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Cumulative Lifetime Violence Severity and Chronic Pain in a Community Sample of Canadian Men

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Abstract

Objective: To create a descriptive profile of chronic pain severity in men with lifetime cumulative violence histories as target and/or perpetrator and investigate how chronic pain severity is associated with, and predicted by lifetime cumulative violence severity and known determinants of chronic pain. **Methods:** Analysis of variance and binary logistic regression using data collected in an online survey with a community convenience sample of 653 men who reported experiences of lifetime violence. **Results:** Prevalence of high intensity/high disability pain in men with lifetime violence was 35.8%. Total Cumulative Lifetime Violence Severity (CLVS)-44 scores were significantly associated with high intensity/high disability chronic pain measured by the Chronic Pain Grade Scale ($OR = 8.40$). In a model with 10 CLVS-44 subscales scores, only psychological workplace violence as target ($aOR = 1.44$) and lifetime family physical violence as target ($aOR = 1.42$) significantly predicted chronic pain severity. In a multivariate model, chronic pain severity was predicted by CLVS-44 total score ($aOR = 2.69$), age ($aOR = 1.02$), injury with temporary impairment ($aOR = 1.99$), number of chronic conditions ($aOR = 1.37$) and depressive symptoms ($aOR = 1.03$). **Conclusion:** The association between lifetime cumulative violence severity and chronic pain severity in men is important new information suggesting the need for trauma- and violence-informed approaches to assessment and intervention with men. This is the first analysis using CLVS-44 subscales to understand which configurations of lifetime cumulative violence may be most predictive of chronic pain severity; further investigation is needed to confirm these findings.

Keywords: cumulative lifetime violence severity, chronic pain severity, psychological workplace violence, gender, perpetration, victimization

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Introduction

Worldwide, chronic pain is identified as the greatest cause of years lost to disability [1] and violence is ranked as 22nd among the top 50 causes of global years of life lost [2]. Despite recognition that both are major public health problems [3,4], associations between lifetime cumulative violence and chronic pain have received little attention in the study of men's health. Yet violence within families, social networks, workplaces and communities is pervasive throughout men's lives [4] and affects men's health through direct injury and allostatic overload from violence-related chronic stress [5]. Allostatic overload causes physiologic (e.g., inflammatory, neuroendocrine, immunologic) changes that are implicated in the development and progression of many chronic diseases including chronic pain [6, 7].

Although the relationship between chronic pain and violence, particularly intimate partner violence, child abuse and sexual assault, has been more widely studied in women [8, 9], some significant positive associations between violence and pain also have been found in men. For example, among men physical assault in the previous year was associated with increased odds for musculoskeletal pain [10]; childhood physical and sexual abuse with chronic pain in adulthood [11]; physical, sexual or emotional child abuse or witnessing domestic violence with headaches in adulthood [12]; child abuse and child and adult molestation with affective pain in adulthood [13], and cumulative polyvictimization in childhood and adult experiences of domestic violence with chronic pain in adulthood [14]. However, the quality of these findings is threatened by a focus on one or two types of violence at one or two points in time and neglect of the confounding influence of exposure to multiple violence experiences across the lifespan. Further,

association between men's violence perpetration and their chronic pain has been largely overlooked. This is a major knowledge gap because many etiological factors, such as biological stress response and poverty, are the same for both violence perpetration and victimization [15]. In addition, experiences of violence are often separated and reported either as victimization or perpetration, when commonly both are experienced across the lifespan, adding to the cumulative nature of violence experiences and their collective impact on health. Differential health outcomes from violence arise from interactions among the number, duration, types and timing of violent incidents as target¹ and/or perpetrator that co-occur and recur across the lifespan [16]. Thus, credible study of the relationship between violence and chronic pain requires assessment of *lifetime* cumulative violence.

In our program of research, we first explored differences in men's health generally by higher and lower lifetime cumulative violence using data collected from the first 590 participants in the Men's Violence Gender and Health Study (MVGHS) [17]. With respect to chronic pain, we found that men with higher lifetime violence exposure were more likely than those with lower to report high disability pain in bivariate analysis, but in a multivariate model, lifetime violence was not a significant predictor. Limitations to this analysis were that lifetime cumulative violence severity was measured dichotomously (higher/lower) based on a median summative score of 64 violence items, and the sample included some men who had no history of lifetime violence. A strength was the comprehensive scope of the 64 violence items that included physical, psychological and sexual violence as target and/or perpetrator from childhood through adulthood in the context of families, workplaces, partner relationships, and communities. Our next step, using these violence data collected from the complete MVGHS sample (n = 685), was

¹ The term 'target' is used to refer to someone who is the object of violence.

to conduct a principal components analysis and develop the Cumulative Lifetime Violence Severity (CLVS)-44 scale to begin to address the aforementioned shortcomings in violence measurement [18].

Our objective in the current analysis is to explore how chronic pain severity is associated with and predicted by lifetime cumulative violence severity measured by the CLVS-44 continuous score using data collected in the MVGHS from 653 men who *all* reported lifetime cumulative violence. Although socio-demographic factors, gender, and comorbid physical and mental health problems are well-established determinants of chronic pain in population-based samples [19], these relationships have not been studied among men with lifetime violence histories. Such research is necessary because the biophysical consequences of the toxic stress of accumulating violence may potentiate the risks of chronic pain in this particular group of men. The underlying assumptions informing the MVGHS are: 1) men's health is best understood in relation to social determinants including lifetime cumulative violence and gender [20], and 2) negative health effects of violence stem from chronic traumatic stress [5]. Drawing on these assumptions and established determinants of chronic pain in population studies [19], we developed a predictive model of chronic pain severity that included concepts of lifetime cumulative violence; gender; socio-demographic indicators of age, employment and difficulty living on income; lifetime injury; violence-related physiological changes indicated by chronic health problems; and mental health, specifically, depression and post-traumatic stress disorder (PTSD).

Our goals were three-fold. Our first was to develop a descriptive profile of chronic pain severity for men who had experienced lifetime cumulative violence. Our second was to explore how chronic pain severity was associated with, and predicted by lifetime cumulative violence

severity. Our third was to test our multivariate model by examining how chronic pain severity was a) associated with each theoretical concept in the model, and b) predicted by lifetime cumulative violence and these theoretical concepts.

Methods

We analysed data from the cross-sectional MVGHS that were collected from April 2016 to March 2018 in an online survey. After receiving ethical approval from the Research Ethics Board at the University of New Brunswick, we recruited a community convenience sample of individuals who self-identified as men, and were English-speaking residents of Eastern Canada, aged 19 to 65 years to take part in a study about violence, gender and health. For the first 590 men who took part, self-identification of a history of violence was not an inclusion criterion. We added this criterion for recruitment of 95 additional men to increase variability in the severity of violence exposure in the sample. Men who responded to newspaper, poster, workplace, and online advertisements contacted the research coordinator who screened for eligibility, explained the study and sent interested eligible men an online link to the letter of information. Informed consent was received online before releasing the survey link. Participants were given an honorarium of 20 Canadian dollars. The survey included self-report questions about demographics, health status, gender, and lifetime cumulative experiences of violence. Upon completion, each participant was directed to a debriefing page reviewing signs and symptoms of possible distress related to survey completion and strategies and resources for managing distress.

Measures

Socio-demographic information, chronic health problems and frequency of lifetime injuries resulting in temporary long-term impairment for more than 6 months were collected with self-report questions. Established measures were used to capture specific health problems and

adherence to gender norms. Lifetime cumulative violence severity was quantified with the CLSV-44 [18].

Chronic pain was measured with the Chronic Pain Grade (CPG) scale, a 7-item self-report measure of chronic pain severity as a function of pain intensity and pain-related disability in the previous 6 months, developed for use with population surveys and studies of primary care pain patients [21]. Participants are asked to rate pain intensity of current pain, worst pain in past 6 months, and average pain, each on Likert-type scales from 0 (no pain) to 10 (pain as bad as it can be). Similarly, pain disability is measured with 3 items measuring past 6-month pain-related interference with daily activities from 0 (no interference) to 10 (unable to carry on any activities), change in ability to take part in recreational, social, and family activities from 0 (no change) to 10 (extreme change) and change in ability to work, including work around the house from 0 (no change) to 10 (extreme change). Disability days are measured with a single item asking how many days have been lost from usual activities (work, school, or work around the house) because of pain in past 6 months. The pain intensity and disability scores, each 0 to 100, are derived by calculating the mean score of the 3 items and multiplying by 10. Disability points are awarded separately for disability scores and disability days. Levels of pain are indicated by CPGs which are derived from pain intensity scores and the total number of disability points: CPG 0 = pain free; CPG I = low disability, low intensity; CPG 2 = low disability, high intensity; CPG 3 = high disability, moderately limiting; CPG 4 = high disability, severely limiting. The CPG scale has demonstrated good reliability and validity in both community and clinical samples of adults [21, 22, 23]. In the current study, Cronbach's alpha reliability coefficient for Pain Intensity and Pain Disability scores were 0.87 and 0.94, respectively.

Depressive symptoms were measured using the Center for Epidemiologic Studies Depression Revised (CESD-R) scale [24]. For each of 20 items, participants are asked to rate symptom frequency in the previous 2 weeks on a 4-point scale. Summed scores range from 0 to 60, with scores of 16 to 21 indicating mild to moderate depressive symptoms, and scores greater than 21 reflecting probable clinical depression. The scale has established reliability and validity among diverse populations including community samples of men [25, 26]. In this study, Cronbach's alpha was 0.95. To identify symptoms of posttraumatic stress disorder (PTSD), we used the PTSD Checklist, Civilian (PCL-C), a widely used 17-item self-report scale [27]. Participants are asked to identify how much they have been bothered by each symptom in the last month on a 5-point scale from 1 (not at all) to 5 (extremely). Higher scores on the summative total symptoms score (17 to 85) reflect greater symptomology. The scale has shown good temporal stability, internal consistency, test-retest reliability and convergent and discriminant validity in clinical and non-clinical samples [28, 29]. In the current study, Cronbach's alpha was 0.95.

Lifetime cumulative violence was measured with the CLVS-44 scale which was developed for health research; it includes 44 items that capture type (physical, psychological, sexual), timing (child or adulthood), focus (target or perpetrator), and context (e.g., family, community, workplace, intimate relationships, schools) of violence/abuse [18]. For each item, participants are asked to score frequency from 1 (never) to 4 (often) and degree of distress from 1 (not at all) to 4 (very) using Likert-type scales [18]. Frequency and distress scores are summed and averaged for a severity score from 1 to 4, with higher scores reflecting greater severity. Similarly, item severity scores are summed and averaged for a CLVS-44 total score (range 1 to 4) and subscale scores (range 1 to 4) for each of its 11 subscales. The CLVS-44 has convergent validity of $r = .75$ ($p < .001$) with a global violence severity rating score created because no

existing measure reflecting a gold standard for criterion validity was available [18]. Additionally, it has concurrent validity with the CESD-R ($r = .482; p < .001$) and the PCL-C ($r = .592; p < .001$) [18]. In the current analysis, the CLVS-44 has a Cronbach's alpha of .92. The subscale alphas were: C1-Lifetime Perpetrator Physical and Psychological Violence (not partner or work) ($\alpha = .84$); C2-Childhood Target Physical and Psychological Peer/Team Violence ($\alpha = .86$); C3-Lifetime Perpetrator Sexual Violence ($\alpha = .75$); C4-Adult Target Psychological Violence—Workplace, Messaging, or Stalking ($\alpha = .78$); C5-Childhood Target Sexual Violence ($\alpha = .79$); C6-Adult Target and Perpetrator Violence related to Nature of Work or Civil/Political Unrest ($\alpha = .81$); C7-Lifetime Target Physical and Psychological Dating/Partner Violence ($\alpha = .77$); C8-Lifetime Target Physical Violence from Family Members or Others with Power Over ($\alpha = .76$); C9-Lifetime Perpetrator Stalking and Messaging ($\alpha = .71$); C10-Adult Perpetrator Workplace Psychological and Gender-based (or other Characteristic) Violence ($\alpha = .65$); and C11-Lifetime Perpetrator Physical Dating/Partner Violence ($\alpha = .67$).

We assessed masculine gender roles with the 46-item Conformity to Masculine Norms Inventory-46 (CMNI-46), a multi-dimensional scale with 9 subscales which measure conformity to dominant masculine gender norms [30]. On a 4-point Likert-type scale, participants are asked to rate agreement from 0 (strongly disagree) to 3 (strongly agree) for each item. Subscale total scores are summed and averaged and range from 0 to 3. Internal consistency has been established for each subscale, ranging from .77 to .91 [30] as has convergent and discriminant validity [35]. In this analysis, internal consistency was found for each subscale: Winning ($\alpha = .85$), Emotional Control ($\alpha = .91$), Risk-taking ($\alpha = .83$), Violence ($\alpha = .85$), Primacy of Work ($\alpha = .77$), Playboy ($\alpha = .81$), Self-reliance ($\alpha = .86$), Power over Women ($\alpha = .77$), and Heterosexual Self-presentation ($\alpha = .89$).

Data Analysis

We used IBM® SPSS® Version 26 for analysis. Descriptive statistics were computed for all variables. To achieve goal 1, a descriptive profile of chronic pain severity by lifetime cumulative violence severity, we conducted analysis of variance of CLVS-44 total scores 5 grades of chronic pain severity, using Welch's F because the assumption of homogeneity of variance was not met. Post-hoc comparisons were explored with Games-Howell procedure as group sizes were unequal, and effect size (ES) was determined with the estimated omega-squared (ω^2). To achieve goals 2 and 3, we used binary logistic regression (LR) with a dichotomous chronic pain severity variable, that is, Low Chronic Pain (no pain or low intensity pain, CPGs 0 and 1) and High Chronic Pain (high intensity/ high disability pain, CPGs 2, 3, and 4). Assumptions of independence, linearity, and lack of multicollinearity were examined for each LR. For goal 2, we first calculated unadjusted odds ratios (OR) for chronic pain severity by the total CLVS-44 score and each of the 11 CLVS-44 subscale scores. Using simultaneous entry, we also examined adjusted odds ratios (aOR) in a model that included all CLVS-44 subscales as predictors of chronic pain severity. For goal 3, we examined concept indicators in our model as unadjusted predictors. Those that were significant were entered sequentially in the LR according to the model (lifetime cumulative violence severity; gender; socio-demographic indicators of age, employment and difficulty living on income; lifetime injury with temporary long-term impairment; violence-related physiological changes indicated by chronic health problems; and mental health, specifically, depression and PTSD) as predictors of chronic pain. Significance for all tests was assessed with a p value less than .05. Our sample of 653 exceeded the minimum recommendation of 500 for LR [32].

Results

Description of the Sample

Our sample consisted of 653 men who reported experiences of lifetime cumulative violence (CLVS-44 total score > 1) and had no missing data on the CPG scale. Unless otherwise specified, descriptive statistics are reported for N = 653. Most men (86.1%, n = 562) reported experiences as both target and perpetrator of violence; 13.6% (n = 89) reported being target only, and 0.3% (n = 2) perpetrator only. Men ranged from 19 to 65 years of age ($\mu = 37.6$, $SD = 12.4$), and most identified as Anglophone (82.5%; n = 539) and heterosexual (89.0%; n = 581). With respect to marital status (n = 650), slightly more than half (58.2%; n = 378) were married or cohabiting. Slightly more than a third (36.4%, n = 236) had dependent children under the age of 18 (n = 648). Regarding community size (n = 652), 52.1% (n = 340) lived in cities of 30,000 to 99,000 residents, 22.2% (n = 145) in small towns of 1,000 to 29,999 thousand, 13.2% (n = 86) in rural communities of less than 1,000, and 12.4% (n = 81) in large cities of more than 100,000. For education (n = 652), 46.9% (n = 306) had college diplomas or university degrees, 24.7% (n = 161) had high school education or less and the rest had some post-secondary education. The majority of the 653 men were employed (68.6%, n = 448); however, 7.4% (n = 48) were receiving disability pension, 14.1% (n = 92) social assistance, 6.3% (n = 41) employment insurance, and 8.1% (n = 53) retirement pension.

Profile of Chronic Pain

Table 1. Profile of Chronic Pain in Last 6 Months in Men with Lifetime Cumulative Violence as Targets and/or Perpetrators (N = 653)

Chronic Pain Grade	Total Sample N = 653	Grade 0 (Pain Free) n = 57 (8.7%)	Grade 1 (Low Intensity, Low Disability) n = 362 (55.4%)	Grade 2 (High Intensity, Low Disability) n = 107 (16.4 %)	Grade 3 (High Disability, Moderately Limiting) n = 64 (9.8 %)	Grade 4 (High Disability, Severely Limiting) 63 (9.6 %)
Pain Intensity Score: μ (SD); range	36.43 (25.00); .00 to 100.00	.00	24.74 (12.72); .00 to 46.67	61.42 (9.72); 50.00 to 100.00	58.85 (18.12); 20.00 to 100.00	71.32 (16.74); 20.00 to 100.00
Pain Disability Score: μ (SD); range	23.21 (13.04); .00 to 100.00	0.35 (1.86); .00 to 13.33	10.57 (12.88); .00 to 66.67	27.66 (18.46); .00 to 66.67	57.71 (17.49); 30.00 to 100.00	73.92 (13.04); 50.00 to 100.00
Days Lost from Usual Activity: μ (SD); range	12.65 (33.86); 0 to 200	0.05 (0.29); 0 to 2	1.42 (3.11); 0 to 30	3.39 (4.61); 0 to 30	20.25 (25.22); 0 to 175	96.63 (55.34); 15 to 200
Ever Diagnosed with Chronic Pain; n (%)	(n = 642) 124 (19.0)	10 (17.5)	(n = 354) 59 (16.7)	(n = 106) 24 (22.6)	(n = 63) 12 (19.0)	(n = 62) 19 (30.7)
Currently taking medication for chronic pain; n (%)	(n = 642) 54 (8.4)	6 (10.5)	(n = 354) 26 (7.3)	(n = 106) 11 (10.4)	(n = 63) 4 (6.4)	(n = 62) 7 (11.3)

μ = mean; SD = Standard Deviation

In Table 1, we report a profile of pain intensity, pain disability, and number of days lost to usual activities by 5 level of pain severity indicated by CPG. Additionally, we show the number of men in each CPG who reported ever being diagnosed with chronic pain by a health professional and the number taking medication for chronic pain. Only 8.7% (n = 57) of men were pain free, while 19.4% (n = 127) had high disability pain (CPG 3 or 4) and 16.4% (n = 107) had high intensity, low disability pain (CPG 2). Only 8.4% (n = 54) of the total sample reported taking medication for chronic pain (n = 642) with the lowest rate (6.4%) being among men with

high disability, moderately limiting CPG 3 and the highest (11.3%) with high disability, severely limiting CPG 4. Those with high intensity CPG 2 had the second highest rate (10.4%) of medication.

Chronic Pain Severity by Lifetime Cumulative Violence

Table 2. Cumulative Lifetime Violence Severity-44 by Chronic Pain Grade (N = 653)

Chronic Pain Grade	^a Grade 0 Pain Free n = 57 (8.7%)	^b Grade 1 Low Disability, Low Intensity n = 362 (55.4%)	^c Grade 2 (Low Disability, High Intensity) n = 107 (16.4%)	^d Grade 3 (High Disability, Moderately Limiting) n = 64 (9.8%)	^e Grade 4 (High Disability, Severely Limiting) n = 63 (9.6%)	Welch's F <i>p</i> ω^2
Cumulative Lifetime Violence Severity-44: μ (SD)	1.31 (0.25) ^{c d e}	1.38 (0.29) ^{c d e}	1.55 (0.40) ^{a b e}	1.59 (0.40) ^{a b}	1.78 (0.37) ^{a b e}	$F(4, 162.48) = 24.59$ $p = .000^*$ $\omega^2 = .126$

^{a b c d e} Indicates significant differences between group mean scores using Games-Howell Post Hoc Tests

Welch's F is an F ratio adjusted for violations of the homogeneity of variance assumption; p = probability value; ω^2 = estimated omega-squared; μ = mean; SD = Standard Deviation

The mean CLVS-44 total score for the 653 participants was 1.46 (SD = 0.35, range 1.01 to 2.97). CLVS-44 total scores were significantly associated with chronic pain grade, Welch's $F(4, 162.48) = 24.59, p = .000, \omega^2 = .126$, medium ES (see Table 2).

Specifically, mean CLVS-44 scores for CPG 0 and CPG 1 were not significantly different from each other, but each was significantly different from those for low disability, high intensity CPG 2, high disability, moderately limiting CPG 3 and high disability, severely limiting CPG 4. Further, CLVS-44 mean scores for CPG 2 and CPG 4 were significantly different from each other but neither was

significantly different from that of CPG 3. Commonly, CPG scores are dichotomized as high disability (CPG 3 & 4) and low disability (CPG 0, 1, 2) [20]. However, based on these findings, we judged that grouping *no pain* CPG 0 and *low intensity pain* CPG 1 in a Low Chronic Pain category, and *high intensity* CPG 2, *high disability moderately limiting* CPG 3, and *high disability, severely limiting* CPG 4 in a High Chronic Pain category would be a more appropriate categorization for exploring associations of chronic pain severity with CLVS-44 total and sub-scale scores.

Table 3. Logistic Regression Unadjusted *ORs* for CLVS-44^a Total and Subscales as Predictors of Chronic Pain Severity ^b (N = 653)

	<i>B (SE)</i>	<i>OR (95% CI)</i>	<i>p</i>	<i>Nagelkerke R²</i>
CLVS-44 Total	2.13 (0.26)	8.40 (5.02, 14.05)	.000*	.15
C1-Lifetime Perpetrator Physical and Psychological Violence—Not Partner or Workplace	0.76 (0.17)	2.13 (1.55, 2.91)	.000*	.05
C2-Childhood Target Physical and Psychological Peer/Team Violence	0.59 (0.10)	1.81 (1.50, 2.18)	.000*	.08
C3-Lifetime Perpetrator Sexual Violence	0.82 (0.43)	2.27 (0.98, 5.26)	.055	.01
C4-Adult Target Psychological Violence—Workplace, Messaging or Stalking	0.82 (0.12)	2.28 (1.79, 2.90)	.000*	.10
C5-Childhood Target Sexual Violence	0.92 (0.17)	2.51 (1.81, 3.48)	.000*	.07
C6-Adult Target and Perpetrator Violence related to Nature of Work or Civil/Political Unrest	0.58 (0.13)	1.79 (1.38, 2.31)	.000*	.05
C7-Lifetime Target Physical and Psychological Dating/Partner Violence	0.63 (0.12)	1.88 (1.50, 2.35)	.000*	.06

C-8-Lifetime Target Physical Violence from Family or Others with Power Over Them	0.90 (0.13)	2.45 (1.91, 3.15)	.000*	.11
C9-Lifetime Perpetrator Messaging and Stalking	0.48 (0.20)	1.61 (1.09, 2.39)	.017*	.01
C10-Adult Perpetrator Workplace Psychological and Gender-based (or other Characteristic) Violence	0.75 (0.17)	2.12 (1.52, 2.96)	.000*	.04
# C11-Lifetime Perpetrator Physical Dating/Partner Violence	0.54 (0.18)	1.72 (1.22, 2.42)	.002*	.02

^a Cumulative Lifetime Violence Severity-44 Scale

^b Chronic Pain Grade dichotomized as Low Chronic Pain CPG 0, 1 (reference group) and High Chronic Pain CPG 2, 3, 4

* Significant at .05

Violates assumption of linearity

B = beta; *SE* = Standard Error; *OR* = Odds Ratio; *CI* = Confidence Interval, *p* = probability value; *Nagelkerke R*² = an approximation of the coefficient of determination

Associations between CLVS-44 total and subscale scores and chronic pain severity are reported as *ORs* in Table 3. We found the odds of experiencing High Chronic Pain (CPG 2, 3, 4) to be 8.4 times higher for each increase of 1 on the CLVS-44 total score. All CLVS-44 subscales except *C5-Childhood Target Sexual Violence* had significant positive associations with High Chronic Pain, with odds ranging from 1.61 to 2.51 for each increase of 1 on the CLVS-44 subscale score. Notably, all CLVS-44 subscale scores except *C11-Lifetime Perpetrator Physical Dating/Partner Violence* met assumptions for binary logistic regression. Because *C-11* was found to violate the assumption of linearity, the *OR* must be interpreted with caution and we chose not to include this subscale in the *aOR* model.

Table 4. Logistic Regression Model *aORs* CLVS-44^a Subscales as Predictors of Chronic Pain Severity^b (N = 653)

	<i>B</i> (<i>SE</i>)	<i>aOR</i> (95% <i>CI</i>)	<i>p</i>
C1-Lifetime Perpetrator Physical and Psychological Violence—Not Partner or Workplace	0.03 (0.23)	1.03 (0.65, 1.61)	.912
C2-Childhood Target Physical and Psychological Peer/Team Violence	0.14 (0.12)	1.15 (0.91, 1.47)	.244
C3-Lifetime Perpetrator Sexual Violence	0.09 (0.51)	1.09 (0.40, 2.97)	.860
C4-Adult Target Psychological Violence—Workplace, Messaging, or Stalking	0.37 (0.16)	1.44 (1.06, 1.96)	.019*
C5-Childhood Target Sexual Violence	0.37 (0.19)	1.45 (0.10, 2.11)	.052
C6-Adult Target and Perpetrator Violence related to Nature of Work or Civil/Political Unrest	0.18 (0.16)	1.20 (0.88, 1.64)	.251
C7-Lifetime Target Physical and Psychological Dating/Partner Violence	0.23 (0.14)	1.26 (0.96, 1.660)	.103
C8-Lifetime Target Physical Violence from Family or Others with Power Over Them	0.35 (0.17)	1.42 (1.02, 1.98)	.038*
C9-Lifetime Perpetrator Messaging and Stalking	-0.33 (0.27)	0.72 (0.42, 1.21)	.210
C10-Adult Perpetrator Workplace Psychological and Gender-based (or other Characteristic) Violence	0.32 (0.21)	1.38 (0.92, 2.07)	.125
Constant	-3.37 (0.56)	0.03	.000*
Model Chi-Square	85.92, <i>df</i> = 10, <i>p</i> = .000*		
Nagelkerke <i>R</i>²	.17		

^a Cumulative Lifetime Violence Severity-44 Scale

^b Chronic Pain Grade dichotomized as Low Chronic Pain CPG 0, 1 (reference group) and High Chronic Pain CPG 2, 3, 4

* Significant at .05

B = beta; *SE* = Standard Error; *aOR* = Adjusted Odds Ratio; *CI* = Confidence Interval, *p* = probability value; *df* = degrees of freedom; Nagelkerke *R*² = an approximation of the coefficient of determination

In Table 4, we report the adjusted odds ratios for a predictive model of chronic pain severity by CLVS-44 sub-scales C1 to C10. Only *C4-Adult Target Psychological Violence—Workplace, Stalking or Messaging* and *C8-Lifetime Target Physical Violence from Family Members or Others with Power Over* contributed significantly in this model. The odds of having High

Chronic Pain were 1.44 and 1.42 times higher for each increase of 1 on *C4* and *C8* subscale scores respectively. For the model, the Nagelkerke R^2 was .17, suggesting that 17% of the variation in the dependent variable (chronic pain severity) was explained by CLVS-44 subscales, C1 to C10. This compared to 15% of the variation in chronic pain severity accounted for by the CLVS-44 total score reported in Table 3.

Table 5. Descriptive Profile and Unadjusted Odds Ratio as Predictor of Chronic Pain Severity ^a for Potential Indicators of Model Concepts (N = 653) ^b

Model Concepts	Measures	Descriptives	Unadjusted OR
Lifetime Cumulative Violence	Cumulative Lifetime Violence Severity Total Score: μ (range)	1.46 (1.10 to 2.97)	8.40 ($p = .000$) *
Gender	Conformity to Masculine Norms Inventory-46 Subscales: μ (range)		
	- Winning	1.39 (0 to 3)	0.77 ($p = .092$)
	- Emotional Control	1.60 (0 to 3)	1.26 ($p = .071$)
	- Risk-Taking	1.37 (0 to 3)	1.24 ($p = .146$)
	- Violence	1.56 (0 to 3)	1.04 ($p = .788$)
	- Power over Women	0.62 (0 to 3)	1.02 ($p = .904$)
	- Playboy	1.18 (0 to 3)	1.02 ($p = .845$)
	- Self-reliance	1.49 (0 to 3)	1.62 ($p = .000$) *
	- Primacy of Work	1.18 (0 to 3)	0.88 ($p = .348$)
	- Heterosexual Self-Presentation	1.20 (0 to 3)	1.20 ($p = .133$)
Socio-demographics			
Age	Age in years: μ (range)	37.6 (19 to 65)	1.03 ($p = .000$) *
Socio-economic Deprivation	Employment: n (%)		
	- No (RC)	205 (31.4)	0.45 ($p = .000$) *
	- Yes	448 (68.6)	
	Difficulty Living on Income: n (%)	(n = 650)	
	- None to a little (RC)	385 (59.2)	2.52 ($p = .000$) *
	- Some to a lot	265 (40.8)	
Ways Violence affects Health			
Direct Injury	Injury with Temporary Long Term (> 6 months) in Lifetime: n (%)		
	- No (RC)	436 (66.8)	3.29 ($p = .000$) *
	- Yes	217 (33.2)	
Physiologic Changes from Allostatic Overload	Number of Chronic Health Problems ever diagnosed by a health care professional: μ (range)	2.36 (0 to 11)	1.60 ($p = .000$) *
Mental Health Depression		15.73 (0 to 60)	1.05 ($p = .000$) *

Posttraumatic Stress Disorder (PTSD)	Center for Epidemiologic Studies Depression Revised Scale: μ (range)	(n = 652) 34.58 17 to 83)	1.05 ($p = .000$) *
	PTSD Checklist, Civilian: μ (range)		

^a Chronic Pain Grade dichotomized as Low Chronic Pain CPG 0, 1 (reference group) and High Chronic Pain CPG 2, 3, 4

^b N = 653 unless otherwise specified

* Significant at $p < .001$

OR = Odds Ratio, μ = mean, RC = reference category

Theoretical Predictive Model of Chronic Pain Severity

Indicators for all model concepts except gender had significant unadjusted associations with chronic pain severity (see Table 5). For gender, only the self-reliance subs-scale for the CMNI-46 had a significant *OR*. Consequently, just the self-reliance sub-scale was included as a predictor in the multivariate LR testing our theoretical model of chronic pain severity (see Table 6). In the multivariate *aOR* model, lifetime cumulative violence severity, age, direct injury, number of chronic health conditions, and depressive symptom severity were significant predictors of chronic pain severity, accounting for 35% of the variation in chronic pain severity according to Nagelkerke R^2 .

Table 6: Logistic Regression Model *aORs* for Predictors of Chronic Pain Severity ^a (N = 653)

Blocks Sequentially Entered	<i>B</i> (<i>SE</i>)	<i>aOR</i> (95% <i>CI</i>)	<i>p</i>
1. Lifetime Cumulative Violence:			
CLVS-44 ^b Total Score	0.99 (0.34)	2.69 (1.37, 5.25)	.004*
2. Gender:			
CMNI Self-Reliance Sub-scale Score ^c	-0.40 (0.17)	0.96 (0.69, 1.33)	.810
3. Socio-Demographics:			
Age in Years	0.02 (0.01)	1.02 (1.01, 1.04)	.010*
Socio-economic Deprivation.			
Current Employment (No = RC)	0.03 (0.22)	1.03 (0.67, 1.60)	.887
Difficulty Living on Income (No = RC)	0.38 (0.22)	1.46 (0.95, 2.25)	.081
4. Direct Injury:			
	0.69 (0.20)	1.99 (1.33, 2.96)	.001*

Injury with Temporary Long Term (> 6 months)
Impairment in Lifetime (No = RC)

5. Physiological Changes from Toxic Stress of Violence:	0.32 (0.05)	1.37 (1.24, 1.52)	.000*
Number of Chronic Health Problems ever diagnosed by a health professional.			
6. Mental Health:			
Center for Epidemiologic Studies Depression Revised Scale Total	0.32(0.01)	1.03 (1.01, 1.06)	.016*
Posttraumatic Stress Disorder Checklist, Civilian, Total	-0.02 (0.02)	0.99 (0.96, 1.01)	.257
Constant	-4.01 (0.64)	0.02	.000*
Model Chi-Square	188.75, <i>df</i> = 9, <i>p</i> = .000*		
Nagelkerke R²	.35		

^a Chronic Pain Grade dichotomized as Low Chronic Pain CPG 0, 1 (reference group) and High Chronic Pain CPG 2, 3, 4

^b Cumulative Lifetime Violence Severity-44 Scale

^c Conformity to Masculine Norms

* Significant at .05

B = beta; *SE* = Standard Error; *aOR* = Adjusted Odds Ratio; *CI* = Confidence Interval, *p* = probability value; RC = reference category; *df* = degrees of freedom; Nagelkerke *R*² = an approximation of the coefficient of determination

Discussion

This analysis provides critical new information about chronic pain in a community sample of men with histories of lifetime violence; specifically, lifetime cumulative violence severity significantly predicted chronic pain severity in a multivariate model that included other known determinants of chronic pain. Generally, chronic pain investigators have measured violence narrowly, such as only victimization or perpetration or only one or two types in adulthood or childhood; therefore, the confounding effects of other violence for chronic pain outcomes are largely unknown. By attending to multiple experiences of violence including physical, psychological and sexual violence from childhood through adulthood as target and perpetrator in the new CLVS-44 scale [18], we have addressed this limitation and increased the integrity of our findings. Additionally, the CLVS-44 continuous *severity* score, which is based on both frequency and distress, is more precise than commonly-used violence indicators such as

dichotomous scores or frequency alone [18]. Inclusion of items measuring experiences as target and perpetrator in the CLVS-44 scale acknowledges their common etiology and contests stereotypical, two-dimensional depictions of “monstrous perpetrators” and “virtuous victims” of violence [15]. Our finding that 86.1% of men reported past experiences as *both* targets and perpetrators of violence demonstrates widespread co-occurrence and substantiates the need to consider both in the study of lifetime cumulative violence and chronic pain.

The 35.8% prevalence rate found for High Chronic Pain (CPG 2, CPG3, CPG4) among men with lifetime cumulative violence in our eastern Canadian community sample is 2 to 3 times greater than the 12.1% to 16.1% reported for Canadian men in 7 national population surveys conducted from 1994 to 2007 [33]. Allostatic overload from violence-related chronic stress may have increased the likelihood of experiencing chronic pain in this sample as compared to Canadian men in general [7]. However, this difference also may be partially attributed to differences in measures of chronic pain severity; the CPG scale is more comprehensive than the single question used in national surveys asking whether one is usually free of pain or discomfort [33]. CPG items cover pain intensity, pain interference, and days lost from usual activities that together permit identification of the severity of chronic pain from *none* to *high disability*, *severely limiting*. Remarkably, in the present community sample, only 24% of men found to have High Chronic Pain reported ever being diagnosed for chronic pain by a health professional, and only 9.5% reported medication use for pain. Until recently within the International Classification of Diseases system, chronic pain could not be classified as the problem of interest, and was considered a symptom of other diseases [34]. Thus, chronic pain may not have been named by primary care providers, and despite experiencing high intensity or disabling pain over time, some men may not have viewed themselves as having chronic pain.

Our results also contribute new knowledge by delineating differences in lifetime cumulative violence severity by CPG. Mean CLVS-44 total scores increased by pain grade with CPG 3, 4, and 5 each being significantly higher than for those with CPG 0 or 1. Because mean total CLVS-44 scores for moderately disabling pain (CPG 3) did not differ significantly from either high intensity pain (CPG2) or severely limiting pain (CPG 4), it is likely that lifetime cumulative violence severity contributes to *both* high intensity and high disability pain. Our subsequent decision to dichotomize pain severity as and High (CPG 2, 3, & 4) and Low (CPG 0 & CPG 1) is similar to that of von Korff and Miglioretti [35]. They dichotomized back pain severity based on clinical significance of intense pain with mild to severe dysfunction (CPG 2, 3, and 4) versus low levels of pain and dysfunction (CPG 1) [35]. In the present study, our High/Low dichotomous indicator of chronic pain severity permitted exploratory analysis using logistic regression to predict chronic pain levels of high intensity or disability.

The bivariate findings expressed as *ORs* for chronic pain severity by CLVS total and subscale scores are fresh foundational evidence for the design of future studies of chronic pain and lifetime violence. The *OR* of 8.4 for the CLVS-44 total score confirms *severity* of lifetime cumulative violence as an influential risk factor for chronic pain severity in this population of men. Also additive to knowledge are the findings that each CLVS-44 subscale score except *C3-Lifetime Perpetrator of Sexual Violence* had a significant bivariate relationship with chronic pain severity. Subscale *C3*'s lack of significance may be specific to this sample where only 61 (9.3%) of men reported perpetrating sexual violence. Indicators of each concept (i.e., gender, age, socioeconomic deprivation, injury, physiologic changes from allostatic overload, and mental health) also each had significant bivariate associations with chronic pain severity, extending knowledge

of potential determinants of chronic pain severity among this group of men. The inclusion of gender as indicated by the CMNI-46 subscales is valuable; although gender has been reported as a social determinant of chronic pain, the emphasis in epidemiological studies has largely been on sex differences and not on gender norms, roles or relations [19]. Our finding that only self-reliance significantly increased the odds of High Chronic Pain is consistent with dominant cultural messages about what it means to be a man that emphasize independence and toughness [36]. Items on the self-reliance subscale focus on men's comfort and willingness to ask for help; possibly men who are more reluctant to seek help for acute pain or injuries or to address violence in their lives are more likely to develop chronic pain. Future research following these lines of inquiry is needed to expand understanding of masculine gender roles and the experience of chronic pain [37].

The CLVS-44 total scale and sub-scales are unique new tools for examining not only whether *total* lifetime cumulative violence severity is significantly associated with a health problem, but also which configurations of violence as indicated by CLVS-44 subscale scores are most likely to be problematic. Thus, our finding that, of 10 subscales in the predictive model, only *C-4* and *C-8* subscales remained significant suggests that their items (See Table 7) are indicative of the nature of lifetime cumulative violence most relevant to High Chronic Pain in this sample.

Conceivably, chronic pain severity stems from accumulating allostatic load and possible injury that begins with physical maltreatment and witnessing violence among family members in childhood through adulthood and is augmented by being a target of psychological violence including in the workplace, stalking and harassment in adulthood. This current result that *psychological* violence is associated with High Chronic Pain in men extends our earlier findings in women that psychological intimate partner violence (IPV) had a direct effect on chronic pain

severity [9]. Workplace psychosocial factors including work relations and job stress have been associated with long-term disability from back pain [38, 39]. Our analysis reinforces psychological violence as a dimension of the workplace environment that requires consideration when men present with chronic pain. Notably this is the first multivariate use of CLVS-44 subscales to explore which patterns of lifetime cumulative violence may be most relevant for specific health outcomes and thus these findings must be interpreted cautiously. The availability of the CLVS-44 will facilitate similar investigations with other populations to build a credible body of knowledge regarding the use of sub-scales.

Table 7. Items included in CLVS^a Subscales with Significant *aORs* for High Chronic Pain

CLVS Subscale	Subscale Items
C4—Adult Target Psychological Violence—Workplace, Messaging or Stalking	<ul style="list-style-type: none"> • Since the age of 18, at work I have been put down, overly criticized, controlled, isolated, or made to feel small. • Since the age of 18, at work I have been taunted, called names or treated meanly, based on my gender, sexual orientation, or other qualities. • Since the age of 18, I have been the target of messages or photos that were meant to hurt, scare, control, or put me down (such as written notes, texts, or social media). • Since the age of 18, I have been harassed or stalked. • Since the age of 18, other than in dating or partner relationships, at work or within teams/groups, I have been yelled at, put down, isolated, controlled, or made to feel afraid.
C8—Lifetime Target Physical Violence from Family or Others with Power Over Them	<ul style="list-style-type: none"> • Before the age of 18, I was hit, kicked, slapped, burned, choked or otherwise physically hurt by someone with power over me (such as, parent, caregiver, teacher, coach, or someone older). • Before the age of 18, I saw violence (such as bullying, threats, physical or sexual assault, or harassment) among my family members, or those I lived with. • Since the age of 18, I have been hit, kicked, slapped, burned, choked or otherwise physically hurt by a caregiver or family member (other than a partner). • Since the age of 18, I have seen violence (such as bullying, threats, physical or sexual assault, or harassment) among my family members, or those I lived with.

^a Cumulative Lifetime Violence Severity-44 Scale

The *aOR* of 2.69 for CLVS-44 total score is new convincing evidence that the greater the severity of lifetime cumulative violence the greater the likelihood of high intensity or high disability chronic pain even when other known correlates are considered. Age (*aOR* = 1.02) also contributed significantly to the model, a result consistent with a large US population study where advancing age increased the likelihood of chronic pain with and without activity limitations [40]. It is not surprising that lifetime injuries with temporary long-term impairment had an *aOR* of 1.99 for High Chronic Pain, given that among people in general, chronic pain is associated with injury [19]. Unlike previous findings where abuse-related injuries were found to mediate the relationships of both child abuse and assaultive IPV severity with chronic pain severity in women [9], reports of lifetime injuries in this study were not restricted to those from violence. However, it is probable that some reported injuries were violence-related because *C8-Lifetime Target Physical Violence from Family Members or Others with Power Over Them* was one of two CLVS-44 subscales associated with increased High Chronic Pain.

Another significant contributor to the model was the number of chronic health problems ever diagnosed by a health professional (*aOR* = 1.37). We considered number of chronic health problems to be an indicator of biophysical changes from the accumulating chronic stress of recurring and new experiences of violence across the lifespan. An alternate perspective is that the comorbid allostatic load of chronic conditions is itself a predictor of chronic pain [40], a view that is supported by the mean number of chronic conditions for those with High Chronic Pain in this sample being 3.12, 3.63 and 5.13 respectively for CPG 2, 3, and 4. Future research is needed to investigate the nature of the relationship between lifetime cumulative violence severity and comorbid chronic conditions as predictors of chronic pain severity. Nonetheless, clinicians need to consider the likelihood that chronic pain severity in men with lifetime cumulative violence

may be incrementally increased by the number of comorbid chronic health conditions.

Depression is a well-established health problem among men who have had various experiences of violence such as child abuse [11], workplace violence [41], or IPV [42]. Additionally, depression and childhood abuse have been found to each contribute to chronic pain in a large community sample of men and women [11]. Thus, our finding that depression was a significant predictor of High Chronic Pain is consistent and adds support to the theory that pathophysiological responses to violence-related chronic stress are associated with chronic conditions such as depression and chronic pain.

Our multivariate findings denote that for men with experiences of lifetime cumulative violence, salient predictors of the severity of chronic pain are severity of that violence, age, having sustained an injury with temporary long-term impairment, number of diagnosed chronic health problems, and depression severity. Despite evidence that gender, employment, income, and PTSD are associated with chronic pain in the general population, these factors were not significant in our multivariate model. In future analyses, examination of their role as moderators will be an important investigative focus to increase our understanding of which men with histories of lifetime violence may be most at-risk for High Chronic Pain.

These findings accentuate that the accumulating effects of multiple recurring and new experiences of violence in a lifetime are a crucial health issue for men and implicated in chronic pain severity. Because violence is ubiquitous in men's lives, trauma- and violence-informed care (TVIC) that focuses on safety, trustworthiness, choice, collaboration and empowerment is necessary [36]. Male gender role socialization to be strong, brave and maintain control may interfere with acknowledgement of fear, vulnerability, and need for help. This may be further

exacerbated by health care providers who also adhere to traditional gender norms, do not recognize symptoms of trauma, and downplay the impact of violence in men's lives [36, 43]. Although self-reliance as a gender norm was not a significant predictor in the multivariate model, its significant bivariate relationship with chronic pain severity suggests that dominant gender norms may play a role in help-seeking for chronic pain among men in this sample, and that TVIC needs to be gender-responsive.

Our analysis has several limitations. Our measurement of chronic pain is largely confined to past 6-month intensity, frequency and pain-related days lost to usual activities. Inclusion of duration, site and whether participants associate their pain with a particular health problem would strengthen the chronic pain profile. Our use of retrospective self-report rather than clinical diagnostic assessment carries risk of recall bias in measurement of health. With respect to the CLVS-44, recall of childhood experiences may be imperfect; however, standard measures with specific questions such as those used in the CLVS-44 are considered more accurate than broad questions [44]; in our previous research with women IPV survivors, we found that only 69% responded affirmatively to a screening question asking about experiences of child abuse, whereas 81.2% experienced child maltreatment according to their responses to the Child Trauma Questionnaire [9, 45]. Another limitation is the cross-sectional design that limits exploration of the directionality of the relationship between chronic pain and some predictor variables. In particular, although depressive symptoms were significantly associated with chronic pain severity, we have no way of knowing whether depressive symptoms began before or after the onset of chronic pain. Finally, our use of a convenience sample of men living in Eastern Canada which consists largely of medium-sized cities, small towns, and rural areas may limit the generalizability of findings.

Conclusion

These findings are a substantive contribution to addressing the knowledge gap in the intersection of two major public health problems for men: chronic pain and lifetime cumulative violence. Our findings show that lifetime cumulative violence has a strong association with high chronic pain severity, even when other predictors are considered. We addressed design weaknesses in our earlier general exploration of lifetime violence and health by using a) a larger sample of men all of whom had histories of lifetime violence, b) a more precise violence indicator, the CLVS-44 continuous score, and, c) a dichotomous indicator of chronic pain severity (no pain and low intensity pain / high intensity and high disability pain). Additionally, we introduced the CLVS-44 subscales as indicators of which experiences of cumulative lifetime violence may be greater risk factors for High Chronic Pain. As this is the first analysis using CLVS-44 subscales, our finding that being a target of lifetime family physical violence and adult psychological violence through workplace, messaging and stalking requires further confirmation. Next steps also include longitudinal studies to understand the trajectory of chronic pain severity over time in relation to lifetime cumulative violence severity.

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