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

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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% confidence interval (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.

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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, 2005b; 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., 2005b; 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, and use of psychiatric services) (Angst, Sellaro, & Ries Merikangas, 2002; Kessler et al., 2005b) 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, and suicidality) and externalizing (e.g. antisocial personality, violence, and criminal offending) spectra (Arseneault, 2018; Moore et al., 2017; Reijntjes, Kamphuis, Prinzie, & Telch, 2010; Reijntjes et al., 2011; Schoeler, Duncan, Cecil, Ploubidis, & Pingault, 2018; Ttofi, Farrington, & Lösel, 2012; van Geel, Vedder, & Tanilon, 2014). 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, and kicking), verbal (e.g. name-calling), and relational (e.g. social exclusion and 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 (i.e. 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. First, 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 a 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). Second, 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; Schreier et al., 2009). However, studies about mental health outcomes following transient experiences 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 relative to no exposure to peer victimization (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 and 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, and 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 shown 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, the formation of lasting intimate partnerships, and 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 2120 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. A total of 1760 participants had at least one measure of peer victimization between 6 and 17 years. Of those, 1216 participants [517 boys (42.5%) and 699 girls (57.5%)] answered the mental health questionnaire at 20 years old, and were selected as study sample for our analyses. Compared to participants included in the study sample, non-included 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. Non-included 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 (online Supplementary Table S1). 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, and suicide attempt/ideation), and externalizing problems [i.e. attention deficit disorder with/without hyperactivity (ADHD), antisocial behavior, alcohol abuse, daily cigarette smoking, cannabis use three 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 et al., 2005a; 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 five participants in each trajectory group). A detailed description of the assessment instrument for each outcome as well as the cut-offs for severe symptomatology is 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 four 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, and 17 years, we collected information on peer victimization using six 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 and 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 four 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%) (Fig. 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 and online Supplementary Table S2).

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 measures is available in online Supplementary Table S3.

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 *v.*

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 three 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 (s.d.) 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 (s.d.) 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)
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)

(*Continued*)

Table 1. (Continued.)

		Peer victimization trajectories			
	Overall	Low	Childhood-limited	Moderate adolescence-emerging	High-chronic
n	1216	415	310	360	131
Child's early childhood behavior rated by the mother, mean (s.d.)					
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 (s.d.)					
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.

childhood-limited, moderate adolescence-emerging v. high-chronic, etc.) (online Supplementary Fig. S1). Variables showing an SMD >0.10 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 four peer victimization trajectories, thus increasing their comparability (online Supplementary Fig. S1). 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 >0.10) 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 and 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 v. moderate adolescence-emerging, high-chronic v. childhood-limited, and childhood-limited v. 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 Fig. 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 adolescence-emerging, and 30 (22.9%) in the high chronic group presented high levels of symptoms for three 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 adolescence-emerging, and high-chronic trajectories presented an increase of 49% [risk ratio (RR) 1.49, 95% confidence interval (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.

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

Outcome, Scale	No. of 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., 2005a)	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.
Conduct problems		
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 rumors 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	Score range 0–7; 1 = Response 'Yes' for 3 or more items, 0 = Otherwise.
Alcohol abuse		
AUDIT Scale	10 items referring to the past 12 months, e.g. '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		
	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 three times or more/week		
	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.

(Continued)

Table 2. (Continued.)

Outcome, Scale	No. of items (examples)	Scale score and cut-offs for severe symptoms
Occasional use of hard drugs		
	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.

Relative to low peer victimization, all the other experiences were associated with an 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, Fig. 3).

Complementary analyses

The strength of the association for the rate of comorbid mental health problems (online Supplementary Table S4) and the likelihood of presenting comorbid internalizing–externalizing problems (online Supplementary Table S4 and Fig. 3) increased from childhood-limited to moderate adolescence-emerging and high-chronic peer victimization. Moreover, all peer victimization groups (v. 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 (online Supplementary Table S5). 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 (online Supplementary Table S6).

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 and 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 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 similarities between moderate
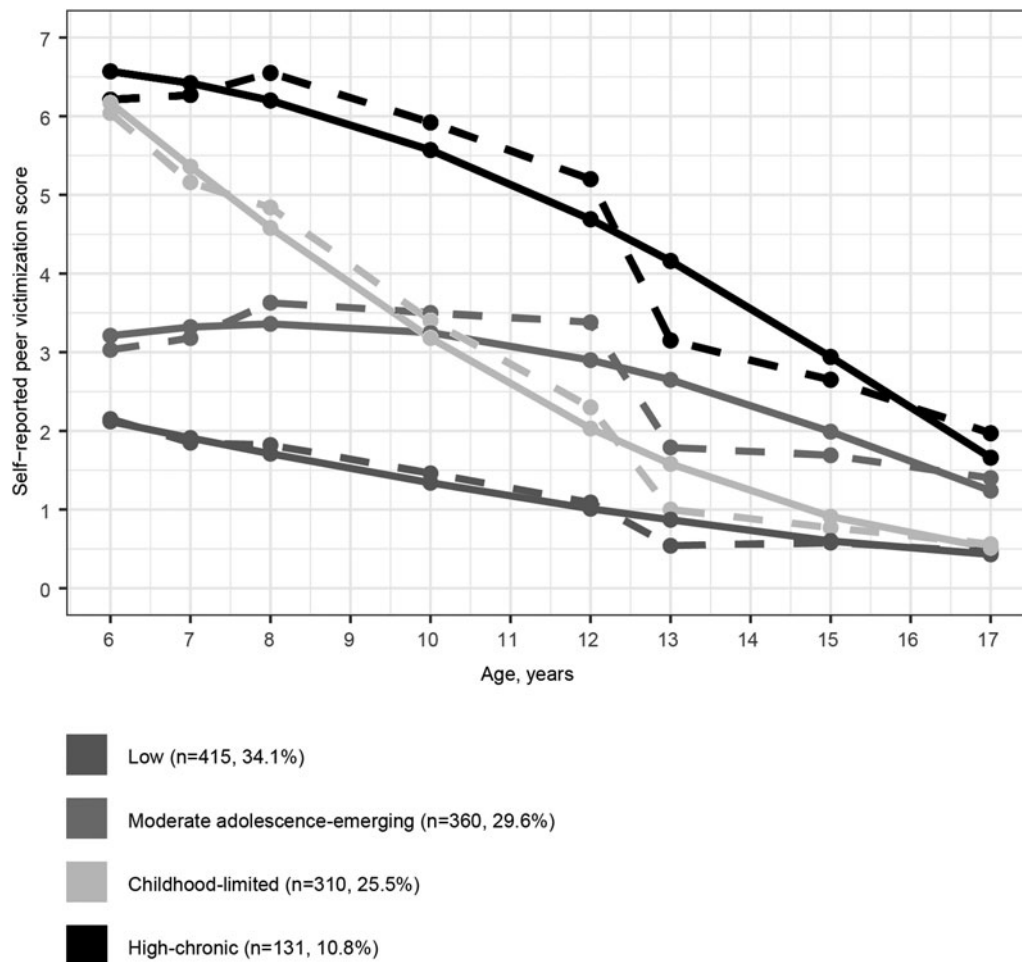
Fig. 1. Trajectories of self-reported peer victimization from 6 to 17 years of age. Reprinted from Oncioiu et al. (2020). Dashed lines represent trajectories for the observed values and solid lines represent trajectories as estimated by our model. To model the slope of the trajectories we used linear term for the low trajectory and quadratic terms for the other trajectories. Fit indices of the model include: Bayesian information criterion: −21,168.9; 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). 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.
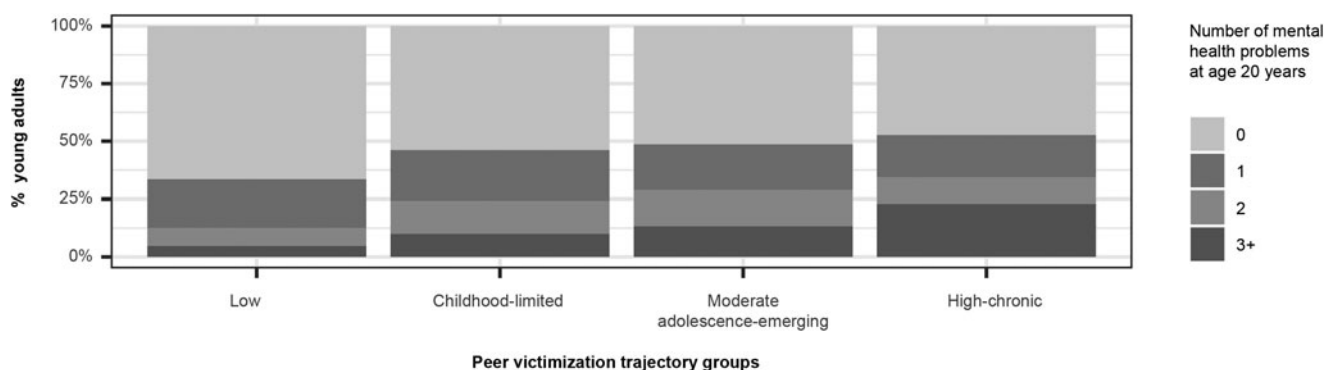
Fig. 2. Mental health comorbidities in young adulthood according to trajectories of peer victimization from 6 to 17 years of age. Data were compiled from the final master file of the Québec Longitudinal Study of Child Development (1998–2018), ©Gouvernement du Québec, Institut de la statistique du Québec.

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 contrary, 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

Table 3. Association of peer victimization trajectories for 6–17 years of age with mental health comorbidities at 20 years of age[a]

	Crude estimates			Adjusted estimates		
	Childhood-limited	Moderate adolescence-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)

[a]Reference group for exposure: low peer victimization trajectory; adjusted estimates for parent, family, and child behavioral characteristics using PS 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.

showing decreasing levels of anxiety associated with desisting trajectories of peer victimization (Hoffman et al., 2016; Ladd et al., 2019; McDougall & Vaillancourt, 2015). 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 (Hanish & Guerra, 2002; Hoffman et al., 2016; McDougall & Vaillancourt, 2015). 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.
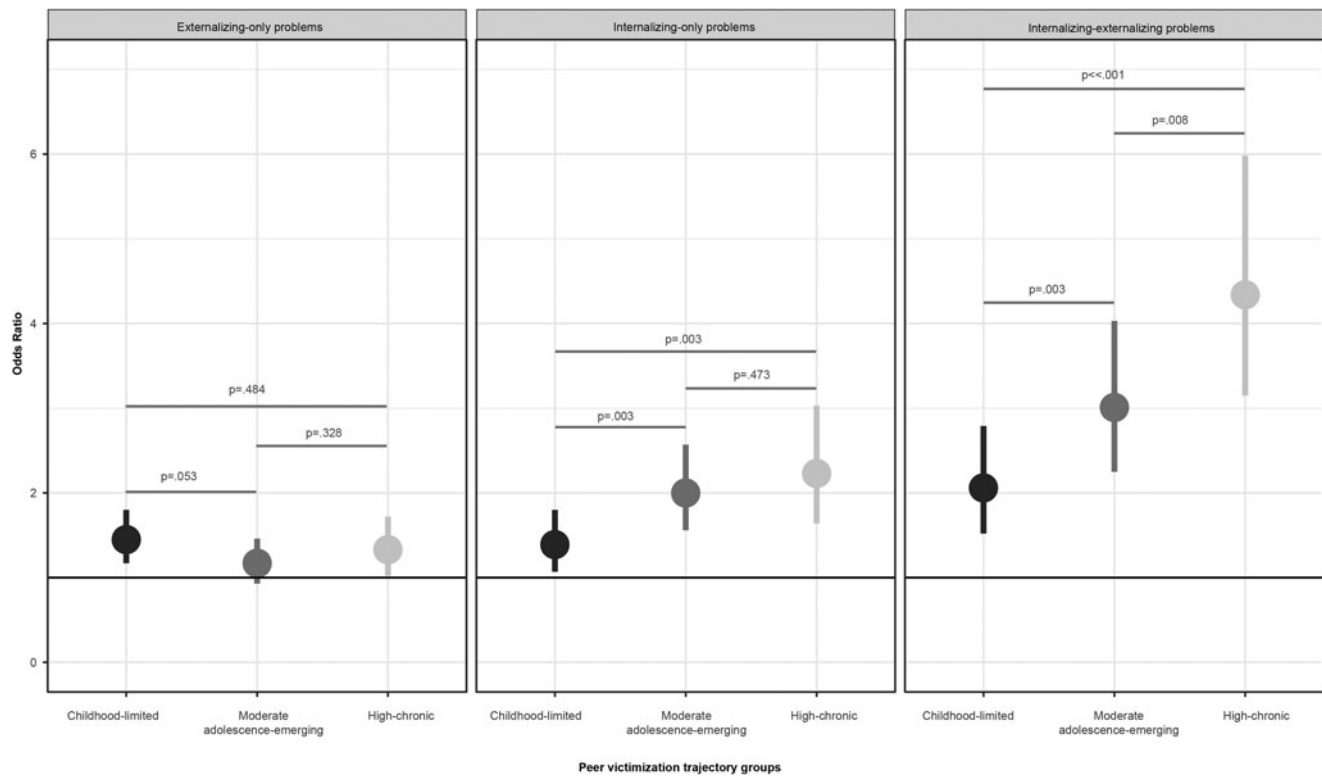
Fig. 3. Association between peer victimization trajectories and type of mental health comorbidities at age 20 years. The figure shows OR and 95% CIs (*y*-axis) for the association between peer victimization trajectories (*x*-axis) and type of mental health comorbidity (panels). Estimates are from the adjusted multinomial regression. The reference category for the exposure was the low peer victimization group, whereas 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 online Supplementary Table S4. 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.

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, validated scales based on the symptoms described in the DSM-5 were used, 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 and friendlessness – Cantin, Brendgen, Dussault, & and 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, the PS 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.

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