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DIGITAL TOOLS TO SUPPORT PHYSICAL ACTIVITY AS AN ELEMENT OF SHAPING A HEALTHY LIFESTYLE FOR PROFESSIONALLY ACTIVE WOMEN

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Abstract The contemporary lifestyle of women working in offices leads to limited physical activity and sedentary behavior, which increases the risk of health problems. Digital tools, including training platforms, offer a potentially effective solution for supporting healthy lifestyle changes.

The aim of the study was to assess the impact of using a training platform on physical activity levels, selected eating habits, sleep quality, and lifestyle factors among adult women working in offices.

The study was longitudinal in nature and included professionally active adult women (n=158) employed in office positions in state-owned entities in the West Pomeranian Voivodeship. Data were collected at four time points: T0 (baseline), T3 (3 months), T6 (6 months), and T9 (9 months). A diagnostic survey approach was employed, utilizing proprietary questionnaires and the Athens Insomnia Scale. Analyses were performed using the Friedman test and post-hoc analyses with Bonferroni correction.

During the 9-month intervention, a significant increase in physical activity levels was observed, including an increase in the frequency and duration of activities of varying intensity. Some changes in dietary habits were also observed, including increased fluid and vegetable consumption. No changes in between-meal snacking were observed. Analysis of sleep parameters revealed a significant deterioration in subjective sleep quality throughout the intervention.

The training platform proved to be an effective tool for supporting increased physical activity in working women, but its impact on other lifestyle factors, particularly sleep quality, was limited.

Key words: physical activity, training platform, lifestyle, working women, digital intervention, sleep quality

Introduction

Modern lifestyles, particularly among office workers, are characterized by significant limitations in daily physical activity and prolonged sedentary time. These working conditions contribute to a number of adverse health consequences, including musculoskeletal disorders , circulatory disorders, decreased physical performance, and impaired mental well-being (Owen et al., 2010; Proper & van Mechelen, 2008). Numerous studies indicate that sedentary work is a significant risk factor for lifestyle diseases, regardless of leisure-time physical activity (Tremblay et al., 2017). This problem particularly affects professional women, who often fulfill numerous social and family roles in addition to their professional responsibilities, which may limit their ability to engage in regular physical activity (Biddle & Mutrie, 2008; Biernat & Tomaszewski, 2015). Research indicates that women working in sedentary positions are characterized by lower levels of physical activity and are more likely to report back and lower limb pain compared to women performing more dynamic work (Kruk, 2019). Physical activity is a key element of a healthy lifestyle and plays a significant role in preventing non-communicable diseases, maintaining functional fitness, and improving quality of life (WHO, 2020). Regular physical activity has a beneficial effect on both somatic and mental health, contributing to stress reduction, improved well-being, and increased energy levels (Dishman et al., 2013). From the perspective of physical culture sciences, activities aimed at developing lasting exercise habits tailored to individual abilities and environmental conditions are particularly important. In recent years, health promotion programs using digital tools, including training platforms and online applications, have become increasingly important. These solutions enable flexible adaptation of physical activity to user needs, increase the availability of health-promoting content, and promote systematic participation (Vandelanotte et al., 2016; Sallis et al., 2021). The literature emphasizes that interventions based on digital technologies can effectively support the motivation to engage in physical activity, especially in time-constrained adult groups (Michie et al., 2017). The growing body of recent evidence confirms the effectiveness of workplace and digitally delivered interventions aimed at reducing sedentary behavior and increasing physical activity among office workers (Rouyard et al., 2025; Bort-Roig et al., 2025). Contemporary studies also indicate that digital physical activity programs may significantly improve mental health outcomes among employees, including reductions in stress and depressive symptoms (Kanamori et al., 2025). Furthermore, the development of structured digital strategies tailored to occupational settings has been shown to enhance engagement and long-term adherence to movement behaviors (Parés-Salomón et al., 2025; Oppermann et al., 2025).

An example of such an initiative is the “New Year – Healthy Year” project, aimed at supporting the health of professionally active adult women working in public offices. A central element of the project was a dedicated training platform offering substantive and practical materials promoting a healthy lifestyle, with particular emphasis on regular physical activity adapted to the specific nature of sedentary work. The remote activities were complemented by open consultations led by a sports coach and a research team, as well as providing participants with basic exercise equipment enabling them to train at home. This intervention model aligns with current research trends in health promotion and women’s physical activity (Kruk, 2019; Biernat & Piątkowska, 2020).

The aim of the study was to assess the effectiveness of a dedicated training platform as a tool supporting the development of a healthy lifestyle for professionally active adult women working in offices. The following research questions were established: 1. Will the training platform contribute to an increase in the level of physical activity of the study women? 2. Will women using the training platform to increase their level of physical activity change their eating habits to health-promoting ones? 3. Will the training platform contribute to improved sleep quality among the study participants? 4. Will using the training platform contribute to changes in selected lifestyle elements among the study participants? 5. Will the support provided to women in engaging in physical activity contribute to a reduction in overweight and obesity among the study participants? Based on the research questions formulated, the following research hypotheses were adopted: H1. The use of the training platform will contribute to a significant increase in the level of physical activity of the study women. H2. Women using the training platform to increase their level of physical activity will be more likely to adopt health-promoting changes in their eating habits. H3. Using the training platform will improve sleep quality among the study women. H4. Using the training platform will positively impact selected lifestyle elements of the study women, such as regular physical activity, health care, and free time management. H5. Supporting women in engaging in physical activity will contribute to reducing the incidence of overweight and obesity in the study group.

Material and methods

The research material consisted of data obtained from professionally active adult women working in government offices located in the West Pomeranian Voivodeship. Women qualified for the project were logged into a dedicated training platform, through which they could access prepared training materials. The content provided to participants was tailored to their physical activity levels, individual needs, and abilities, enabling a safe and gradual initiation of physical activity. The study was longitudinal in nature. Participants completed the research tools before beginning the exercise program and then after 3, 6, and 9 months of using the training platform. These were defined as time points: T0 (study start), T3 (3 months), T6 (6 months), and T9 (9 months). This allowed for the assessment of changes occurring in the study group throughout the project. Participants were enrolled in the "New Year – Healthy Year" project and voluntarily consented to participate in the study by submitting appropriate participation declarations. The study was conducted in accordance with the Declaration of Helsinki. The project received a positive opinion from the relevant bioethics committee, and all research procedures were conducted in accordance with applicable ethical standards, maintaining the anonymity and confidentiality of participant data. The study employed a diagnostic survey method, using a questionnaire as the research technique. The research tools assessed physical activity levels, selected lifestyle elements, and health factors relevant to physical activity. The study utilized a questionnaire assessing physical activity levels, a questionnaire assessing dietary habits, a questionnaire addressing selected lifestyle factors, and the Athens Insomnia Scale (AIS), which assesses sleep quality and the occurrence of insomnia symptoms. The collected data were statistically analyzed to assess changes occurring in the study group of women as a result of using the training platform. Statistical analyses were conducted using descriptive statistics, allowing for characterization of the study population and an assessment of the direction and scope of observed changes. Statistical inference allowed for the assessment of the relationship between use of the training platform and the level of physical activity, dietary habits, sleep quality, and selected lifestyle factors of the study women.

Group selection criteria

Inclusion criteria: female gender, age≥18 years, good health condition allowing for physical activity, access to mobile devices enabling the use of the training platform, informed consent to participate in the study.

Exclusion criteria: medical contraindications to physical activity, inability to use the platform regularly.

Statistical analysis

Statistical analysis was performed using Python 3.11 with the following libraries: pandas, numpy, scipy, statsmodels, matplotlib, and seaborn. For each variable, a repeated measures matrix was created containing only complete cases (participants with measurements at all four time points). Statistical tests were used: for continuous variables (physical activity), the Shapiro-Wilk test ($\alpha=0.05$) was used to test for normality. Parametric ANOVA with repeated measures was used in the case of a normal distribution; otherwise, the nonparametric Friedman test was used. For ordinal variables (nutrition, sleep), the Friedman test was used. If a significant result was obtained in the main test ($p<0.05$), post-hoc analyses comparing all pairs of time points were performed: the Wilcoxon signed-rank test for nonparametric analyses, the paired-samples t test for parametric analyses, and Bonferroni correction to control for Type I error with multiple comparisons. Descriptive statistics for continuous variables were presented as mean ± standard deviation and median, and for ordinal variables as median with interquartile range (Q1-Q3). The level of statistical significance was set at $\alpha=0.05$.

Results

A total of 158 women participated in the study at various stages. Due to missing measurements at some time points, the sample size varied across variables (from n=71 to n=134 for complete cases). Analysis of the 88 complete cases (Table 1) showed a statistically significant increase in the number of days of leisure-time walking during the 9-month intervention (Friedman test: $\chi^2=132.66$, df=3, $p<0.001$).

Table 1. Number of days of leisure-time walking at specific time points

Point time	N	Mean	SD	Median	Min	Max
T0	88	3.26	2.53	3.00	0.00	7.00
T3	88	3.78	2.33	3.50	0.00	7.00
T6	88	4.34	2.26	4.00	0.00	7.00
T9	88	4.92	1.88	5.00	1.00	7.00

Source: own study based on the data received

Post-hoc analyses with Bonferroni correction showed significant differences between all pairs of measurements (all $p<0.001$), indicating a progressive increase in the number of walking days throughout the intervention period. The largest increase was observed between T0 and T9 ($\Delta=1.66$ days/week, $p<0.001$).

The analysis of 88 complete cases (Table 2) showed a statistically significant increase in the number of days with intense physical activity (Friedman test: $\chi^2=172.59$, df=3, $p<0.001$).

Table 2. Number of days of intense physical activity at specific time points

Point time	N	Mean	SD	Median	Min	Max
T0	88	0.82	1.18	0.00	0.00	5.00
T3	88	1.27	1.35	1.00	0.00	6.00
T6	88	1.95	1.41	2.00	0.00	7.00
T9	88	2.48	1.44	2.00	0.00	7.00

Source: own study based on the data received

All post-hoc comparisons were statistically significant (all $p<0.001$). Particularly impressive was the more than three-fold increase in the number of days with intense activity between T0 and T9 ($\Delta=1.66$ days/week).

The analysis of 73 complete cases (Table 3) showed a statistically significant increase in time spent on intense activity (Friedman test: $\chi^2=164.49$, df=3, $p<0.001$).

Table 3. Time of intense activity in an average day (minutes) at individual time points

Point time	N	Mean	SD	Median	Min	Max
T0	73	42.96	71.37	20.00	0.00	508.00
T3	73	49.21	71.08	27.00	0.00	512.00
T6	73	52.82	71.27	31.00	2.00	516.00
T9	73	57.18	71.64	33.00	3.00	521.00

Source: own study based on the data received

All pairwise comparisons were statistically significant (all $p<0.001$), with a total gain of 14.22 minutes between T0 and T9 ($p<0.001$).

The analysis of 88 complete cases (Table 4) showed a statistically significant increase in the number of days with moderate activity (Friedman test: $\chi^2=171.00$, df=3, $p<0.001$).

Table 4. Number of days of moderate physical activity at individual time points

Point time	**N**	**Mean**	**SD**	**Median**	**Min**	**Max**
T0	88	0.78	1.41	0.00	0.00	7.00
T3	88	1.33	1.51	1.00	0.00	7.00
T6	88	1.89	1.49	2.00	0.00	7.00
T9	88	2.47	1.41	2.00	0.00	7.00

Source: own study based on the data received

All post-hoc comparisons showed significant differences (all $p<0.001$). The cumulative increase between T0 and T9 was 1.68 days/week, representing a more than 3-fold increase.

The analysis of 71 complete cases (Table 5) showed a statistically significant increase in time spent on moderate activity (Friedman test: $\chi^2=171.04$, df=3, $p<0.001$).

Table 5. Moderate activity time in an average day (minutes) at individual time points

Point time	**N**	**Mean**	**SD**	**Median**	**Min**	**Max**
T0	71	39.38	72.26	15.00	0.00	508.00
T3	71	46.59	71.82	16.00	0.00	513.00
T6	71	50.83	71.66	25.00	2.00	513.00
T9	71	55.72	72.04	27.00	8.00	524.00

Source: own study based on the data received

All pairwise comparisons were statistically significant (all $p<0.001$). The total increment between T0 and T9 was 16.34 minutes ($p<0.001$).

The analysis of 83 complete cases (Table 6) showed a statistically significant increase in the amount of fluids consumed (Friedman test: $\chi^2=75.87$, df=3, $p<0.001$).

Table 6. Number of fluids consumed during the day (rank) at individual time points

Point time	N	Median	Mean	Q1	Q3	Min	Max
T0	83	3.00	2.89	2.00	3.50	1.00	4.00
T3	83	3.00	2.95	2.00	4.00	1.00	4.00
T6	83	4.00	3.55	3.00	4.00	1.00	4.00
T9	83	4.00	3.57	3.00	4.00	1.00	4.00

Source: own study based on the data received

Post-hoc analyses showed a significant increase in fluid intake between T0 and T6 ($p<0.001$) and T0 and T9 ($p<0.001$). No significant difference was observed between T0 and T3 or between T6 and T9, suggesting that the main change occurred between months 3 and 6 of the intervention.

The analysis of 83 complete cases (Table 7) showed a statistically significant deterioration in the subjective assessment of dietary habits (Friedman test: $\chi^2=59.34$, df=3, $p<0.001$). Higher rank values indicate a worse assessment (1=very good, 6=don't know/worst).

Table 7. Nutrition assessment (rank) at individual time points

Point time	N	Median	Mean	Q1	Q3	Min	Max
T0	83	3.00	2.54	2.00	3.00	1.00	4.00
T3	83	3.00	3.24	2.00	5.00	1.00	6.00
T6	83	4.00	3.77	2.00	5.00	1.00	6.00
T9	83	6.00	4.84	4.00	6.00	2.00	6.00

Source: own study based on the data received

All post-hoc comparisons except T3 vs. T6 were statistically significant, indicating a progressive deterioration in subjective nutrition assessment. Paradoxically, despite objective improvements (more vegetables, fluids), participants rated their nutrition increasingly worse, which may be due to increased nutritional awareness and a more critical approach to their own habits.

Analysis of 134 complete cases (Table 8) showed no changes in the extent of snacking between meals (Friedman test: χ^2=inf, $p<0.001$, but all post-hoc comparisons $p=1.00$).

Table 8. Snacking between meals (rank) at individual time points

Point time	N	Median	Mean	Q1	Q3	Min	Max
T0-T9	134	3.00	2.30	1.00	3.00	1.00	3.00

Source: own study based on the data received

The values remained identical at all time points, indicating no effect of the intervention on this aspect of eating habits.

The analysis of 83 complete cases (Table 9) showed a statistically significant increase in the number of vegetable servings consumed daily (Friedman test: $\chi^2=154.29$, df=3, $p<0.001$).

Table 9. Number of vegetable servings per day (rank) at individual time points

Point time	N	Median	Mean	Q1	Q3	Min	Max
T0	83	2.00	2.01	1.00	3.00	1.00	5.00
T3	83	2.00	2.12	1.00	3.00	1.00	5.00
T6	83	3.00	3.12	2.00	4.00	1.00	5.00
T9	83	4.00	3.73	3.00	5.00	2.00	5.00

Source: own study based on the data received

All post-hoc comparisons except T0 vs. T3 were statistically significant (all $p<0.001$). The mean number of vegetable servings increased from 2.01 to 3.73, representing an 85.6% increase and approaching the recommended 5 servings per day.

For all sleep variables, higher rank values indicate poorer sleep (e.g., 1=rapid sleep onset, 4=very delayed sleep onset). The observed increase in values therefore indicates worse sleep quality. Analysis of 80 complete cases (Table 10) revealed a statistically significant deterioration in the sleep onset parameter (Friedman test: $\chi^2=144.83$, df=3, $p<0.001$).

Table 10. Falling asleep after going to bed (rank) at individual time points

Point time	N	Median	Mean	Q1	Q3	Min	Max
T0	80	2.00	1.88	1.00	2.25	1.00	4.00
T3	80	2.00	2.05	1.00	3.00	1.00	4.00
T6	80	3.00	2.76	2.00	3.00	1.00	4.00
T9	80	3.50	3.40	3.00	4.00	2.00	4.00

Source: own study based on the data received

Post-hoc analyses showed a significant deterioration in sleep onset in all comparisons except T0 vs. T3. The mean rank increased from 1.88 to 3.40, indicating a shift from “fast sleep onset” towards “delayed sleep onset”.

The analysis of 80 complete cases (Table 11) showed a statistically significant increase in the number of nighttime awakenings (Friedman test: $\chi^2=147.51$, df=3, $p<0.001$).

Table 11. Nighttime wakings (rank) at specific time points

Point time	N	Median	Mean	Q1	Q3	Min	Max
T0	80	2.00	2.23	2.00	3.00	1.00	4.00
T3	80	3.00	2.43	2.00	3.00	1.00	4.00
T6	80	3.00	3.16	3.00	4.00	1.00	4.00
T9	80	4.00	3.70	3.00	4.00	2.00	4.00

Source: own study based on the data received

All post-hoc comparisons except T0 vs. T3 were statistically significant ($p<0.001$). The mean rank increased from 2.23 to 3.70, indicating a shift from "occasional" arousals toward "very frequent" arousals.

The analysis of 80 complete cases (Table 12) showed a statistically significant deterioration in the assessment of total sleep time (Friedman test: $\chi^2=150.87$, df=3, $p<0.001$).

Table 12. Total sleep time (rank) at individual time points

Point time	N	Median	Mean	Q1	Q3	Min	Max
T0	80	2.00	2.00	2.00	2.00	1.00	4.00
T3	80	2.00	2.10	1.00	3.00	1.00	4.00
T6	80	3.00	2.95	2.00	4.00	1.00	4.00
T9	80	4.00	3.49	3.00	4.00	2.00	4.00

Source: own study based on the data received

All post-hoc comparisons except T0 vs. T3 were statistically significant. The mean rank increased from 2.00 to 3.49, representing a shift from rating sleep duration as "slightly insufficient" to "significantly insufficient".

The analysis of 80 complete cases (Table 13) showed a statistically significant deterioration in well-being the next day (Friedman test: $\chi^2=146.43$, df=3, $p<0.001$).

Table 13. Well-being the next day (rank) at individual time points

Point time	N	Median	Mean	Q1	Q3	Min	Max
T0	80	2.00	1.64	1.00	2.00	1.00	3.00
T3	80	1.00	1.75	1.00	2.00	1.00	4.00
T6	80	3.00	2.51	1.75	3.00	1.00	4.00
T9	80	4.00	3.41	3.00	4.00	2.00	4.00

Source: own study based on the data received

All post-hoc comparisons except T0 vs. T3 were statistically significant. The mean rank increased from 1.64 to 3.41, representing a shift from "good" well-being to "significantly worse" well-being.

The analysis of 80 complete cases (Table 14) showed a statistically significant deterioration of mental and physical performance the next day (Friedman test: $\chi^2=165.76$, df=3, $p<0.001$).

Table 14. Mental and physical performance on the next day (rank) at individual time points

Point time	N	Median	Mean	Q1	Q3	Min	Max
T0	80	2.00	1.65	1.00	2.00	1.00	3.00
T3	80	2.00	1.75	1.00	2.00	1.00	4.00
T6	80	2.50	2.51	2.00	3.00	1.00	4.00
T9	80	4.00	3.41	3.00	4.00	2.00	4.00

Source: own study based on the data received

All post-hoc comparisons except T0 vs. T3 were statistically significant. The mean rank increased from 1.65 to 3.41, representing a shift from “unimpaired performance” to “markedly impaired performance”.

The analysis of 80 complete cases (Table 15) showed a statistically significant increase in daytime sleepiness (Friedman test: χ^2=135.02, df=3, p<0.001).

Table 15. Daytime sleepiness (rank) at individual time points

Point time	N	Median	Mean	Q1	Q3	Min	Max
T0	80	2.00	2.18	2.00	3.00	1.00	4.00
T3	80	2.00	2.23	1.00	3.00	1.00	4.00
T6	80	3.00	3.05	2.00	4.00	1.00	4.00
T9	80	4.00	3.64	3.00	4.00	2.00	4.00

Source: own study based on the data received

All post-hoc comparisons except T0 vs. T3 were statistically significant. The mean rank increased from 2.18 to 3.64, representing a shift from “slight sleepiness” to “significant sleepiness” during the day.

Discussion

The aim of this study was to assess the effectiveness of using a digital training platform as a tool to support the development of a healthy lifestyle among professionally active women working in offices. The results indicate that participation in the long-term, nine-month intervention resulted in significant changes in physical activity levels and selected lifestyle elements; however, not all analyzed areas improved.

One of the most important study results was a significant increase in the level of physical activity among the women studied. An increase in the number of days spent walking during leisure time and an increase in the frequency and duration of moderate and vigorous activity were observed. These changes were progressive and sustained across subsequent measurement points, indicating the effectiveness of the tool in long-term support for physical activity. These results are consistent with the World Health Organization’s recommendations, which consider regular physical activity to be a key element in the prevention of lifestyle diseases and maintaining adult health (World Health Organization, 2020). The obtained results also correspond to the authors’ reports indicating that interventions using digital tools and online platforms can effectively increase physical activity levels among sedentary individuals (Vandelanotte et al., 2016; Müller et al., 2021). Flexible access to training content, the ability to individualize exercises and the lack of the need for physical presence in sports facilities promote systematicity and the consolidation of exercise habits, which is particularly important in the group of professionally active women.

Analysis of changes in dietary habits demonstrated the partial effectiveness of the intervention. The observed increase in fluid and vegetable consumption can be considered a result of increased health awareness among project participants. Similar relationships were observed in studies by other authors, who indicate that even indirect health education, implemented as part of physical activity programs, can lead to beneficial changes in dietary behaviors (Contento, 2016; Górnicka et al., 2019). The lack of changes in between-meal snacking, however, confirms that emotional eating habits are particularly difficult to modify and require long-term, targeted interventions. The deterioration in the subjective assessment of one’s own diet, despite objective, positive changes, is noteworthy. This phenomenon may result from increased nutritional knowledge and awareness, leading to a more critical self-assessment. Similar observations have been described in studies on adult health education, which emphasize that increased health literacy does not always correlate with improved self-assessment of health-promoting behaviors (Nutbeam, 2008).

The most ambiguous study finding was a deterioration in sleep quality assessed using the Athens Insomnia Scale. These results contradict numerous literature reports indicating a beneficial effect of regular physical activity on sleep parameters (Kredlow et al., 2015; Yang et al., 2012). However, it can be assumed that the observed deterioration was related to the additional burden of combining work, family life, and regular participation in the project, as well as to possible evening exercise, which could disrupt circadian rhythms. It is also important to consider the longitudinal nature of the study, covering a nine-month period, which means participants were exposed to changing seasonal factors, occupational stress levels, and changes in mental strain. Research indicates that psychosocial and occupational factors play a significant role in shaping sleep quality in sedentary women (Åkerstedt et al., 2017).

In summary, the study results confirm the effectiveness of the training platform as a tool supporting increased physical activity levels and partial modification of dietary habits in women working in offices. At the same time, the results indicate the need to expand the intervention to include components related to sleep hygiene, regeneration, and stress management, which could increase the overall effectiveness of health-promoting programs implemented in the workplace.

Conclusions

1. The use of a training platform in a longitudinal study contributed to a significant increase in the level of physical activity of adult women performing office work, both in terms of the frequency of activity and its duration.
2. The greatest changes were recorded in relation to leisure-time walking and moderate and intense physical activity, which confirms the effectiveness of the training platform as a tool supporting regular exercise.
3. Using the training platform resulted in a partial modification of the eating habits of the surveyed women, manifested by an increase in the consumption of fluids and vegetables, with no changes in snacking between meals.
4. During the intervention, no improvement in the quality of sleep was observed in the studied women; on the contrary, a deterioration in the subjective assessment of sleep was noted, including difficulties in falling asleep, more frequent nocturnal awakenings and poorer daytime functioning.
5. The obtained results indicate that the training platform-based intervention effectively impacts selected lifestyle elements, primarily physical activity levels, but its impact on other health components is limited. The observed significant increase in physical activity levels and partial improvement in eating habits indicate a positive trend towards reducing the risk of overweight and obesity.
6. The training platform can be a useful tool for health-promoting support for working women, but the effectiveness of health effects requires a comprehensive approach that also covers other aspects of lifestyle.

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