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PROSPECTS FOR IMPLEMENTING DIGITAL TOOLS FOR HEALTH PROMOTION IN THE WORKPLACE

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Summary

Aim. To assess the effectiveness of a three-month corporate health program (CHP) at the workplace that utilized digital tools for implementation.

Materials and methods. The study involved 22 employees of an IT company in Ukraine. The CHP was developed and implemented using a digital tool with a special algorithm for collecting, processing, and sharing information within the CHP. For further implementation, a chatbot with an intuitive interface was constructed, which allowed a personalized access to the account for each CHP participant. It has become possible to obtain personalized information regarding changes in CHP participation and to provide personalized recommendations. The CHP plan also included educational events on healthy lifestyles, accompanied by interactive materials in the chatbot. The CHP's effectiveness was assessed based on the results of the survey using standardized scales of the Health Promoting Lifestyle Profile Questionnaire (HPLP-II) before and after CHP implementation.

Results. The overall score of the Healthy Lifestyle Profile increased significantly (from 52.9 % to 57.9 %, $p=0.025$), the same as the individual scales of Health Responsibility (from 38.4 % to 48.8 %, $p=0.00621$) and Stress Management (from 45.1 % to 55.3 %, $p=0.00104$) before and after CHP implementation. Although positive changes were observed in the Physical Activity, Nutrition, Spiritual Growth, and Interpersonal Relationships scales, they did not reach statistical significance. The survey participants' responses to individual questions suggest that their behavior has undergone positive changes. Specifically, respondents are opting for lower-fat and sugar foods, visiting their doctor regularly, eating healthy foods, taking care of their own mental health, and effectively managing their workload.

Conclusions. The CHP, which utilized digital tools, had a positive impact on the development of healthy habits and practices among participants. As evidenced by the data collected, the CHP increased participants' sense of responsibility for their own health and stress management skills. These findings suggest that implementing similar programs using digital tools is feasible.

Keywords: public health, corporate program, workplace health, digital health, health informatics

INTRODUCTION

Health promotion measures enable individuals to enhance their control over their own health and improve it through various social and environmental interventions [1]. These measures are comprehensive, and systemic, and pertain to the development of public health policy, including the establishment of a favorable workplace environment, the strengthening of community activities, and the improvement of health education [1, 2]. Health promotion is a crucial aspect of a global health. It deals with intricate socio-economic and cultural changes

at the family and community levels. It also encourages cross-sectoral actions that aim to shape healthy public policies and establish sustainable health systems [3].

Health promotion is crucial in addressing global challenges related to mental health, physical activity, nutrition, and workplace health [1]. According to the World Health Organization (WHO), unhealthy diet and physical inactivity are the primary global health risks [4]. Mental health is a significant public health concern [5, p. 256]. WHO experts focus on the health of the working population. Work-related health problems are estimated

to cause economic losses of 4-6 % of GDP for most countries. Research shows that workplace health initiatives can reduce sickness absence by 27 %, healthcare costs – by 26 %, and ultimately keep employees healthy.

Traditional health promotion approaches and tools can be expensive and difficult to access, particularly in low- and middle-income countries. Furthermore, challenges such as the COVID-19 pandemic have highlighted the potential benefits of digital technologies for public health. Therefore, there is an increasing need to utilize digital health to achieve health promotion objectives [7].

Digital health interventions offer a promising approach to health promotion by providing affordable solutions to global problems for different populations. These interventions include a wide range of digital tools, products, and services. Furthermore, the utilization of such tools optimizes resources, increases productivity, and prevents complications, thereby reducing healthcare costs. The use of these technologies in healthcare empowers patients to manage their own health by increasing awareness, self-control, and autonomy [8].

According to the study conducted in the United States, a considerable number of women use smartphones or tablets to track goals, make decisions, and discuss health issues with their doctors [9]. Additionally, digital tools for health communication, such as email platforms like MailChimp, have been found to be effective in disseminating health-related information in a timely and personalized manner [10].

Digital tools for mental health have become increasingly popular and accessible in recent years, particularly during the COVID-19 pandemic. According to Ukrainian researchers, these tools can help reduce symptoms of depression, anxiety, and post-traumatic stress disorder (PTSD) [11].

Digital tools are increasingly used for workplace health promotion initiatives. Studies have shown that mobile health apps (mHealth) can positively impact employee behavior and well-being [12]. A pilot study conducted in Germany during the COVID-19 pandemic showed that digital workplace health promotion has high potential to improve workplace health initiatives in terms of participation, outcomes, and costs [13].

The increasing use of digital tools in health promotion highlights their significance in addressing public health concerns. Furthermore, global experience underscores the potential of digital tools to promote healthy behaviors, mental health, and access to necessary health information in the workplace. However, there is still insufficient evidence on the effectiveness of digital tools usage in promoting workplace health among the working population.

AIM

The objective of this study is to assess the effectiveness of a three-month corporate health program (CHP) at the workplace that utilized digital tools for implementation.

MATERIALS AND METHODS

The study involved the development and implementation of a three-month CHP for an IT company using a digital tool – chatbot.

The CHP was created specifically for specialists of the Ukrainian IT company. Names of the company and participants are prohibited from disclosure due to contractual obligations. To measure its effectiveness, standardized evaluation scales were used to assess the survey participants before and after implementation, and data from the chatbot was analyzed to identify any complaints or needs mentioned by the 22 respondents. The study participants were specialists from the IT company with offices in three cities of Ukraine: Kyiv, Zhytomyr, and Chernihiv. Their work is related to information technology.

The CHP was implemented, and data was collected from October 2020 to March 2021.

The chatbot functioned as an application to collect, process, and disseminate information to participants of the CHP. Through the use of this digital tool, participants were granted access to a personal account with personalized information and recommendations for their health improvement. Personal identification was only possible with the explicit consent of the CHP participant. To ensure anonymity during the collection and processing of the gathered information, a unique identifier (UID) was generated for every respondent.

This study used a questionnaire consisting of items from the Health-Promoting Lifestyle Profile (HPLP-II) (University of Nebraska Medical Center, 1996) [14].

The questionnaire includes 52 items about health-promoting behaviors and, in addition to the general (total) scale, has six subscales in separate areas:

1. Health Responsibility: includes questions related to attention to one's health, understanding the importance of health promotion.
2. Physical Activity: concerns with obtaining information about adherence to a certain regimen of regular physical activity.
3. Nutrition: includes questions about the level of knowledge and choice of foods needed to maintain health, as well as the food system.
4. Spiritual Growth: refers to information about understanding the possibilities for developing internal resources, achieving self-realization, and having goals in life.

5. Interpersonal Relations: questions included in this area reflect the respondent's ability to use communication to maintain relationships with other people/colleagues.

6. Stress Management: contains questions to recognize sources of stress, take measures to counteract stress, and use special techniques to help relieve stress.

Likert-type of scale was used to measure each behavior, within the following ranges: 'never' (1), 'sometimes' (2), 'often' (3), and 'regularly' (4).

The questionnaire yields a total score ranging from 52 to 208, with higher values indicating a greater focus on improving one's health. To calculate scale values, an alternative approach has been proposed, which involved expressing score ranges as a percentage of the total possible number of points on the selected scale, varying from 0 % (52 points) to 100 % (208 points). The questionnaire has been adapted accordingly.

The digital tool was created using a low-code development platform, which allowed programming through a graphical interface. The design of the tool, in the form of a chatbot, included several functional components: a personal account; information dissemination, collection, interpretation; feedback and communication. The chatbot was connected to a separate database for storing and processing the gathered answers. Upon request, the data was transferred to the chatbot and displayed on an analytical panel (dashboard) with personalized health status information for participants. The development of the digital tool was followed by principles of information security and data privacy and complied with the General Data Protection Regulation (GDPR). The author's model was used to create the CHP [15].

Quantitative research methods were utilized to conduct this study, and the data obtained was analyzed using descriptive statistics, given the purpose of this study.

The data was examined in the Statistical Package for the Social Sciences (SPSS) and Microsoft Excel. Percentages and means were used to describe the total HPLP II and subscale scores. The reliability of the HPLP II and its subscales was assessed using Wilcoxon's test. The critical level of significance for testing statistical hypotheses was set at $p=0.05$ or lower.

RESULTS

The study implemented and assessed the results of a three-month CHP for employees of the Ukrainian IT company. The CHP utilized a digital tool, specifically the chatbot, to collect, exchange, and interpret information about each participant. Additionally, the chatbot provided continuous feedback to each participant, allowing timely response to their needs. If necessary, the chatbot could help organize a consultation with a general practitioner, who was involved in the planning and implementation of the CHP.

The utilization of a digital tool enabled the creation of a database, automatic processing of results, and its presentation to participants of the CHP. At the beginning of the survey, respondents were asked to describe CHP activities and components that require support from the IT company's management, as well as their expectations and preferences for the format and structure of the future CHP. The results of the first phase of data collection through the HPLP-II questionnaire, which identified priority areas for health promotion interventions, were also taken into account. Among implemented interventions, it is important to highlight the chatbot functionality, which allowed the automated distribution of personalized recommendations for healthy behaviors to participants. Additionally, four health education events were held and lasted from 60 to 90 minutes in a form of online sessions with an invited expert. Each educational event was dedicated to a specific topic, including mental health, the biopsychosocial model, healthy eating, physical activity and maintaining health while working from home. Participants accessed user education events through the chatbot. Based on the results of these events, users received additional interactive questions, banner materials with useful health information, and instructions on mental or physical health support practices. All materials were stored in a personal account and could be accessed at any time.

Based on the survey results of respondents before and after CHP implementation, a positive trend was observed (Fig. 1). The general health-promoting lifestyle scale score increased from 52.9 % to 57.9 % ($p=0.025$). Statistically significant increases were observed in the Health Responsibility (from 38.4 % to 48.8 %, $p=0.00621$) and Stress Management (from 45.1 % to 55.3 %, $p=0.00104$) subscales. Simultaneously, other subscales such as Physical Activity, Nutrition, Spiritual Growth, and Interpersonal Relations exhibit positive trends, but they lack statistical significance.

The analysis of each item in the questioner before and after the implementation of the CHP shows positive shifts towards healthier habits and practices among respondents. Specifically, the average scores for the following statements have increased: «Choose a diet low in fat, saturated fat, and cholesterol.» (from 2 to 3 points), «Report any unusual signs or symptoms to a physician or other health professional.» (from 2 to 3 points), «Limit use of sugars and food containing sugar (sweets).» (from 2 to 3 points), «Eat 6-11 servings of bread, cereal, rice and pasta each day.» (from 2 to 3 points), «Get a second opinion when I question my health care provider's advice.» (from 2 to 3 points), «Concentrate on pleasant thoughts at bedtime» (from 2 to 3 points), «Eat 3-5 servings of vegetables each day» (from 2 to 3 points), «Eat 2-3 servings of milk, yogurt or cheese each day.» (from 2 to 3 points), «Practice relaxation or meditation for 15-20 minutes daily.» (from 1 to 2 points), «Attend educational programs on personal health care.» (from 1 to 2 points), «Pace myself to prevent tiredness.» (from 2 to 3 points).

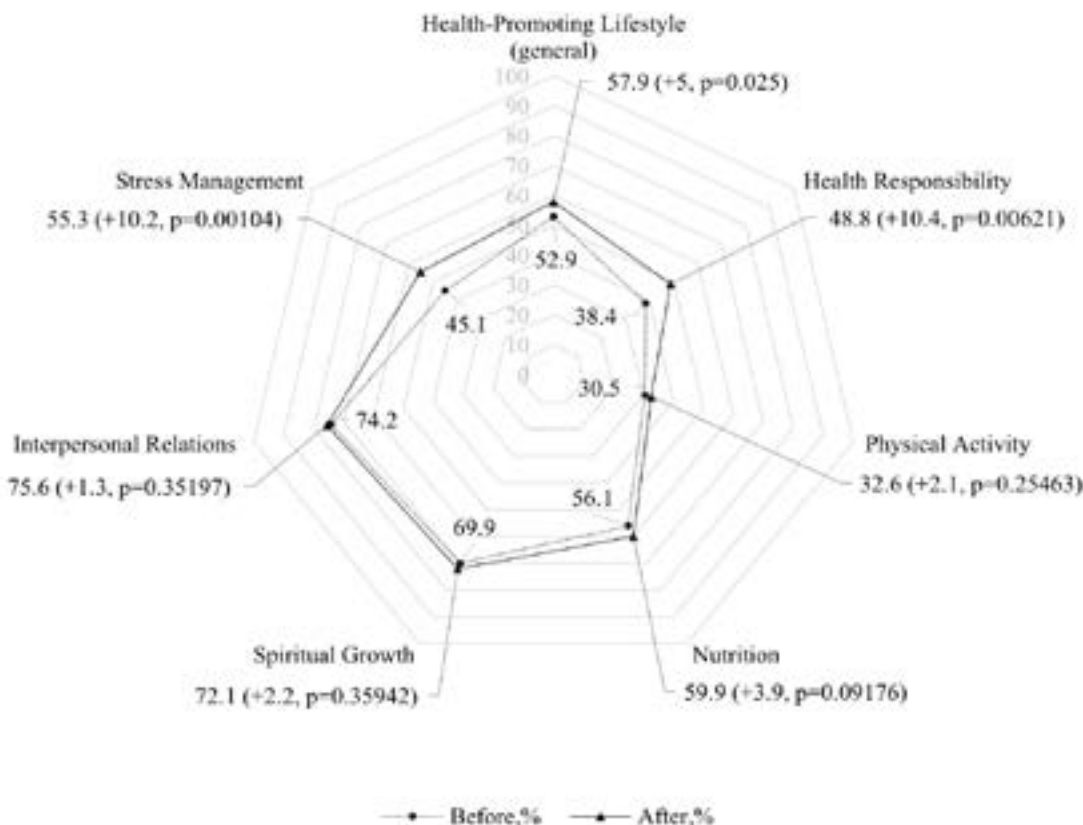


Figure 1. Results of measuring the health-promoting lifestyle profile before and after the implementation of the CHP (n=22).

As for the other items in the questionnaire, there have been minor changes or the same scores as before the CHP implementation.

DISCUSSION

The study results align with previous research in this direction on the efficacy of digital products and services for CHPs. Specifically, a systematic review discovered that digital health interventions can positively impact employee health indicators, such as reducing stress and improving mental health [16]. Our study results indicate that the Stress Management subscale received the highest scores. Mental health was a priority of the CHP implemented in the study due to the active phase of the COVID-19 pandemic. This explanation is supported by the fact that the CHP was designed to address the mental health challenges faced by employees during the pandemic.

A pilot study conducted in Germany discovered that digital technologies could enhance workplace health initiatives in terms of employee engagement, effectiveness, and costs [13]. Similar to our findings, the Health Responsibility subscale indicates the level of engagement in the CHP. This could be attributed to the fact that digital tools optimize the process of obtaining necessary health information, making it more personalized and convenient.

However, another study among office workers in Ireland found that using a mobile app had a positive

effect on physical activity, maintaining and in some cases increasing the number of steps taken per day [12]. In contrast, our study shows less pronounced changes in some areas, including physical activity. This may be due to the lack of effectiveness of the CHP interventions on physical activity or the difficulty of changing respondents' habits in this area within the short duration of the CHP.

Lessons learned and recommendations should be emphasized. It is important to consider cybersecurity and data protection requirements when implementing digital tools. Additionally, it is worth considering the specifics of the participant's organization, which could affect their interest and level of digital skills necessary to use a digital tool within the CHP. However, the IT company was intentionally chosen due to national priorities for the development of the IT industry in Ukraine and the importance of its human resources. In other cases, it is important to consider the development of digital skills among end users of digital tools within such programs and provide appropriate preliminary training.

Limitations of the study include the absence of personal data about participants, such as age, gender, and work experience. The reason for this was the need for participants to be completely anonymous. Additionally, the study was conducted during the COVID-19 pandemic, which required adaptation at all stages of the development and implementation of the CHP. The participants were geographically dispersed, and as a result, all activities

were conducted online. This may have limited their participation in certain educational events. It is also crucial to consider the limits of the study's timeframe and the number of participants.

CONCLUSIONS

The study findings revealed the CHP developed and implemented using digital tools had a positive impact on the formation of healthier habits and practices among the employees of the IT company in health improvement.

The data shows a statistically significant increase in the average score on the total scale, indicating a positive shift in the respondents' attitude towards a healthy lifestyle, from 52.9 % to 57.9 %, respectively. This suggests that employees are becoming more responsible for their own health and are willing to make efforts to improve it and participate in similar programs. The scores on the Health Responsibility subscale increased significantly from 38.4 % to 48.8 %. This suggests that employees are paying more attention to their health, undergoing regular check-ups, and following doctor's recommendations. Additionally, a significant improvement was recorded on the Stress Management subscale, from 45.1 % to 55.3 %. This indicates that participants have acquired more effective skills to cope with stress, maintain an optimal workload, and relax in difficult situations.

Other subscales (Physical Activity, Nutrition, Spiritual Growth, and Interpersonal Relations) also show positive dynamics, but they are not statistically significant. This indicates the need to further improvement of the CHP, digital tool, and deeper focus on these areas.

Thus, the results of the study provide an argument for the feasibility of introducing digital tools for health promotion in the workplace. This justifies the implementation of such programs using digital tools at the national level and their inclusion in the public health system, based on international experience and covering arguments mentioned above. This would help establish a culture of healthy lifestyles and encourage a more responsible attitude towards personal health among the working population. It can also increase productivity, reduce staff turnover, and ultimately improve the overall health of the nation.

Prospects for future research. The study's positive results on the effectiveness of the implemented CHP using digital tools suggest the need for further research. Specifically, expanding the sample to include participants from different companies of the same country, conducting repeated measurements six and twelve months after CHP completion, studying the impact of individual components, and comparing it with traditional methods are advisable. Such studies could provide further evidence of the approach's effectiveness and aid in its improvement and dissemination.

COMPLIANCE WITH ETHICAL REQUIREMENTS

The study was conducted in compliance with ethical principles. Participation in the CHP was voluntary and based solely on the self-motivation of potential participants. External motivation from management was not allowed. Participants joined the project based on the expected results and CHP presented. A non-disclosure and confidentiality agreement was signed. The consent terms were duly observed and considered. Information was collected, processed, and presented in an objective manner. Additionally, at the request of the participants, the collection of personal data was limited. UIDs were used to separate the information. Participants provided their personal data to the doctor independently during an anonymous conversation through an algorithm in the chatbot.

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AUTHORS' CONTRIBUTIONS TO ARTICLE PREPARATION

Hlib D. Aleksandrenko: work concept and design, data collection and analysis, Responsibility for statistical analysis, writing the article.

Maryna V. Shevchenko: critical review, final approval of the article.

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Резюме

ПЕРСПЕКТИВИ ВПРОВАДЖЕННЯ ЦИФРОВИХ ІНСТРУМЕНТІВ ДЛЯ ЗМІЦНЕННЯ ЗДОРОВ'Я НА РОБОЧОМУ МІСЦІ Гліб Д. Александренко, Марина В. Шевченко

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Мета. Оцінити ефективність трьохмісячної корпоративної програми охорони здоров'я на робочому місці, для імплементації якої використовувалися цифрові інструменти.

Матеріали та методи. У дослідженні взяли участь 22 працівники однієї з ІТ-компаній в Україні. Було розроблено та впроваджено корпоративну програму охорони здоров'я на робочому місці з використанням цифрового інструмента зі спеціальним алгоритмом для збору, обробки та обміну інформацією. Для реалізації програми було розроблено чат-бот з інтуїтивним інтерфейсом, через який було забезпечено персоналізований доступ кожного з учасників дослідження до особистого кабінету. Це дало змогу отримати персоналізовану інформацію про відстеження змін щодо участі у програмі, а також дозволило надавати індивідуальні рекомендації. Додатково проводилися освітні заходи на теми здорового способу життя, які супроводжувались інтерактивними матеріалами у чат-боті. Ефективність програми оцінювалась на основі результатів опитування з використанням стандартизованих шкал опитувальника щодо визначення профілю способу життя, що сприяє зміцненню здоров'я (HPLP-II), до і після запровадження програми.

Результати. Виявлено статистично значуще зростання показника загальної шкали щодо профілю способу життя, що сприяє зміцненню здоров'я (з 52.9 % до 57.9 %, $p=0,025$), а також окремих шкал «Відповідальність за здоров'я» (з 38.4 % до 48.8 %, $p=0,00621$) та «Управління стресом» (з 45.1 % до 55.3 %, $p=0,00104$). За шкалами «Фізична активність», «Харчування», «Внутрішнє зростання» та «Міжособистісні відносини» також було виявлено позитивні зміни показників, однак вони не досягли рівня статистичної значущості. Аналіз відповідей респондентів за окремими запитаннями анкети вказує на появу позитивних зрушень щодо поведінкових змін. Зокрема, це стосується обрання респондентами продуктів харчування з меншим вмістом жирів та цукру, регулярності звернень до лікаря, споживання корисних продуктів, психічного здоров'я та контролю робочого навантаження тощо.

Висновки. Корпоративна програма охорони здоров'я на робочому місці з використанням цифрового інструмента мала позитивний вплив на формування здорових звичок та практик серед учасників. Зафіксовано факт підвищення відповідальності учасників програми за власне здоров'я та навичок управління стресом. Отримані дані вказують на доцільність впровадження таких програм із використанням цифрових інструментів.

Ключові слова: громадське здоров'я, корпоративні програми, здоров'я на робочому місці, цифрова охорона здоров'я, медична інформатика