: 3½, 4½, 5 y	0-10	10-12 items, e.g., *hits, bites, kicks; encourages children to pick on a particular child; reacts in an aggressive manner when something is taken away from him/her* (0=never to 2=often).	Preschool Behavior Questionnaire[41,42]
Hyperactivity	Mother: 1½, 2½, 3½, 4½, 5 y Father: 3½, 4½, 5 y	0-10	5-7 items, e.g., *cannot sit still, is restless or hyperactive; has difficulty waiting for his/her turn in games; is fidgety* (0=never to 2=often).	Preschool Behavior Questionnaire[41,42]
Internalizing behavior	Mother: 1½, 2½, 3½, 4½, 5 y Father: 3½, 4½, 5 y	0-10	5 items, e.g*., is nervous, is high-strung or tense; is too fearful or anxious* (0=never to 2=often).	Preschool Behavior Questionnaire[41,42]
Social withdrawal	Mother & Father: 3½, 4½, 5 y	0-10	3-4 items, e.g., *tends to play alone; not much interest for activities with other children* (0=never to 2=often).	Preschool Behavior Questionnaire[41,42]
Participation in child care services	Mother: 0½, 1½, 2½, 3½, 4½, 5 y		3 items about the use of childcare services (yes/no), the type and the number of attendance hours/week. Using the repeated measurements of the number of hours per week in child care services, Laurin et al., derived 3 trajectories which capture the age of entry into and intensity of use of child care services (Laurin et al., 2015)	

Table S4. Association of peer victimization trajectories for 6 to 17 years of age with mental health comorbidities at 20 years of age

	Adjusted estimates (reference group: high-chronic group)										
	Childhood-limited				**Moderate-emerging**				**Low**			
	RR	**95% CI**		**p-value**	**RR**	**95% CI**		**p-value**	**RR**	**95% CI**		**p-value**
Severe mental health problems count												
	0.63	0.56	0.72	<0.001	0.73	0.64	0.83	<0.001	0.43	0.37	0.49	<0.001
	OR	**95% CI**		**p-value**	**OR**	**95% CI**		**p-value**	**OR**	**95% CI**		**p-value**
Type of mental health problems												
No problem	ref								ref			
Internalizing only	0.63	0.46	0.85	0.003	0.9	0.67	1.2	0.473	0.45	0.33	0.61	<0.001
Externalizing only	1.09	0.85	1.4	0.484	0.88	0.68	1.14	0.328	0.75	0.58	0.98	0.034
Comorbid	0.47	0.36	0.63	<.001	0.69	0.53	0.91	0.008	0.23	0.17	0.32	<0.001

	Adjusted estimates (reference group: childhood-limited group)										
	Moderate-emerging				**High-chronic**				**Low**			
	RR	**95% CI**		**p-value**	**RR**	**95% CI**		**p-value**	**RR**	**95% CI**		**p-value**
Severe mental health problems count												
	1.15	1.02	1.29	0.022	1.58	1.38	1.8	<0.001	0.67	0.59	0.77	<0.001
	OR	**95% CI**		**p-value**	**OR**	**95% CI**		**p-value**	**OR**	**95% CI**		**p-value**
Type of mental health problems												
No problem	ref								ref			
Internalizing only	1.44	1.13	1.83	0.003	1.6	1.18	2.17	0.003	0.72	0.55	0.93	0.013
Externalizing only	0.81	0.65	1	0.053	0.92	0.72	1.17	0.484	0.69	0.56	0.86	<0.001
Comorbid	1.46	1.14	1.88	0.003	2.11	1.59	2.79	<0.001	0.49	0.36	0.66	<0.001

Table S5. Association of peer victimization trajectories for 6 to 17 years of age with mental health comorbidities at 20 years of age

	Adjusted estimates											
	Childhood-limited				Moderate adolescence-emerging				High-chronic			
	OR	95% CI		p-value	OR	95% CI		p-value	OR	95% CI		p-value
Type of mental health problems												
Externalizing-only	ref				ref				ref			
Internalizing only	0.96	0.71	1.3	0.799	1.72	1.27	2.32	<0.001	1.68	1.18	2.39	0.004
Comorbid	1.42	1.02	1.99	0.041	2.58	1.85	3.62	<0.001	3.27	2.26	4.74	<0.001
No problem	0.69	0.56	0.86	<0.001	0.86	0.68	1.08	0.184	0.75	0.58	0.98	0.034

	Adjusted estimates											
	Childhood-limited				Moderate adolescence-emerging				High-chronic			
	OR	95% CI		p-value	OR	95% CI		p-value	OR	95% CI		p-value
Type of mental health problems												
Internalizing-only	ref				ref				ref			
Externalizing-only	1.04	0.77	1.41	0.799	0.58	0.43	0.79	<0.001	0.6	0.42	0.85	0.004
Comorbid	1.48	1.02	2.15	0.039	1.51	1.06	2.14	0.023	1.95	1.31	2.9	0.001
No problem	0.72	0.55	0.93	0.013	0.5	0.39	0.64	<0.001	0.45	0.33	0.61	<0.001

Table S6. Association of peer victimization trajectories from age 6 to 17 years with mental health problems at 20 years of age

	Crude Estimates									IPW Adjusted Estimates								
	Childhood-limited			Moderate adolescence-emerging			High-chronic			Childhood-limited			Moderate adolescence-emerging			High-chronic		
	OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
Internalizing																		
Severe depression (CESD-12)	1.35	0.63	2.91	2.7	1.44	5.31	4.56	2.21	9.61	1.09	0.49	2.45	2.43	1.21	4.84	3.73	1.58	8.83
Severe anxiety (GAD-7)	0.86	0.39	1.85	1.45	0.75	2.83	3.03	1.45	6.26	0.80	0.34	1.86	1.44	0.7	2.96	3.37	1.40	8.09
Eating disorder (SCOFF3)	1.35	0.85	2.15	1.97	1.30	3.02	2.15	1.24	3.68	1.36	0.83	2.22	2.27	1.45	3.54	2.53	1.30	4.92
Suicidal ideation/attempt	2.17	1.26	3.8	2.31	1.38	3.98	3.63	1.95	6.75	2.17	1.21	3.90	2.36	1.34	4.15	3.17	1.53	6.58
Externalizing																		
ADHD	1.37	0.76	2.46	1.27	0.71	2.26	2.11	1.05	4.11	1.37	0.73	2.57	1.27	0.69	2.35	1.55	0.72	3.35
Conduct problems	2.46	1.09	5.87	3.08	1.45	7.11	3.33	1.27	8.7	1.80	0.73	4.40	2.50	1.07	5.87	2.15	0.75	6.15
Risky use of alcohol (AUDIT)	1.87	0.85	4.23	1.38	0.61	3.17	2.07	0.75	5.38	1.47	0.61	3.54	0.94	0.39	2.32	1.09	0.38	3.14
Cigarette	3.94	2.00	8.33	3.83	1.97	8.03	5.11	2.33	11.62	2.88	1.33	6.22	2.77	1.29	5.93	2.20	0.86	5.64
Cannabis	1.75	1.00	3.07	2.33	1.4	3.96	3.29	1.77	6.10	1.34	0.74	2.43	1.76	1.01	3.06	3.00	1.43	6.27
Hard drugs	1.69	1.11	2.58	1.38	0.91	2.11	2.13	1.26	3.55	1.55	0.99	2.44	1.25	0.80	1.96	2.45	1.31	4.60

Figure S1. Covariance balance by peer victimization groups before and after the application of the propensity score via inverse probability weights