The role of workplace bullying in low back pain: a study with civil servants from a middle-income country

Running Title: Workplace bullying and low back pain

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Abstract

Introduction: Low back pain (LBP) is one of the most common complaints in occupational health, and it is associated with several individual and occupational factors. However, the role of workplace bullying in LBP is not well established. Therefore, this study aimed to investigate the prevalence of LBP in the last week and chronic LBP, analysing the association between workplace bullying and LBP in a group of Brazilian civil servants.

Methods: Cross-sectional study with 894 judiciary civil servants from Porto Alegre, southern Brazil. Workplace Bullying was measured by the Negative Acts Questionnaire (NAQ-r) and Low Back Pain by the Nordic Questionnaire for Musculoskeletal Symptoms (NQMS). Logistic Regression was used to analyse data and test hypotheses.

Results: The overall prevalence of LBP in the last 7 days was 50.1%, while the overall prevalence of Chronic LBP was 19.3%. Some psychosocial factors at work were strongly associated with both LBP in the last week and Chronic LBP. Workplace bullying was strongly associated with LBP, even after adjustment for several covariates. The risk of LBP in the last 7 days among bullied workers (weekly or daily exposure to negative acts) was 1.89 (95% CI: 1.31-2.71) times higher, compared to non-bullied. Workplace bullying was also associated with chronic LBP after adjustment for sociodemographic, behavioural and some occupational factors (OR=1.60; 95% CI: 1.05-2.44).

Discussion: The prevalence of LBP in the last week and chronic LBP was higher than in the general population. Psychosocial factors at work, and particularly workplace bullying, were strong risk factors for LBP, in contrast to most individual factors. The positive association between bullying and LBP was consistent with studies from high-income countries, and dose-response patterns were showed. Some psychosocial factors at work may be on the causal path between bullying and LBP. Further longitudinal studies should address this hypothesis, investigating mechanisms and possible mediation.

Keywords: Workplace Bullying; Low Back Pain; Chronic Low Back Pain; Occupational Health; Epidemiology; Psychosocial Factors at Work.

Introduction:

Low back pain (LBP) is a major public health problem around the world[1], and it is one of the most common complaints in occupational health, with high prevalence in several groups of workers. It is also a major cause of sick leave, disability and absenteeism worldwide, demanding high costs for institutions and for society[2,3,4,5]. The prevalence of point LBP, last month LBP, and annual LBP in the general population is 11.9%, 23.2%, and 38.0%, respectively[1]. The prevalence of chronic low back pain (CLBP) varies according to sex, age, characteristics of the population, and definitions used by researchers, being estimated in a range from 3.9% to 23.3%[6].

Some risk factors such as ergonomic problems[7,8,9] and psychosocial factors at work such as stress[10,11], altogether with individual characteristics (sex, age, overweight, obesity, sedentary lifestyle, smoking) are already well recognized risk factors for LBP[12,13,14,15]. However, the role of workplace bullying in musculoskeletal pain remains unclear.

A few recent studies suggested a positive association between bullying and musculoskeletal pain[16,17,18,19,20]. Some authors argue that bullying could cause musculoskeletal pain through stress, other psychosocial factors related to pain[18,19] and emotions[17]. No studies on this theme were found in low- and middle-income countries. Therefore, this study aimed to investigate the prevalence of LBP in the last week and chronic LBP and their risk factors, focusing on the association between workplace bullying and LBP in workers from the Federal Judiciary in southern Brazil.

Methods:

This is a cross-sectional study. Data were collected between July and October 2018. The target population were judiciary federal civil servants from Porto Alegre, the capital of the state of Rio Grande do Sul, in southern Brazil. Inclusion criteria were being a civil servant in the Federal Judiciary for at least six months and being working during the period of data collection. Exclusion criteria were being either a trainee, temporary and outsourced worker. All workers who met the inclusion criteria received an e-mail and were invited to answer the self-reported questionnaire, which could be accessed on-line through a link available in the personal institutional e-mail. The deadline to receive the questionnaires was defined by the researchers for logistic reasons.

The Brazilian validated version[21,22] of the Standardized Nordic Questionnaire (SNQ)[23] for musculoskeletal symptoms was used to evaluate Low Back Pain. The questionnaire included an adapted and coloured version of the original drawing from the SNQ. The drawing of a person in a standing and supine position indicated the low back region. Participants were asked the following question:

1. "During the last 7 days, have you had trouble (such as ache, pain, discomfort, numbness) in the lower back / lumbar area?"

Regarding chronic low back pain, the following question was added:

2. "In the last year, have you continuously felt this pain for 12 weeks (3 months) or more?"

Subjects who answered yes to these questions were considered positive cases of LBP in the last week and chronic LBP, respectively.

The Negative Acts Questionnaire revised (NAQ-r) was used to measure workplace bullying. The NAQ-r is compounded by 22 questions (with answers in a likert scale) asking about the frequency (never, now and then, monthly, weekly, or daily) that the individual has been exposed to negative acts, perpetrated by others in the workplace, during the last six months[24]. We considered a case of bullying when the individual reported at least one negative act in a weekly basis, according to the operational definition[25]. For the main associations of interest, the exposure to workplace bullying was analysed in three different ways: as a dichotomous variable, considering the operational definition of bullying; as a polytomous variable, considering the five frequencies of the likert scale from the NAQ-r; and as a score, using the cut-off points (<33, 33-45, and >45) proposed by Notalaers and Einarsen (2013)[26].

The general questionnaire also included information on individual, demographic, behavioural and occupational characteristics. Physical activity was evaluated by the short version of the International Physical Activity Questionnaire (IPAQ), validated in Brazil[27]. Occupational stress, based on the job strain and effort-reward imbalance models, was evaluated through the validated Brazilian versions[28,29] of the Job Stress Scale[30] and the Effort-Reward Scale[31], respectively. A translated version of the Psychosocial Safety Climate Scale (PSC–12)[32] was used to evaluate the PSC. Ergonomic factors were measured by a questionnaire created by the authors, with questions concerning the number of hours of sitting and typing per day, duration of repetitive strain (in hours), awkward postures, and adequacy of office furniture.

Multiple logistic regression was used to analyse the associations between the independent variables and low back pain, controlling for sex and age (which were considered "forced" variables)[33]. We also used multiple logistic regression models to test the association between bullying and LBP in the last week and chronic LBP. Sixteen covariates were considered possible confounders: sex and age, in the first model; skin colour, educational level, physical inactivity, body mass index (BMI), years of work, and main role, in the second model; and ergonomic factors (hours sitting, repetitive strain, adequate posture, adequate desk, adequate chair), job strain, effort-reward imbalance and psychosocial safety climate, in the third model. Previous knowledge supported our theoretical models. The third model included those variables that could have a bidirectional association.

The study was approved by the Research Ethics Committee from the Federal University of Pelotas and is registered (registration number 86800218.9.0000.5317) in the Brazilian National Platform for Research (*Plataforma Brasil*). The administration of the Federal Judiciary and the trade union (legally representing this group of civil servants) signed a statement of agreement with the study. The institution and the union supported the research and the data collection, providing a list of e-mails and sending the on-line questionnaires to all eligible subjects. All respondents included in the study agreed to participate and signed the on-line informed consent form. Those who did not return the questionnaire providing complete information were considered non-respondents.

Results:

894 out of 2,403 workers (37.2% response rate) were included in this analysis. The participation of female workers was slightly higher (51.6%) and more than one third of the participants were aged between 35 to 44 years-old. More than 90% were white, and had a high educational level, with almost 60.0% having postgraduate, master or doctoral degree. Approximately 45.0% worked in the Labour Justice and did administrative work. The majority were technicians (65.9%), worked with virtual processes (52,5%) and worked up to 6 hours a day (41.1%). More than one third has worked in the Federal Judiciary for more than 20 years (Table 1).

The overall prevalence of LBP in the last week was 50.1%. Female sex was the only sociodemographic factor associated with higher risk of LBP (OR = 1.39, 95% CI 1.07-1.82), after adjustment for age. Regarding other individual and behavioural

characteristics, physical inactivity was associated with a 36% higher risk of LBP, while BMI and smoking were not associated. Some occupational characteristics and psychosocial factors such as being a technician, not having breaks, pressure for goals, high job strain and high effort-reward imbalance were associated with a higher risk of LBP in the last 7 days. Ergonomic factors such as hours typing at work, repetitive strain, inadequate postures, inadequate chair and inadequate desk were also strongly associated with LBP in the last 7 days (Table 1).

The overall prevalence of CLBP was 19.3%, and it was not associated with sex. Workers older than 55 years-old had a prevalence odds ratio of 2.27 (95% CI: 1.25-4.13) of CLBP, compared to workers under 35. Other sociodemographic factors, as well as BMI, physical activity and smoking were not associated with CLBP. Adjusting for sex and age, years of work was the only occupational characteristic associated with CLBP; workers with 10 to 14 and with more than 20 years of work had approximately double the risk of CLBP, compared to the ones with less than 10 years in the institution. Regarding psychosocial factors at work, pressure for goals, high job strain, high effort-reward imbalance and high-risk psychosocial safety climate were associated with CLBP, with odds ratios between 1.6 and 2.4 ($p<0.01$). Ergonomic factors such as hours typing at work, repetitive strain, inadequate postures, and inadequate desk were strongly associated with CLBP, while hours sitting and inadequate chair showed no association with CLBP. (Table 2)

Considering the three categorizations of bullying, all regression models showed a positive association between workplace bullying and low back pain in the last 7 days. Those exposed to workplace bullying had 2.02 (95% CI: 1.41-2.88) times higher risk of LBP in the last 7 days, compared to those non-exposed, after adjustment for sex and age group. In the second model (controlled for sex, age, skin colour, educational level, BMI, physical inactivity, years of work, and main role), those exposed to workplace bullying weekly or daily had almost two times the risk of LBP compared to those non-exposed (adjusted OR 1.91, 95% CI: 1.33-2.76). In the full model, after controlling for all covariates in model 2 adding psychosocial and ergonomic factors, the association remained strong (adjusted OR 1.63, 95% CI: 1.09-2.43; $p=0.016$). (Table 3)

Considering workplace bullying as a polytomous variable (five categories of negative acts, based on the frequency in the last 6 months), the first model, after adjustment for sex and age, showed that weekly and daily bullying increased 2.88 (95%

CI 1.52-5.44) and 2.63 (95% CI 1.56-4.42) times the risk of LBP, respectively, compared to workers non-exposed to negative acts. In the second model, the risk of LBP among bullied workers on a weekly or daily basis exposure was 2.72 (95% CI 1.42-5.18) and 2.45 (95% CI 1.44-4.18) higher, compared with non-bullied workers, respectively. (Table 3)

Also, when we operationalized the score levels of the NAQ-r, the associations remained strong and positive in models 1 and 2. However, after adjustment for safety climate, occupational stress and ergonomic variables, the associations were no longer significant.

Associations between workplace bullying and Chronic Low Back Pain were significant in logistic regression models 1 and 2. In model 3, the significance no longer remained. After adjustment for sex and age group, weekly or daily exposure to workplace bullying increased 72% the risk of CLBP (p=0.009); when the negative acts were analysed as a polytomous variable, workplace bullying was associated with CLBP (p value for linear tendency <0.001), increasing the risk up to 2.72 times (95% CI: 1.46-5.07), when compared to workers non-exposed to negative acts. Associations remained strong in model 2, after adjustment for sex, age group, skin colour, educational level, BMI, physical inactivity, years of work, and main role. When psychosocial and ergonomic factors were included in the model, associations were no longer significant. (Table 4)

Discussion:

Our study showed a high prevalence of low back pain in the last seven days, and a high prevalence of chronic low back pain in this group of civil servants from southern Brazil. Ergonomic and psychosocial factors at work were associated with both LBP in the last week and chronic low back pain. Also, workplace bullying was strongly associated with LBP (last 7 days) and CLBP, even after adjustment for covariates, corroborating our hypothesis.

The prevalence of LBP in the last 7 days (50.1%) is more than double the overall prevalence described worldwide[1] and in several Brazilian work settings[34]. It was also remarkably higher than the prevalence estimated by a systematic review, which included several different populations[35]. These findings indicate that LBP is a serious health problem in the institution, which may lead to disabilities and high social and economic

costs. Most of the participants were office workers and had a high educational level, which may partially justify the lack of association between most sociodemographic factors and LBP.

The higher risk of LBP in the last week among females agrees with the literature[1,6]. However, possibly due to its extremely high overall prevalence, no significant differences were found between age groups, in contrast with previous reviews[1,6]. Some characteristics of the participants, such as their high educational level, might also have contributed to this finding. Pressure for goals and occupational stress increased the risk of LBP in the last week, corroborating results from previous studies[36,37], and reinforcing the role of psychosocial factors at work in musculoskeletal pain[36,38,39,40,41,42]. Well-known ergonomic risk factors (related to repetitive strain and inadequate postures)[43] also increased the risk of LBP in the last 7 days.

The prevalence of chronic low back pain (19.3%) was higher than those estimated by most studies from a systematic review[6], which draws attention to some occupational aspects of this work setting. Due to the high educational and socioeconomic level of participants, which could make the population relatively more homogeneous, the prevalence of CLBP did not differed between sexes, in contrast to most working age populations[6]. However, the prevalence of CLBP was higher in older workers, agreeing with the literature[1,6]. Overweight, obesity, physical inactivity and smoking are often cited as risk factors for LBP in the literature[6,14,15,44], but they were not associated with CLBP in this group of workers. On the other hand, CLBP was associated with some psychosocial factors at work (pressure for goals, high job strain, high effort-reward imbalance and poor psychosocial safety climate) and ergonomic factors (typing activities, repetitive strain, inadequate postures and inadequate desk), indicating a similar pattern for both outcomes. All these findings indicate that the role of occupational factors in LBP in the last week and chronic LBP may be more important than individual risk factors, especially in this work setting. Office work usually does not require high physical efforts, such as lifting weight, bending forward and backyard, or working with flexed trunk. However, office workers may be exposed to monotonous tasks and inadequate postures, which increase the risk of back pain[11].

Reinforcing evidence from high-income countries[16,17,18,19,20], workplace bullying was strongly associated with LBP in the last 7 days, even after adjustment for

sociodemographic, behavioural and occupational (including ergonomic and psychosocial factors) confounders. The magnitude of effect (odds ratios) of workplace bullying on low back pain was either similar or lower, compared to previous researches[45,46]. Lower odds ratios would be expected in our analysis, considering that our statistical models included several covariates which were not evaluated in previous studies. We tested the association between bullying and low back pain in three logistic regression models, including sociodemographic, behavioural and occupational factors in the analyses. The decrease in the magnitude of effect in the third model indicate that psychosocial factors at work (including job strain, ERI and poor psychosocial safety climate) and ergonomic characteristics might partially mediate this association, once workplace bullying may degrade the work environment[47,48], and may also lead to inadequate postures[37]. Besides, bullied workers may be exposed to worse working conditions, which include worse workstations.

In this context, workplace bullying may be an occupational marker of a violent and unethical contemporary work organisation, which materializes a precarious work, with intense workloads, bad ergonomic conditions, absence of pores during a workday, and high risks to labourers' health. The work intensification is part of a strategy of accumulation of capital[49,50], affecting workers physical and mental health.

Similarly to a study with Finnish workers[46], our study showed a strong association between workplace bullying and CLBP after adjustment for sociodemographic, behavioural and occupational confounders, but it was no longer significant after including ergonomic and other psychosocial factors at work in the model. Chronic pain is determined by several long-term risk factors, including genetics, lifestyle and mental health, while bullying and other psychosocial risks may have a shorter and more direct effect on biological stress and acute pain. Some psychosocial factors are likely to be mediators in the causal path between bullying and CLBP, and may also affect musculoskeletal pain over the months or years.

The relationship between psychosocial factors at work and musculoskeletal pain is reasonably well established[36,37,51,52,53], and plausible biological mechanisms include the effect of stress in spine loading[4]. Biological stress, generating inflammatory response and changes in neurotransmission, is also a plausible pathway for the association between workplace bullying and low back pain, once bullying can increase the level of cortisol[54].

Some other mechanisms include deleterious effects in postures, in the work environment, and other exposures which could mediate the association between psychosocial risks at work and LBP[37]. Particularly for workplace bullying, mechanisms through emotions and mental health are also discussed in the literature[17], once mental health problems are risk factors for back pain[52,55], and bullying is associated with mental disorders in longitudinal studies[56]. Similar mechanisms might also be related to the transition from acute to chronic low back pain, which is associated to psychosocial factors at work[52,57].

Our study has some limitations. Considering it is a cross-sectional analysis, we cannot exclude reverse causality for the association between workplace bullying and LBP, once workers with health problems are more likely to be bullied[58]. For the association between bullying and LBP in the last week, the reverse causation is minimized by the fact that the recall of negative acts is six months, reinforcing the temporality between exposure and outcome. However, we were not able to evaluate previous musculoskeletal status of participants. Also, psychosocial factors such as occupational stress, and ergonomics, which can either mediate or confound the association between bullying and LBP, were only evaluated at one point. In order to address this limitation, we performed three statistical models, including these covariates.

Our study also lacks an optimal response rate, and some statistically significant differences between respondents and non-respondents were identified, what could incur in selection bias, as non-representative samples may overestimate the prevalence of workplace bullying[59]. However, associations are less affected by this bias, and we were able to control for these factors in the analyses. Also, our results are consistent with the literature[16,17,18,19,20,45,46], reinforcing the validity of our findings. Moreover, response rates in web surveys[60] are usually similar to this and other occupational health studies. Due to the conflicting nature of workplace bullying, and the institutions' neglect of the problem, the issue itself may reduce response rates..

The participants of our study belong to a group of wealthy civil servants, in a stable job in the Brazilian state, thus resigning the job is not common. Musculoskeletal problems are one of the main causes of absenteeism in Brazil[61] and severe cases of low back pain may lead to long-term sick-leaves. Therefore, due to the “healthy worker effect”, associations between bullying and LBP might have been underestimated.

Conclusions:

To our knowledge, this is the first study analysing the association between workplace bullying and musculoskeletal complaints in a low- or middle-income country. We were able to evaluate several individual and occupational aspects, measure the variables with validated tools, and test our hypotheses with logistic regression models adjusting for several demographic and occupational characteristics, including psychosocial and ergonomic factors, strengthening the validity of our results.

Our findings reinforce that workplace bullying may play an important role in low back pain causal chain. Therefore, preventing harassment at work may be a tool to reduce musculoskeletal problems such as LBP. LBP is a severe health outcome, which may demand sick leaves, visits to the doctor, high cost treatments, economic loss, and lead to disability. Interventions to prevent bullying might reduce costs and deleterious effects of LBP for individuals, institutions and society.

LBP is determined by several risk factors, which may vary according to the population and work setting. Depending on the context, traditionally well established risk factors for LBP, such as individual, behavioural and ergonomic characteristics, may be less important than some occupational risks like workplace bullying. The results are in line with the theory of social determination of health[62,63], and drive attention to the importance of occupational factors in common health problems such as low back pain.

Longitudinal studies are necessary to strength causal inference for the association between workplace bullying and low back pain. Also, more epidemiological studies investigating the effect of bullying on musculoskeletal complaints and its mechanisms are needed, especially in low- and middle-income countries, where there is lack of evidence on the theme. Our findings are valuable for future comparisons with other populations and work settings worldwide.

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	Respondents	LBP (Last 7 days)	POR		
	n total (%)	n (%)	POR	95% CI	p value
Variables					
Sex					
Male	433 (48.4)	198 (45.8)	1.00	-	
Female	461 (51.6)	250 (54.2)	1.39	1.07-1.82	0.014
Age (categories)					
<35	134 (15.0)	60 (44.8)	1.00	-	
35-44	291 (32.6)	143 (49.1)	1.16	0.77-1.75	
45-54	323 (36.1)	166 (51.4)	1.25	0.83-1.87	
>=55	146 (16.3)	79 (54.1)	1.43	0.89-2.30	0.125*
Skin colour					
White	822 (91.9)	409 (49.8)	1.00	-	
Black, Brown, Asian, Indigenous	72 (8.1)	39 (54.2)	1.26	0.77-2.06	0.350

Educational level					0.504[#]
Postgraduate, MSc, PhD	521 (58.3)	268 (51.4)	1.00	-	
Graduate	299 (33.4)	141 (47.2)	0.87	0.65-1.16	
High school	74 (8.3)	39 (52.7)	1.12	0.68-1.83	
BMI (Kg/m²)					0.470[#]
<25	432 (48.4)	179 (52.3)	1.00	-	
25-29.99	317 (35.6)	194 (46.4)	0.83	0.61-1.13	
30 or more	143 (16.0)	73 (51.0)	0.97	0.66-1.44	
Physical activity (min/week)					
150 or more (Active)	555 (62.1)	262 (47.2)	1.00	-	
<150 (Insufficient)	339 (37.9)	186 (54.9)	1.36	1.03-1.79	0.028
Smoking					0.782[#]
No	700 (78.3)	351 (50.1)	1.00	-	
Former smoker	139 (15.5)	68 (48.9)	0.91	0.63-1.32	
Yes	55 (6.2)	29 (52.7)	1.13	0.65-1.97	
Court					0.141[#]
Regional Federal Court	173 (19.3)	91(52.6)	1.00	-	
Federal Court	125 (14.0)	61 (48.8)	0.88	0.55-1.40	
Electoral Court	199 (22.3)	87 (43.7)	0.68	0.45-1.03	
Labour Court	397 (44.4)	209 (52.6)	1.02	0.71-1.46	
Field of expertise					0.603[#]
Administrative (1st court)	123 (13.8)	56 (45.5)	1.00	-	
Administrative (2nd court)	274 (30.7)	136 (49.6)	1.18	0.77-1.81	
Judicial (1st court)	232 (25.9)	123 (53.0)	1.35	0.87-2.11	
Judicial (2nd court)	265 (29.6)	133 (50.2)	1.19	0.77-1.83	
Job position					
Analyst	305 (34.1)	132 (43.3)	1.00	-	
Technician	589 (65.9)	316 (53.7)	1.54	1.16-2.03	0.003
Tenure					0.157[#]
Administrative (office work)	475 (53.1)	247 (52.0)	1.00	-	
Judiciary (office work)	325 (36.4)	166 (51.1)	0.94	0.71-1.25	
IT (office work)	66 (7.4)	22 (33.3)	0.52	0.30-0.92	
Security and Judicial Officer	28 (3.1)	13 (46.4)	0.82	0.38-1.79	
Main role/activity					0.325[#]
Virtual process	470 (52.5)	229 (48.7)	1.00	-	
Paper process	48 (5.4)	26 (54.2)	1.18	0.65-2.16	
Non-judicial activity	234 (26.2)	121 (51.7)	1.18	0.85-1.62	
Telephone/help desk	32 (3.6)	21 (65.6)	2.04	0.95-4.37	
Other	110 (12.3)	51 (46.4)	0.93	0.61-1.41	
Years of work					0.734[#]

<10	245 (27.4)	111 (45.3)	1.00	-	
10-14	228 (25.5)	117 (51.3)	1.21	0.81-1.80	
15-19	110 (12.3)	58 (52.7)	1.29	0.78-2.14	
>=20	311 (34.8)	162 (52.1)	1.22	0.76-1.96	
Work hours					0.249#
Up to 6	366 (41.1)	184 (50.3)	1.00	-	
7	361 (40.5)	172 (47.6)	0.90	0.67-1.21	
8 or more	164 (18.4)	92 (56.1)	1.24	0.85-1.80	
Work hours (continuous)	-	-	1.09	0.95-1.24	0.206
Extra hours					
No	551 (61.8)	268 (48.6)	1.00	-	
Yes	340 (38.2)	180 (52.9)	1.17	0.89-1.54	0.260
Extra hours (days per month)					0.756#
None	550 (61.7)	267 (48.6)	1.00	-	
1 to 4	96 (10.8)	53 (55.2)	1.30	0.84-2.02	
5 to 9	101 (11.3)	51 (50.5)	1.07	0.70-1.64	
10 to 14	45 (5.1)	24 (53.3)	1.14	0.62-2.11	
15 or more	99 (11.1)	53 (53.5)	1.21	0.78-1.86	
Breaks (not including lunch)					
None	199 (22.3)	104 (52.3)	1.00	-	
1 to 2	476 (53.4)	252 (52.9)	1.00	0.72-1.40	
3 to 4	178 (20.0)	78 (43.8)	0.71	0.47-1.07	
5 or more	38 (4.3)	14 (36.8)	0.56	0.27-1.14	0.033*
Pressure for goals					
No	452 (50.7)	210 (46.5)	1.00	-	
Low or adequate	253 (28.4)	130 (51.4)	1.21	0.88-1.65	
High or very high	186 (20.9)	108 (58.1)	1.61	1.14-2.27	0.007*
Demand-Control Model					
Low strain	259 (29.0)	112 (43.2)	1.00	-	
Passive job	245 (27.4)	116 (47.4)	1.17	0.82-1.67	
Active job	208 (23.3)	114 (54.8)	1.56	1.08-2.26	
Job strain (High strain)	181 (20.3)	105 (58.0)	1.76	1.20-2.60	0.001*
Effort-Reward Imbalance					
Low	322 (36.1)	136 (42.2)	1.00	-	
Moderate	294 (32.9)	155 (52.7)	1.55	1.12-2.13	
High	277 (31.0)	156 (56.3)	1.76	1.27-2.43	0.001*
Psychosocial Safety Climate					0.391#
Low risk	225 (25.2)	103 (45.8)	1.00	-	

Moderate risk	78 (8.7)	40 (51.3)	1.26	0.75-2.12	
High risk	590 (66.1)	304 (51.5)	1.23	0.90-1.68	
Hours sitting at work					0.886[#]
Up to 5	112 (12.5)	57 (50.9)	1.00	-	
6	356 (40.0)	175 (49.2)	0.94	0.61-1.45	
7	334 (37.5)	167 (50.0)	0.97	0.63-1.50	
8 or more	89 (10.0)	49 (55.1)	1.14	0.65-2.00	
Hours typing at work					0.064[#]
Up to 1 hour	202 (22.7)	87 (43.1)	1.00	-	
1 a 3	145 (16.3)	73 (50.3)	1.36	0.89-2.10	
3 a 5	254 (28.5)	128 (50.4)	1.31	0.90-1.90	
5 a 7	250 (28.1)	132 (52.8)	1.42	0.97-2.07	
8 or more	40 (4.5)	28 (70.0)	2.82	1.35-5.89	
Hours typing at work (cont.)	-	-	1.15	1.03-1.38	0.014*
Repetitive strain					
Never/Rarely/Sometimes	226 (25.3)	96 (42.5)	1.00	-	
Usually	349 (39.2)	173 (49.6)	1.24	0.88-1.76	
Always	316 (35.5)	179 (56.7)	1.64	1.14-2.35	0.006*
Adequate posture					
Never or rarely	97 (10.9)	67 (69.1)	1.00	-	
Sometimes	306 (34.3)	170 (55.6)	0.57	0.35-0.93	
Usually or Always	488 (54.8)	211 (43.2)	0.33	0.21-0.53	<0.001*
Adequate office chair					
No	315 (35.3)	185 (58.7)	1.00	-	
Yes	576 (64.7)	263 (45.7)	0.58	0.44-0.77	<0.001
Adequate office desk					
No	251 (28.2)	154 (61.3)	1.00	-	
Yes	640 (71.8)	294 (45.9)	0.53	0.39-0.72	<0.001

POR: Prevalence Odds Ratio; 95% CI: 95% Confidence interval; *p value for linear trend. [#]p-value for heterogeneity

Table 1 – Sociodemographic and occupational characteristics of judicial civil servants from Porto Alegre, Rio Grande do Sul, Brazil, and risk factors for low back pain in the last 7 days (adjusted for sex and age). 2018 (n=894).

	Chronic LBP	POR		
	n (%)	POR	95% CI	p value
Variables				
Sex				
Male	74 (17.1)	1.00		
Female	99 (21.5)	1.32	0.94-1.84	0.110
Age (categories)				
<35	20 (14.9)	1.00	-	
35-44	42 (14.4)	0.94	0.53-1.68	
45-54	69 (21.4)	1.49	0.86-2.58	
>=55	42 (28.8)	2.27	1.25-4.13	<0.001*
Skin colour				
White	161 (19.6)	1.00	-	
Black, Brown, Asian, Indigenous	12 (16.7)	0.89	0.46-1.71	0.728

Educational level				0.139[#]
Postgraduate, MSc, PhD	111 (21.3)	1.00	-	
Graduate	50 (16.7)	0.70	0.48-1.02	
High school	12 (16.2)	0.68	0.35-1.33	
BMI (Kg/m²)				0.232[#]
<25	92 (21.3)	1.00	-	
25-29.99	58 (18.3)	0.79	0.54-1.18	
30 or more	23 (16.1)	0.66	0.39-1.10	
Physical activity (min/week)				
150 + (Active)	102 (18.4)	1.00	-	
<150 (Insufficient)	71 (20.9)	1.25	0.88-1.76	0.212
Smoking				0.687[#]
No	130 (18.6)	1.00	-	
Former smoker	30 (21.6)	1.05	0.66-1.67	
Yes	13 (23.6)	1.33	0.69-2.59	
Court				0.873[#]
Regional Federal Court	32 (18.5)	1.00	-	
Federal Court	22 (17.6)	1.08	0.59-1.99	
Electoral Court	43 (21.6)	1.24	0.74-2.08	
Labour Court	76 (19.1)	1.12	0.70-1.78	
Field of expertise				0.680[#]
Administrative (1st court)	28 (22.8)	1.00	-	
Administrative (2nd court)	49 (17.9)	0.72	0.42-1.23	
Judicial (1st court)	45 (19.4)	0.85	0.50-1.46	
Judicial (2nd court)	51 (19.3)	0.80	0.47-1.36	
Job position				
Analyst	57 (18.7)	1.00	-	
Technician	116 (19.7)	1.08	0.75-1.54	0.687
Tenure				0.359[#]
Administrative	93 (19.6)	1.00	-	
Judiciary	68 (20.9)	1.05	0.74-1.50	
IT	6 (9.1)	0.46	0.19-1.12	
Security and judicial officer	6 (21.4)	1.03	0.40-2.66	
Main role/activity				0.886[#]
Virtual process	87 (18.5)	1.00	-	
Paper process	10 (20.8)	1.00	0.47-2.10	
Non judiciary activity	44 (18.8)	1.04	0.69-1.57	
Telephone/help desk	9 (28.1)	1.54	0.68-3.50	
Other	23 (20.9)	1.11	0.66-1.88	
Years of work				0.064[#]
<10	28 (11.4)	1.00	-	

10-14	51 (22.4)	2.15	1.23-3.76	
15-19	21 (19.1)	1.85	0.92-3.71	
>=20	73 (23.5)	1.93	1.01-3.68	
Work hours				0.257[#]
Up to 6	66 (18.0)	1.00	-	
7	66 (18.3)	1.01	0.69-1.48	
8 or more	41 (25.0)	1.41	0.90-2.22	
Extra hours				
No	96 (17.4)	1.00	-	
Yes	77 (22.7)	1.36	0.97-1.91	0.076
Extra hours (days per month)				0.164[#]
None	96 (17.5)	1.00	-	
1 to 4	21 (21.9)	1.27	0.74-2.17	
5 to 9	18 (17.8)	1.07	0.61-1.87	
10 to 14	15 (33.3)	2.22	1.13-4.35	
15 or more	23 (23.2)	1.38	0.82-2.33	
Breaks (not including lunch)				0.645[#]
None	36 (18.1)	1.00	-	
1 to 2	98 (20.6)	1.14	0.74-1.75	
3 to 4	30 (16.9)	0.92	0.54-1.58	
5 or more	9 (23.7)	1.49	0.64-3.45	
Pressure for goals				0.042[#]
No	74 (16.4)	1.00	-	
Low or adequate	63 (24.9)	1.64	1.11-2.41	
High or very high	36 (19.4)	1.25	0.80-1.95	
Demand-Control Model				0.349[#]
Low Strain	44 (17.0)	1.00	-	
Passive Job	46 (18.8)	1.14	0.72-1.81	
Active Job	39 (18.8)	1.12	0.69-1.81	
Job Strain (High Strain)	44 (24.3)	1.53	0.95-2.46	
Effort-Reward Imbalance				0.011[#]
Low	45 (14.0)	1.00	-	
Moderate	65 (22.1)	1.80	1.18-2.75	
High	63 (22.7)	1.75	1.14-2.69	
Psychosocial Safety Climate				0.056[#]
Low risk	34 (15.1)	1.00	-	
Moderate risk	11 (14.1)	0.95	0.45-1.99	
High risk	128 (21.7)	1.57	1.03-2.38	
Hours sitting at work				0.251[#]

Up to 5	22 (19.6)	1.00	-		POR:
6	58 (16.3)	0.87	0.50-1.52		
7	72 (21.6)	1.26	0.73-2.17		
8 or more	21 (23.6)	1.30	0.65-2.58		
Hours typing at work					
Up to 1 hour	28 (13.9)	1.00	-		
1 a 3	30 (20.7)	1.65	0.93-2.92		
3 a 5	49 (19.3)	1.44	0.86-2.40		
5 a 7	54 (21.6)	1.74	1.04-2.89		
8 or more	12 (30.0)	2.34	1.05-5.20	0.025*	
Hours typing at work (cont.)	-	1.18	1.02-1.36	0.025	
Repetitive strain					
Never/Rarely/Sometimes	33 (14.6)	1.00	-		
Usually	66 (18.9)	1.29	0.81-2.06		
Always	74 (23.4)	1.76	1.09-2.81	0.015*	
Adequate posture					
Never/Rarely	32 (33.0)	1.00	-		
Sometimes	70 (22.9)	0.65	0.39-1.08		
Usually or always	71 (14.5)	0.34	0.21-0.56	<0.001*	
Adequate office chair					
No	64 (20.3)	1.00	-		
Yes	109 (18.9)	0.88	0.62-1.25	0.484	
Adequate office desk					
No	64 (25.5)	1.00	-		
Yes	109 (17.0)	0.60	0.42-0.86	0.005	

Prevalence Odds Ratio; 95% CI: 95% Confidence interval; *p value for linear trend. #p-value for heterogeneity

Table 2 – Risk factors for chronic low back pain among civil servants from the Federal Judiciary of Porto Alegre in southern Brazil, adjusted for sex and age. 2018 (n=894).

	LBP (Last 7 days)	POR (Model 1)[a]	p-value	POR (Model 2)[#]	p-value	POR (Model 3)[§]	p-value
Workplace bullying (Operational definition)			<0.001		<0.001		0.016
No	345 (47.2%)	1.00		1.00		1.00	
Weekly	103 (63.2%)	2.02 (1.41-2.88)		1.92 (1.33-2.76)		1.63 (1.09-2.43)	
Workplace bullying			<0.001*		<0.001*		0.008*
No	58 (39.7%)	1.00	-	1.00	-	1.00	-
Now and then	247 (48.0%)	1.38 (0.95-2.02)		1.36 (0.93-2.00)		1.22 (0.80-1.85)	
Monthly	40 (57.1%)	2.05 (1.14-3.67)		1.91 (1.06-3.46)		1.58 (0.82-3.04)	
Weekly	37 (63.8%)	2.88 (1.52-5.44)		2.72 (1.42-5.18)		2.16 (1.07-4.33)	
Daily	66 (62.9%)	2.63 (1.56-4.42)		2.45 (1.44-4.18)		1.94 (1.05-3.59)	
Workplace bullying (Scores)			0.001*		0.007*		0.110*
>33	341 (47.6%)	1.00		1.00		1.00	
33-45	86 (58.5%)	1.55 (1.08-2.22)		1.44 (1.00-2.09)		1.22 (0.81-1.84)	

>45	21 (67.7%)	2.48 (1.14-5.36)	2.29 (1.04-5.05)	1.86 (0.80-4.29)
Total	448 (50.1%)			

POR: Prevalence Odds Ratio; 95% CI: 95% Confidence interval; *p value for linear trend.

ªModel 1: adjusted for sex and age; #Model 2: adjusted for sex, age, skin colour, educational level, BMI, physical inactivity, years of work, and main role; §Model 3: adjusted for all variables in model 2 + psychosocial factors (job strain, effort-reward imbalance, psychosocial safety climate) and ergonomic factors (hours sitting, repetitive strain, adequate posture, adequate desk, adequate chair).

Table 3 – Association between workplace bullying and low back pain in the last week among civil servants from the Federal Judiciary of Porto Alegre in southern Brazil, 2018. (n=894)

	CLBP	POR (Model 1)[a]	p-value	POR (Model 2)[#]	p-value	POR (Model 3) [§]	p-value
Workplace bullying (Operational definition)			0.009		0.028		0.150
No	131 (17.9%)	1.00		1.00		1.00	
Weekly	42 (25.8%)	1.72 (1.14-2.58)		1.61 (1.05-2.45)		1.41 (0.88-2.25)	
Workplace bullying			0.001*		0.005*		0.085*
No	22 (15.1%)	1.00		1.00		1.00	
Now and then	94 (18.2%)	1.26 (0.76-2.10)		1.24 (0.74-2.09)		0.98 (0.55-1.74)	
Monthly/Weekly	24 (18.8%)	1.42 (0.75-2.71)		1.32 (0.68-2.54)		0.89 (0.43-1.87)	
Daily	33 (31.4%)	2.72 (1.46-5.07)		2.49 (1.31-4.71)		1.88 (0.89-3.95)	
Workplace bullying (Scores)			0.003*		0.009*		0.090*
>33	123 (17.2%)	1.00		1.00		1.00	
33-45	42 (28.6%)	1.88 (1.24-2.83)		1.80 (1.17-2.76)		1.53 (0.95-2.45)	

	>45	8 (25.8%)	1.85 (0.80-4.27)	1.73 (0.73-4.10)	1.51 (0.59-3.85)
Total		173 (19.3%)			

POR: Prevalence Odds Ratio; 95% CI: 95% Confidence interval; *p value for linear trend.

ªModel 1: adjusted for sex and age; #Model 2: adjusted for sex, age, skin colour, educational level, BMI, physical inactivity, years of work, and main role. §Model 3: adjusted for all variables in model 2 + psychosocial factors (job strain, effort-reward imbalance, psychosocial safety climate) and ergonomic factors (hours sitting, repetitive strain, adequate posture, adequate desk, adequate chair).

Table 4 – Association between workplace bullying and chronic low back pain among civil servants from the Federal Judiciary of Porto Alegre in southern Brazil, 2018. (n=894)