

Could AI-Chatbot Help With Prevention of Burnout Syndrome? Pilot Study in Two Czech Manufacturing Companies

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ABSTRACT

Burnout syndrome develops as a result of prolonged overload combined with insufficient recovery. It manifests as emotional and physical exhaustion as well as cognitive fatigue. In the modern era, numerous digital approaches are available for the prevention and promotion of health, including mental health. A pilot project aimed at verifying the feasibility of burnout prevention using a professionally supervised chatbot was conducted from January to July 2025. Collaboration was established with two manufacturing companies, and based on baseline questionnaires—particularly the SMBM (Shirom–Melamed Burnout Measure)—30 respondents were selected. Out of 71 respondents, 63 SMBM questionnaires were analyzed, yielding a mean score of 51 points, indicative of mild to moderate burnout. Over an 8-week period, chatbot communication was enabled for the 30 selected participants. A total of 22 respondents engaged with the chatbot. The follow-up SMBM questionnaire was completed by 10 respondents (response rate 30%). Due to the low number of responses, group-level evaluation was not feasible; however, improvement was observed in 6 individual cases. A professionally designed and supervised digital tool—a chatbot utilizing artificial intelligence—appears to be a highly promising instrument for large-scale prevention of work-related burnout. Further validation in practice is required.

Keywords Workplace stress, Questionnaires, SMBM, Digital tool, Prevention

INTRODUCTION

Despite extensive research, burnout was only relatively recently officially recognized by the World Health Organization (WHO) as an occupational phenomenon within the International Classification of Diseases (ICD-10); the

updated ICD-11 provides a more detailed definition. WHO conceptualizes burnout as a result of chronic workplace stress that has not been successfully managed, characterized by three dimensions: feelings of energy depletion or exhaustion; increased mental distance from one's job or feelings of negativism or cynicism related to work; and reduced professional efficacy (WHO, 2019).

The broad agreement in the literature regarding the most commonly reported symptoms of burnout exists, but the definition – even with WHO approach - remains for some researchers insufficiently standardized for scientific and therapeutic purposes. This highlights an ongoing need for a unified conceptual framework that accommodates the diverse psychological and research perspectives on the syndrome (Hillert et al., 2020).

According to the literature, burnout is most commonly characterized by a broad range of psychological, behavioral, interpersonal, and somatic symptoms. Prominent manifestations include persistent exhaustion, diminished energy, and sleep disturbances. Cognitive symptoms frequently involve impaired concentration and memory, feelings of inadequacy, and difficulty making decisions.

Emotional and motivational changes are also commonly reported, including reduced initiative and creativity, indifference, boredom, disillusionment, increased tearfulness, feelings of weakness, inner restlessness, and despair. In the interpersonal domain, individuals experiencing burnout often develop greater emotional distance from clients or colleagues, increased reliance on impersonal or technical language, a tendency to attribute blame to others, diminished empathy, cynicism, loss of idealism, bitterness, and, in severe cases, dehumanization. Burnout may additionally be associated with difficulties in intimate and family relationships, as well as a perceived lack of recognition or appreciation. Somatic symptoms are frequently observed and may include chest tightness, dyspnea, back pain, and nausea. Increased consumption of nicotine and alcohol has also been reported as a maladaptive coping response (Burisch M., 2001, 2014).

Burnout syndrome develops as a consequence of prolonged overload and inadequate recovery. It is characterized by emotional and physical exhaustion, cognitive fatigue (e.g., slowed thinking and impaired concentration), and reduced capacity for social interaction and empathy in the workplace. Key factors influencing burnout include workplace bullying, job stress, and poor communication, with protective factors such as supportive work environments, adequate staffing, and individual resilience (Amiri et al., 2024).

Since the 1970s, psychologists and physicians have examined states of overall, particularly psychological, exhaustion affecting cognitive functions, motivation, and emotions, as well as attitudes, opinions, and work performance, ultimately influencing patterns of professional behavior. Since the first description of burnout in 1974 until today, more than 140 definitions of burnout syndrome or phenomenon have been suggested (Hillert et al., 2020).

The term “burnout” was introduced in 1974 by Freudenberger, who observed a loss of motivation or incentives among volunteers working in humanitarian organizations, particularly when their dedication did not yield the expected results. (Freudenberger, 1974, 1989). Maslach and Jackson

(1981) later proposed the most systematic conceptualization of burnout, defining it as a syndrome characterized by emotional exhaustion (feelings of emotional overload and depletion), depersonalization (a negative, detached response toward recipients of care or services), and reduced personal accomplishment (feelings of incompetence and lack of achievement at work) (Maslach and Jackson, 1981). These three dimensions of the burnout experience are – exhaustion, cynicism and inefficacy. The significance of this three-dimensional model is that it clearly places the individual stress experience within a social context and involves the person's conception of both self and others (Maslach and Leiter, 2016). Some authors conceptualize burnout syndrome as consisting of only two fundamental components, or dimensions: the inability to continue (exhaustion) and the unwillingness to continue (detachment). (Schaufeli et al., 2001, Schaufeli and Taris, 2005).

The relationship between burnout and mental disorders and the wide range of correlations between burnout and depression argues for a complex relationship between these constructs. Given that the primary therapeutic objective in burnout is to facilitate a successful return to work and the restoration of occupational functioning, psychiatry is uniquely positioned to identify and implement treatment strategies that most effectively support these outcomes (Maslach and Leiter, 2016).

The first burnout measure that was based on a comprehensive program of psychometric research was the Maslach Burnout Inventory (MBI) which was specifically designed to assess the three dimensions of the burnout (Maslach et al., 1996). In addition to the MBI, numerous other instruments exist for assessing both general and occupation-specific burnout. Occupational Burnout is currently measured through several Patient-Reported Outcome Measures. The psychometric validity is considered for the Maslach Burnout Inventory (MBI), the Pines' Burnout Measure (BM), the Psychologist Burnout Inventory (PBI), the Oldenburg Burnout Inventory (OLBI), the Copenhagen Burnout Inventory (CBI), Shirom-Melamed Burnout Measure (SMBM) and the Burnout Assessment Tool (BAT) (Shoman et al., 2021, 2023).

For this pilot project, the Czech version of the SMBM (Shirom–Melamed Burnout Measure) was used to assess physical fatigue, cognitive exhaustion, and emotional exhaustion (Shirom and Melamed, 2006; Ptacek et al., 2017). The SMBM questionnaire consists of 14 items: 6 assess physical fatigue, 5 assess cognitive fatigue, and 3 assess emotional exhaustion. Responses are rated on a seven-point Likert scale ranging from 1 (“never or almost never”) to 7 (“always or almost always”), with higher scores indicating greater burnout. Statistical analyses and results were looked upon with correspondence to the population average in the Czech Republic (Sebalová et al., 2023).

MATERIALS AND METHODS

The pilot study project was conducted from January to July 2025. Two Czech manufacturing companies were recruited through in-person meetings with employer representatives. The entire project was explained during a meeting with employer representatives, who subsequently distributed an informational

email to employees containing a link to the digital questionnaires. After that, the employers were no longer involved in the project and were informed only upon its completion.

The initial questionnaire survey in the abovementioned companies took place in April–May 2025. Its distribution was managed by designated contact persons and conducted online. The questionnaire covered demographic data, job roles, stress, mental health (PSS-10) and burnout aspects (SMBM — Shirom–Melamed Burnout Measure), and also included the informed consent for participation.

The communication through the chatbot began on 19 May 2025 and continued for 8 weeks (the final message was sent on 10 July 2025). The selected respondents were first informed via an SMS that they had been enrolled in the project, and that a more detailed information was sent to their email. This email contained access instructions for the chatbot, registration steps, and the guidance on its use.

Selected respondents participated in an 8-week communication intervention initiated proactively by a chatbot via a web-based platform. Each day at 10:00 a.m., the chatbot sent an initial message to the participant's phone number. Participants could respond at whatever time suitable for them. The total number of messages from chatbot was up to 10 messages per day. The communication was guided by topics specified by the respondent, encompassing both work-related situations—such as fatigue, stress, and demanding workplace communication—as well as non-work-related contexts. Over the time the chatbot progressively became familiar with the respondent and, throughout the interaction, consistently built upon knowledge acquired from previous communications.

The very first message from the chatbot read as follows: “Hello! I am a chatbot here to listen to you and provide support whenever you would like it. I am not a professional expert, but I can share useful information and offer a space for reflection. Each day, we can exchange up to 10 messages to keep our conversation clear and meaningful. How are you feeling today? I would also like to address you by name—what should I call you?”

The artificial intelligence system operated within specialized software integrating expert-curated content covering a range of symptoms and effective preventive measures, prepared and selected by the research team. The expert sources prepared by the research team were carefully selected, and the system was simultaneously designed to ensure that it did not use any other external professional sources that had not been approved.

The chatbot was also trained to recognize critical communication signals indicating potential urgent situations and was able to refer users to a psychological crisis helpline.

For the control group (respondents not selected for the communication through the chatbot), an email with a link to a psychoeducational video was sent on 25 June 2025. The video, titled “Stress, Burnout and Communication: Strategies for Well-Being”), was prepared by member of the research team. It summarized stress and burnout, their prevention and management; the psychological aspects of communication; approaches to conflict; and understanding the dynamics of workplace relationships.

On 6 August 2025 (one month after the chatbot intervention ended), an email inviting to the completion of follow-up questionnaires was sent to all 30 respondents; data collection closed on 30 August 2025. The instruments used as questionnaires included again the Perceived Stress Scale (PSS-10), SMBM (Shirom–Melamed Burnout Measure), and a questionnaire on the impact of chatbot use on work productivity, and items on user experience with the chatbot.

The employers of both companies were informed only through anonymized aggregated data about the total number of participants and the overall number of conversations conducted across both companies combined, due to the small number of respondents.

Statistical Analyses

Given the sample size (N = 63 in the initial phase, and N = 10 the follow-up phase), the SMBM (Shirom–Melamed Burnout Measure) was at first evaluated in descriptive statistics and in the follow-up phase had to be evaluated strictly as a qualitative study. Statistical analyses of PSS-10 questionnaire are not part of this article.

Evaluation procedure was done by scoring and calculation of mean values. In the SMBM questionnaire, respondents answer on a 1 to 7 scale, where 1 indicates “never” and 7 indicates “always.” For each respondent, the arithmetic mean was calculated separately for the three main subscales: physical fatigue (6 items), cognitive weariness (5 items), and emotional exhaustion (3 items). According to the standard methodology, a mean score above 40 is considered to indicate an increased risk of burnout syndrome. The number of individuals exceeding this threshold out of the total sample of ten was recorded. Some extreme values were noted and excluded in the initial phase for not fitting the purpose of the pilot study - it was evaluated and decided by research team as not entirely safe for AI-chatbot use.

RESULTS

In the initial phase, 71 fully completed questionnaires were obtained; 8 individuals declined SMS communication and were therefore excluded. Of the remaining 63 respondents included in the study, 48 held administrative positions (working in the office) and 15 were employed in non-administrative roles (manual workers). A total of 63 SMBM questionnaires were analyzed, with a mean score of 51.22 (SD = 15.45), indicating mild to moderate burnout levels. See Table 1.

Table 1: SMBM scores – initial phase.

	Number of Respondents	Mean	St.Deviation	Min	Max
Office	48	51.47917	14.12405	21	78
Manual	15	50.4	19.64252	20	84
Total	63	51.22222	15.44548	20	84

Based on expert team decisions, 30 respondents with a mean score of 43 (mild burnout), corresponding to the population average in the Czech Republic, were selected for the intervention. The exclusion criteria were based on the research team decision with regard to fit the purpose of the pilot study – AI-chatbot could not be entirely safe for higher levels of burnout.

Over the 8-week period, active chatbot communication was conducted with these 30 participants. A total of 22 respondents engaged with the chatbot, with various levels of activity; 5 respondents were highly active.

The follow-up SMBM questionnaire was completed by 10 respondents (response rate 30%). Due to the small sample size, group-level statistical evaluation was not feasible; however, improvements were observed in 6 individual cases.

At the individual level, improvements were predominantly observed in overall burnout scores, although notable exceptions occurred. For example, Respondent A showed a reduction in total burnout score from 41 to 33 (–8), with substantial decreases in physical (21→11; –10) and cognitive (17→13; –4) components, but an increase in emotional exhaustion (3→9; +6), reflecting a typical pattern in which physical and cognitive symptoms improve faster than emotional detachment. A similar trend was observed in Respondent B. Respondent C demonstrated a slight reduction (60→57; –3). See Table 2.

Table 2: Changes in the SMBM scale for respondents A, B, and C.

	Respondent A	Respondent B	Respondent C
SMBM – overall score	41 → 33	35 → 25	60 → 57
Physical fatigue	21 → 11	21 → 13	24 → 23
Cognitive weariness	17 → 13	10 → 6	23 → 21
Emotional exhaustion	3 → 9	4 → 6	13 → 13

Evaluation of user experience indicated predominantly positive responses, particularly regarding usefulness, clarity, and ease of use. A smaller group expressed more critical views, especially concerning message length and preferred communication channels. Open-ended responses highlighted the value of concise, actionable recommendations and daily prompts (“nudges”), while also suggesting a need for greater personalization according to job type and work schedule constraints.

An important finding of this pilot study was the differing trajectory of burnout dimensions. While physical fatigue and cognitive weariness tended to improve over the intervention period, emotional exhaustion showed a slower recovery and, in some participants, even increased. One possible explanation is that the chatbot intervention enhanced self-reflection and emotional awareness. Participants may have become more conscious of their emotional burden and work-related difficulties, leading to a temporary increase in the reporting of emotional symptoms. At the same time, practical recommendations regarding recovery, stress management, sleep, daily routines, and coping strategies may have produced faster improvements in physical and cognitive functioning. This observation is consistent with the

understanding that emotional components of burnout are often more deeply rooted and may require longer-term interventions and broader organizational changes.

DISCUSSION

The growing global demand for accessible mental health support has stimulated the development of a wide range of digital interventions, including conversational agents and workplace wellness platforms. Although most of these tools were not designed specifically to address burnout, many incorporate evidence-based components that are directly relevant to the prevention and early management of emotional exhaustion, occupational stress, and related behavioral health outcomes. Collectively, the digital and AI based tools demonstrate the growing role of digital technologies in burnout prevention and mental health promotion. Although evidence regarding long-term effectiveness remains limited, their scalability, anonymity, and accessibility make them promising adjuncts to traditional interventions. As an illustrative example is “Florence”, a multilingual digital health worker developed by the World Health Organization; “Wysa”, AI-based mental health chatbot using psychotherapeutic approaches, particularly cognitive behavioral therapy; “Woebot Health”, emphasizes mood monitoring and stress reduction through conversational interaction; “Youper”, combines artificial intelligence with cognitive behavioral therapy to deliver mood tracking, guided conversations, meditation, and reflective journaling. These tools may be particularly valuable for individuals experiencing early manifestations of burnout, including irritability, diminished motivation, and persistent psychological strain.

In addition to chatbot-based interventions, several digital wellness platforms target occupational mental health at the organizational level – “Headspace for Work” offers structured programs focused on stress management, mindfulness, and resilience and can be incorporated into employee well-being strategies; “Unmind” provides workplace mental health assessments, self-guided interventions, educational modules, and mindfulness exercises, including content specifically addressing burnout.

Other platforms emphasize monitoring and early detection of burnout-related symptoms – “Wellness Coach” combines digital coaching with mindfulness, breathing exercises, and productivity tools; “Moodfit” enables users to track mood, sleep, physical activity, and behavioral habits, thereby identifying patterns that may contribute to chronic stress and burnout.

Burnout intervention would mostly need to change the environment to reduce stressors, but most interventions focus on making the individual more resilient to the ongoing work demands/stressors. Individual interventions generally include programs aimed to support coping skills, resilience, and/or job skills, including communication and interpersonal skills. Organization-directed interventions involve changes to the job or work-environment, such as increasing work flexibility, reducing workload, providing additional resources, or more in-depth job and organizational redesign (Wullert and Whitacre, 2025).

The majority of digital components used in burnout interventions are apps, a digital platform, or web-based interventions. Even with implementation of the individual interventions the organizational support is needed for successful implementation (Adam et al., 2023).

This research project was co-financed by World Health Organization and strict temporal and financial constraints were imposed. These conditions established a project duration of six months, which substantially influenced the scope and methodological options of the research design. At the same time, this framework enabled the development of an AI-based chatbot capable of actively engaging in communication with respondents, drawing on a predefined set of expert sources, and identifying critical indicators within the conversation. The project timeline also influenced the selection of the instant messaging application used for communication and determined the duration of the interventions. Nevertheless, we consider the results obtained to represent an important first step in the right direction, particularly with regard to the professional quality of the communication and the chatbot's proactive engagement.

CONCLUSION

The use of an AI-supported chatbot for the prevention of work-related burnout appears to be a promising and feasible approach, particularly due to its accessibility, scalability, anonymity, and ability to provide regular proactive support. Despite the limited sample size and low follow-up response rate, improvements in overall burnout scores were observed in several participants, suggesting a potential benefit of professionally supervised digital interventions.

Qualitative feedback of this study suggests that the most valued elements of the intervention were regular daily prompts ("nudges"), concise actionable recommendations, and the opportunity for reflection through ongoing conversation. These components may represent important mechanisms contributing to symptom improvement.

It must be also noted the importance of combining individual-level digital support with organizational prevention measures. Burnout is strongly influenced by workplace conditions, and therefore digital tools should be viewed as complementary rather than standalone interventions.

Overall, this pilot study represents an important first step toward the development of evidence-informed AI-assisted tools for workplace mental health promotion and burnout prevention. Future studies should include larger samples, longer follow-up periods, and a more detailed analysis of user interactions in order to identify the factors associated with successful outcomes.

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