









Burden of disease, pain catastrophizing, and central sensitization in relation to work-related issues in young spondyloarthritis patients

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Abstract

Introduction: Spondyloarthritis (SpA) is a common rheumatic inflammatory disease and can impact patients' work productivity. We aimed to evaluate the impact of pain catastrophizing and central sensitization on work outcomes in young SpA patients and determine the predictive factors of work productivity loss.

Material and methods: We performed a cross-sectional study over 6 months. We included patients aged between 18 and 50 years old, diagnosed with axial or peripheral SpA. Pain catastrophizing and central sensitization were assessed using the Pain Catastrophizing Scale (PCS) and Central Sensitization Inventory (CSI) questionnaire, respectively. Impact of SpA on work productivity and activity impairment during and outside of work was measured with the Work Productivity and Activity Impairment Questionnaire (WPAI: Spondyloarthritis).

Results: A total of 72 patients were enrolled, with a median age of 39 years (28.3–46), 65.3% men, and 54.4% working patients. Median scores of activity impairment outside of work, and work productivity loss were 50% (40–70), and 50% (40–60), respectively. Median absenteeism and presenteeism scores were 0% (IQR 0–7), and 100% (IQR 86.5–100), respectively. Regarding work-related outcomes: activity impairment was positively correlated with CSI and PCS; presenteeism was significantly associated with male sex ($p = 0.009$); and work productivity loss was positively associated with anxiety, depression, and poor quality of life. Multivariate regression analysis identified predictive factors of work productivity loss: male sex, poor quality of life, and prolonged morning stiffness.

Conclusions: Assessment of the impact of pain catastrophizing and central sensitization on work-related outcomes in patients with SpA is important to understand the burden of illness and to identify early those in need of interventions in clinical practice.

Key words: spondyloarthritis, work performance, central sensitization, catastrophization.

Introduction

Spondyloarthritis (SpA) is a common form of inflammatory arthritis with a prevalence rate of 0.5% [1], and an overall estimated incidence rate of axial SpA of about 4.8 cases per 100,000 person-years [2].

There is considerable evidence that SpA can impact patients' productivity even during the very early phase of the disease. According to previous studies, the disease onset is often in adolescence or young adulthood and it can cause impaired function, activity limitations, and decreased health-related quality of life [3, 4]. Poor health

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at work would be costly to SpA workers and the economy. This rheumatic disease affects young subjects in full activity and in the absence of a constant clear legislation that protects them. In fact, some countries have laws that offer flexible working time arrangement, adjustable workstations, and/or a long-period sick leave but others do not guarantee those rights, in particular for workers who are employed in the informal sector with no social protection or healthcare insurance. There are also issues of disability, reimbursement, and loss of employment.

In addition to the effect of physical disability (pain intensity, functional impairment), anxiety and depression disorders may also predict reduced productivity at work in patients with SpA [5]. On the other hand, pain catastrophizing, which is a negative mental attitude, was reported to be related to an increase in sick leave in non-specific work-related low back pain disorders [6]. It was also associated with early job stress, even in workers without pain [7]. Recently, the role of central sensitization in specific pain perception has been proposed as a possible explanation for a portion of the chronic pain in SpA [8].

There is, however, a lack of knowledge concerning the impact of these different clinical phenotypes illustrating pain catastrophizing and central sensitization on the work capacity related to SpA. Hence, we aimed to evaluate the impact of pain catastrophizing and central sensitization on work outcomes in young SpA patients and to determine the predictive factors of work productivity loss in these patients.

Material and methods

This was a cross-sectional study performed over 6 months. Consecutive young and middle-aged patients (aged between 18 and 50 years old) who visited the outpatient clinic and who were hospitalized in the rheumatology department of Charles Nicole Hospital, and diagnosed with axial and/or peripheral SpA according to the Assessment of Spondyloarthritis International Society (ASAS) criteria were selected [9]. Patients with a history of other medical conditions that could negatively affect pain perception and work productivity, such as neurological, inflammatory, and psychiatric diseases, were not included.

Demographic data (date of birth, sex), working status (employed patients in any sector were identified as workers), and disease characteristics (date of diagnosis, date of onset of SpA, duration of the disease, treatment history) were collected. At baseline, disease activity was assessed by two scores: the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) [10], and the Ankylosing Spondylitis Disease Activity Score (ASDAS) [11]. Functional impairment was assessed by the Bath Ankylosing Spondylitis Functional Index (BASFI). Quality of life was

measured by the Ankylosing Spondylitis Quality of Life scale (ASQoL) [12].

Outcomes measures

Nociceptive component: pain intensity was measured for each participant on a Visual Analogue Scale (VAS) from 0 to 10.

Pain catastrophizing was assessed using the Arabic version of the Pain Catastrophizing Scale (PCS), which is a 13-item self-inventory measuring pain-related negative thoughts and feelings. This tool includes 3 subscales: helplessness (6 items), magnification of pain (3 items), and rumination (4 items). Each item was answered on a scale from 0 to 4 (0 = not at all, 4 = all the time). The PCS score ranged from 0 to 52, with a higher score indicating greater catastrophizing. A PCS score of > 30 indicates a clinically relevant level of catastrophizing.

Central sensitization was screened by the Central Sensitization Inventory (CSI) questionnaire. The CSI is composed of two parts, assessing the presence of somatic and emotional symptoms associated with central sensitization (part A) and previous diagnoses possibly associated with central sensitization and central sensitivity syndrome (such as tension headaches, fibromyalgia, irritable bowel syndrome, etc.) (part B). Only part A of the CSI (25 items) was measured in our study. Each item recorded the frequency of each symptom on a 5-point Likert scale (0: never, 1: rarely, 2: sometimes, 3: often, 4: always). The Part A score ranged from 0 (the best score) to 100 (the worst score). According to previous research on chronic pain patients, a cutoff of 40 appears to be associated with a higher likelihood of central sensitization [13].

Anxiety and depression: Anxiety and depression were evaluated by the Arabic version of the Hospital Anxiety and Depression Scale (HADS). It is a self-administered scale composed of two subscales: (HADS-A) for anxiety and (HADS-D) for depression. Each subscale is scored from 0 to 21 points. A score of 11 or higher indicates the presence of anxious or depressive disorders.

Work Productivity and Activity Impairment: The impact of SpOA on work productivity and activity impairment during and outside of work was measured with a validated questionnaire: the Work Productivity and Activity Impairment Questionnaire (WPAI: Spondyloarthritis). The WPAI is a validated instrument that measures the impact of a specified disease such as SpA on work and other daily activities during the last 4 weeks. The WPAI provides four types of sub-scores: work absenteeism (sick leave), work presenteeism (reduced work performance), work productivity loss, and activity impairment. The WPAI results are expressed as percentages of impairment (multiplying scores by 100 to express them in percentages), with higher numbers

indicating greater impairment and lower productivity (0%: no impairment, 100%: total impairment).

Statistical analysis

The SPSS Statistics version 25 was used to analyze the data. Given the non-normal distribution of data, quantitative variables were described with their interquartile range between the 25th and 75th percentiles (IQR). Qualitative variables were expressed by frequencies and percentages. A comparison of variables was performed using the Mann-Whitney *U* test and the Kruskal-Wallis *H* test. The Spearman's rho was used to assess the correlation between WPAI and other clinical dimensions (nociceptive component, pain catastrophizing, anxiety and depression, and central sensitization). Multivariate linear regression was performed to determine the predictive factors of the sub-score "work productivity loss" of WPAI. The "Enter" method was used. The final model was selected based on the good quality of the regression model (a good R^2 with significant *p*-values) and after checking the collinearity between the variables. The validation of the final model was carried out with the Durbin-Watson residual study. The confidence interval was estimated at 95% and all hypotheses were tested at a significance level of 0.05.

Bioethical standards

Ethical approval for the study was obtained from the local hospital ethics committees (CHRH12/2022), and each participant gave informed consent.

Results

Demographic and occupational variables

The demographic and clinical characteristics of our sample at baseline ($n = 72$) are detailed in Table I. The median age of the included patients was 39 years (IQR 28.3–46), and 65% of patients were males. According to their occupational status, 54% of participants were workers: workers in the private sector (31%), workers in the public sector (18%), and self-employed workers (6%). There were 46% non-worker patients: housewives (24%), unemployed (16%), and students (6%). No worker was on sick leave at baseline.

Clinical variables

The median age at onset of SpA was 21 (IQR 18–34) years, and the median duration of the disease was 10 (IQR 6–14) years. Among enrolled patients, we noted coxitis in 53%, IBD in 10%, and psoriasis in 8%. Non-steroidal anti-inflammatory drugs (72%) and TNF inhibitors (51%) were the most commonly used treatments. As

Table I. Baseline characteristics

| Variables | |
|---|----------------|
| Age, Median (IQR 25–75) | 39 (28.3–46) |
| Sex | |
| Females [<i>n</i> (%)] | 25 (35) |
| Males [<i>n</i> (%)] | 47(65) |
| Occupation [<i>n</i> (%)] | |
| Student | 4 (6) |
| Unemployed | 11 (16) |
| Housewife | 16 (24) |
| Worker in the private sector | 21 (31) |
| Worker in the public sector | 12 (18) |
| Self-employedworker | 4 (6) |
| Age at onset of SpA, Median (IQR 25–75) | 21 (18–34) |
| Disease duration, Median (IQR 25–75) | 10 (6–14) |
| Form of SpA | |
| Axial [<i>n</i> (%)] | 35 (49) |
| Axial and peripheral [<i>n</i> (%)] | 34(47) |
| Peripheral [<i>n</i> (%)] | 3(4) |
| Coxitis [<i>n</i> (%)] | 38 (53) |
| PGA, Median (IQR 25–75) | 5 (4–7) |
| VAS for global pain, Median (IQR 25–75) | 5 (3.5–6.5) |
| VAS for axial pain, Median (IQR 25–75) | 5 (3–7) |
| VAS for peripheral pain, Median (IQR 25–75) | 0 (0–5) |
| BASDAI, Median (IQR 25–75) | 3 (2.1–4.7) |
| ASDAS-CRP, Median (IQR 25–75) | 2.7 (1.9–3.48) |
| BASFI, Median (IQR 25–75) | 3.5 (1.8–5.1) |
| ASQoL, Median (IQR 25–75) | 6 (3–10) |
| CRP, Median (IQR 25–75) | 11.5 (3.18–25) |

ASDAS-CRP – Ankylosing Spondylitis Disease Activity Score correlated with C-reactive protein, BASFI – The Bath Ankylosing Spondylitis Functional Index, BASDAI – Bath Ankylosing Spondylitis Disease Activity Index, CRP – C-reactive protein, PGA – Patient Global Assessment, SpA – spondyloarthritis, VAS – Visual Analogue Scale.

for SpA activity, the median BASDAI and ASDAS scores were 3 (IQR 2.1–4.7) and 2.7 (IQR 1.9–3.48), respectively. The median VAS pain score was 5 (IQR 3.5–6.5). A clinically relevant level of catastrophizing (PCS ≥ 30) was found in 21% of patients. High central sensitization (CSI-A ≥ 40) was found in 15%. The median (IQR) values of HADS-D and HADS-A were 5 (IQR 3–8) and 3 (IQR 2–8), respectively (Table II). HADS-D was ≥ 11 in 11%, and 10% presented HADS-A ≥ 11 .

The median score of activity impairment outside of work was 50% (IQR 40–60) for all patients. As for workers with SpA, the median score of absenteeism

was 0% (IQR 0–7), the median score of presenteeism was 100% (IQR 86.5–100), and the median score of work productivity loss was 50% (IQR 40–70).

A moderate positive correlation was found between activity impairment among all the participants (WPAI) and both central sensitization (CSI-A) and pain catastrophizing (PCS) (Table III). Presenteeism (WPAI) was significantly higher in working men with SpA than in women ($p = 0.009$) (Table III). No significant association between pain catastrophizing (PCS), central sensitization (CSI-A), and occupational status was found (Table IV).

In univariate analysis, the sub-score “work productivity loss” of WPAI was positively associated with HADS-A, HADS-D, and ASQoL (Table V). Male sex, high ASQoL, and prolonged morning stiffness were the pre-

dictive factors of work productivity loss in multivariate regression analysis (Table VI).

Discussion

In this study, we demonstrated increased work productivity loss, presenteeism, and higher activity impairment in young SpA patients aged between 18 and 50 years. Our results were close to the reported frequency of work productivity loss and activity impairment among SpA patients in several studies [14–16]. However, compared to these studies, this study showed a higher frequency of presenteeism. The higher scores for presenteeism in our cohort can be partly explained by the fact that SpA patients were selected from the hospitalized patients, which included patients with more severe diseases. Previous research suggested that reduced work performance due to poor health (often referred to as “presenteeism”) is a widespread phenomenon. Presenteeism was found as an indicator of productivity loss and the risk of absence from work due to mental health problems [17]. Additionally, job characteristics can significantly impact work outcomes. In fact, manual jobs and unfavourable coping strategies were found to be predictors of negative work outcomes [4].

Catastrophizing and work outcomes

Pain catastrophizing (PCS ≥ 30) was at a clinically relevant level in 21% of subjects and was positively correlated with activity impairment outside work. The new insight investigated in our study is the potential effect

Table II. Clinical outcomes variables

| Variables | Median (IQR [25–75]) |
|------------------------|----------------------|
| CSI | 15 (6.25–33.75) |
| HAD anxiety | 3 (2–8) |
| HAD depression | 5 (3–8) |
| PCS | 11 (3–26) |
| Absenteeism (%) | 0 (0–7) |
| Presenteeism (%) | 100 (86.5–100) |
| Work productivity loss | 5 (4–7) |
| Activity impairment | 5 (4–6) |

ASQoL – Ankylosing Spondylitis Quality of Life, CSI – central sensitization inventory, HAD – Hospital Anxiety and Depression Scale, PCS – Pain Catastrophizing Scale.

Table III. Correlations between WPAI variables and PCS, CSI, and sex

| | PCS | | CSI | | Sex | | <i>p</i> |
|------------------------|----------|----------|----------|----------|----------------|------------------|----------|
| | <i>p</i> | <i>r</i> | <i>p</i> | <i>r</i> | Males (median) | Females (median) | |
| Absenteeism (%) | 0.122 | 0.243 | 0.435 | 0.124 | 0 | 4 | 0.299 |
| Presenteeism (%) | 0.201 | –0.202 | 0.409 | –0.131 | 100 | 84 | 0.009 |
| Work productivity loss | 0.056 | 0.291 | 0.122 | 0.237 | 5 | 4 | 0.313 |
| Activity impairment | 0.004 | 0.338 | 0.004 | 0.333 | 5 | 5 | 0.805 |

CSI – central sensitization inventory, PCS – Pain Catastrophizing Scale, WPAI – Work Productivity and Activity Impairment.

Table IV. Medians of PCS and CSI according to the occupation

| | Occupation | | | | | | <i>p</i> |
|-------|------------|------------|-----------|------------------------------|-----------------------------|----------------------|----------|
| | Student | Unemployed | Housewife | Worker in the private sector | Worker in the public sector | Self-employed worker | |
| PCS | 2 | 18 | 7 | 18 | 11 | 15 | 0.132 |
| CSI-A | 8 | 18 | 18 | 18 | 12 | 20 | 0.869 |

CSI – central sensitization inventory, PCS – Pain Catastrophizing Scale.

of psychological distress, such as pain catastrophizing, on work productivity among young patients with SpA.

Pain catastrophizing has been considered an exaggerated negative cognitive response to actual or perceived pain [18]. It is a multidimensional construct comprising ruminating thoughts, helplessness, and magnified pain experiences. Pain catastrophizing appears to increase the intensity and duration of pain [19]. Thus, SpA patients who catastrophize may fear further pain-related activities and avoid activities outside of work, resulting in activity impairment.

Spondylitis affects patients negatively throughout their working life, causing absenteeism and reduced productivity at work, which generates negative psychosocial effects. As is known, SpA affects adults at their most economically active ages [4]. Our study population was mainly young and active; the median age of the included patients was 39 years (IQR 28.3–46), and 54% were workers.

The impact of pain catastrophizing on work-related disability in SpA has not been yet studied. Catastrophizing was significantly associated with sickness leave, its duration, and the degree of disability in patients with work-related low back pain [6].

The role of pain catastrophizing as a significant mediator of work outcomes such as work limitations and perceived disability has been increasingly considered in other musculoskeletal diseases [6]. Hylkema et al. found that pain catastrophizing was significantly associated with the four sub-scores of WPAI (activity impairment, work productivity loss, absenteeism, and presenteeism) after total knee arthroplasty [20]. A Japanese study showed that pain catastrophizing may be associated with early job stress even in workers without chronic pain [7].

In our study, anxiety and depression were associated with work productivity loss. Comorbidity between SpA and anxiety/depression is widely known and associated with greater loss of work productivity and reduced work performance [14, 15, 21, 22].

Some researchers have argued that pain catastrophizing is rooted in cognitive-behavioral conceptualizations of anxiety and depression and is characterized substantially by a relative inability to suppress or inhibit pain-related cognitions. To date, establishing a causal relationship between pain catastrophizing and anxiety/depression remains difficult since the causal direction might be the reverse [18].

Pain catastrophizing, depression and anxiety appeared to interact together through the same behavioral, cognitive, and physiological pathways. We aimed to evaluate the impact of pain catastrophizing on work productivity among patients with SpA to early identify

Table V. Correlation between work productivity loss and patients' characteristics

| Work productivity loss | <i>p</i> | <i>r</i> |
|------------------------|----------|----------|
| Age | 0.064 | −0.282 |
| HAD anxiety | 0.044 | 0.305 |
| HAD depression | 0.049 | 0.298 |
| ASQoL | 0.005 | 0.417 |
| Morning stiffness | 0.059 | 0.301 |

ASQoL – Ankylosing Spondylitis Quality of Life, HAD – Hospital Anxiety and Depression Scale.

Table VI. Multivariate linear regression analysis

| | B | <i>p</i> | 95% CI | |
|------------------|-------|----------|--------|-------|
| | | | Lower | Upper |
| (Constant) | 2,222 | 0.015 | 0.454 | 3.990 |
| Sex | 2.013 | 0.015 | 0.416 | 3.610 |
| ASQoL | 0.110 | 0.047 | 0.002 | 0.217 |
| Morningstiffness | 0.034 | 0.013 | 0.007 | 0.060 |

ASQoL – Ankylosing Spondylitis Quality of Life.

those in need of interventions in clinical practice. Early detection of pain catastrophizing in SpA patients would reduce the effects of depression, anxiety, helplessness, and other psychological correlates of chronic pain.

Central sensitization and work outcomes

High central sensitization (CSI-A ≥ 40) was correlated with activity impairment in SpA patients. In a recent study, the authors concluded that central sensitization and related comorbidities were found to be increased in axial SpA patients, thus this increase should be taken into consideration in the management of these patients [23]. In another study, a close relationship between central sensitization severity and the female sex, pain, disease activity, sleep quality, and quality of life was found among axial SpA patients. The authors found that central sensitization should be considered when planning axial SpA treatment [24]. Nowadays, research is focused on the central sensitization of pain [25]. Available literature suggests that glial overactivation and neuroinflammation enhance the establishment and/or maintenance of central sensitization. To our knowledge, the link between central sensitization and work productivity has not yet been investigated. Recently, Nijs et al. [26] reported that aberrant glial activity in chronic pain might have been triggered by sleep disturbances. Moreover, the significant role of central sensitization as a major pathophysiological mechanism in fibromyalgia

syndrome has been widely documented, including among patients with rheumatoid arthritis [27]. As a result, we can assume that some confounding factors, such as sleep disturbance, insomnia, and fibromyalgia, interfere with the relationship between work outcomes and central sensitization in patients with SpA [28, 29]. The pain amplification syndrome in fibromyalgia, which on its own affected work absenteeism and work productivity, negatively impacted the pain perception in SpA [30].

In concordance with our results, Haglund et al. identified poor quality of life and higher scores of anxiety and depression as significant predictors of presenteeism and activity impairment at follow-up in SpA [31].

Sex difference

According to our findings, working men with SpA had significantly higher presenteeism than women ($p = 0.009$), and male sex was identified as a predictor of work productivity loss. To our knowledge, this is the first study to demonstrate these findings. Results from the European Map of Axial SpA survey demonstrated that SpA patients with work-related issues were more often female [14]. Similarly, recent data from Norway, Sweden, and American centers showed that women reported greater absenteeism, and work and activity impairment [31–33]. A web survey of Latin American SpA patients showed that females had significantly higher work absenteeism and presenteeism, although they were less likely to receive treatment (26% vs. 16%, $p < 0.01$). Sex differences disappeared after correction for treatment [34]. Lee et al. [35] revealed that increased costs of productivity loss were strongly associated with female sex.

Although our study found an association between work productivity loss, presenteeism, and male sex, the literature appears to be divided on the subject. A difference in disease aspects between males and females with SpA has always been described. In fact, male SpA patients had higher radiological progression while female patients had in comparison higher enthesitis scores, higher disease activity, higher functional limitation, predominant cervical spine involvement, and lower TNF inhibitor efficacy and drug survival. However, the burden of the disease was found to be similar in both sexes [36]. Our results could be explained by the increase in anxiety and depressive disorders in our male population, both of which have been shown to reduce work productivity, as previously discussed.

Burden of disease

Poor quality of life (high ASQoL) and prolonged morning stiffness were identified as predictors of work produc-

tivity loss in our findings. This finding supports previous research that linked higher disease activity, functional impairment, and altered quality of life to poor work outcomes [37]. Furthermore, a study by Kucharz et al. [38] found that SpA patients feared losing their jobs because of their disease. Consistent with our findings, the results of Garrido-Cumbrera et al. in the Spanish Atlas Study and the European Map Survey showed that being unemployed was associated with spinal stiffness, anxiety, and depression [14, 15]. A Tunisian survey pointed out the association of lumbar stiffness with absenteeism, presenteeism, and work productivity loss in SpA [16].

Limitations

However, the present study has limitations. A cross-sectional design was applied, although a longitudinal approach might help verify the impact on work productivity and assess differences in disease outcomes over time between men and women. The cross-sectional design does not allow us to determine the causal relationship between disease and patients' related parameters and working productivity loss. Patients absent at baseline for sick leave were not included; it is, therefore, difficult to know how many workers with SpA might be eligible for the survey. Due to the cross-sectional nature of our study, no longitudinal analyses were conducted. Considering these factors, this study's conclusions are limited to the investigated group exclusively.

Implications and recommendations

To the best of our knowledge, studies exploring the impact of pain catastrophizing and central sensitization on work-related outcomes in SpA are lacking. First, our results may provide evidence for further research on developing intervention strategies for SpA workers with pain catastrophizing in collaboration between rheumatologists and occupational physicians.

Furthermore, laws to protect workers from professional downgrading and dismissal because of this disease are needed. Further studies are needed to better understand the differences in disease progression and the impact of mental health symptoms on work in patients with SpA. We can propose to take into consideration the central sensitization and also the pain catastrophizing when evaluating the fitness for work and return to work after sick leave in SpA workers, by screening for anxiety, depression, catastrophizing, and pain sensitization. Better early professional integration for these young SpA patients could help to improve work performance, work productivity, and satisfaction.

Indeed, a recent meta-analysis showed the effects of workplace interventions on clinical outcomes related

to low back pain in a working population and pointed out significant improvements in pain, fear-avoidance of physical activity, and quality of life, and a significant decrease in sick leave [39].

Improving work outcomes in SpA should involve physical and psychological interventions to modulate the perception of pain as well as pharmacological treatment of nociplastic pain. Here, the role of the occupational physician takes its full place in terms of workplace intervention programs. Physical interventions consist of ergonomic posture training and supervised exercise of muscle strengthening in the workplace. Psychological interventions including cognitive-behavioral therapy, meditation, stress self-management, and educational strategies to cope with pain could be proposed for SpA workers. Additionally, modern management of SpA with early treatment intensification using biological disease-modifying antirheumatic drugs can be associated with improvement of work-related issues [37, 40]. Our findings support the need to follow a biopsychosocial framework to optimize work outcomes in SpA patients with pain catastrophizing and sensitization.

Conclusions

Spondyloarthropathies affects adults at their most economically active ages, increasing absenteeism, work productivity loss, and psychosocial repercussions. Employed patients with SpA endure many problems at work related to their health condition in terms of presenteeism, absenteeism, and work productivity loss. The assessment of the impact of pain catastrophizing and central sensitization on work productivity in patients with SpA is important to understand the burden of illness and the long-term outcomes of interventions.

Patients with SpA need legal health protection and adequate working conditions, such as the ergonomic design of the workstations, the arrangement of adequate rest, as well as recovery programs to empower their resilience at work and their psychological well-being.

The authors declare no conflict of interest.

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