Lara Može[1], Urška Stanković Elesini[1], Barbara Luštek Preskar[1], Anna Jedrejčič[2], Tanja Medved[1]
[1] Faculty of Natural Sciences and Engineering, University of Ljubljana, Aškerčeva 12, 1000 Ljubljana, Slovenia
[2] UNO Elektronika, Dolenja vas 1b, 6224 Senožeče, Slovenia

Exercise Cards for Taking Active Breaks During Prolonged Sitting

Vadbene karte za izvajanje aktivnih odmorov med dolgotrajnim sedenjem

Original scientific article/*Izvirni znanstveni članek*
Received/*Prispelo* 12–2025 • Accepted/*Sprejeto* 12–2025

Corresponding author/*Korespondenčna avtorica:*
Prof. dr. Urška Stanković Elesini
E-mail: urska.stankovic@ntf.uni-lj.si
ORCID iD: 0000-0003-4280-0615

Abstract

The consequences of prolonged sitting are faced both by employers and by employees themselves. This paper presents the findings from statistical reports and scientific studies on the negative effects of prolonged sitting on employees' health and consequently, on the importance of introducing short active breaks. A survey conducted among the employees of the Faculty of Natural Sciences and Engineering of the University of Ljubljana revealed that as many as 88.3% of respondents perform their work in a seated position for an average of 2.9 hours per day. Although more than half (55.9%) of the respondents are physically active, they still most frequently experience discomfort caused by sitting, e.g. pain in the back, neck, wrists etc. While no structured group implementation of active breaks is organised at the faculty, employees still have the option to take such breaks independently, which, according to the survey results, suits them well. The majority of respondents (76.0%) prefer performing exercises whenever they feel the need for a break. Even though half of the respondents (50%) are aware that the discomfort (pain) caused by prolonged sitting could be alleviated by taking active breaks, they rarely do so. Those who do take active breaks individually (20% every half hour, 10% every two to three hours) generally perform the exercises freely, without guidance. To ensure that employees perform appropriate exercises during active breaks – especially those that prevent the negative consequences of prolonged sitting – we developed exercise cards as part of the study. Most respondents rated the cards as visually appealing (design, colour palette, typographic choices etc.) and useful. One third of the respondents stated that they would certainly use the exercise cards to take short active breaks during extended periods of sitting at work, while slightly more than one third were undecided. The majority of the respondents (64.5%) also believe that frequent active breaks supported by the exercise cards during long periods of sitting at work would indeed contribute to increasing their physical activity. The exercise cards were distributed to employees at the beginning of the academic year, together with information on the consequences of prolonged sitting; however, this will certainly not be sufficient. To develop a culture of regular active breaks, further awareness-raising among employees will be required, with the exercise cards representing a promising starting point.

Keywords: prolonged sitting, sedentary behaviour, active breaks, exercise cards

Izvleček

S posledicami dolgotrajnega sedenja se soočajo tako delodajalci kot tudi delavci sami. V članku so podane ugotovitve iz statističnih poročil in znanstvenih raziskav o negativnih vplivih dolgotrajnega sedenja na zdravje delavcev ter posledično pomen vpeljevanja kratkih aktivnih odmorov. Iz ankete, izvedene med zaposlenimi Naravoslovnotehniške fakultete Univerze v Ljubljani, je bilo ugotovljeno, da kar 88,3 % sodelujočih svoje delo opravlja v sedečem položaju v povprečju 2,9 ure/dan. Kljub temu da je več kot polovica (55,9 %) sodelujočih telesno aktivna, pa zaradi sedenja najpogosteje občutijo bolečine v hrbtu, vratu, zapestjih itd. Skupno izvajanje aktivnih odmorov na fakulteti ni organizirano, imajo pa zaposleni možnost samostojnega izvajanja le-teh, kar jim glede na rezultate ankete tudi ustreza. Večina sodelujočih v raziskavi (76,0 %) namreč želi izvajati vaje takrat, ko potrebujejo odmor. Čeravno se polovica sodelujočih (50 %) zaveda, da bi omenjeno nelagodje (bolečine) zaradi dolgotrajnega sedenja lahko odpravili z izvajanjem aktivnih odmorov, pa to storijo le redko. Tisti, ki aktivne odmore izvajajo individualno (20 % na vsake pol ure, 10 % na vsake 2–3 ure), vaje izvajajo večinoma prosto, brez navodil. Da bi tekom aktivnih odmorov zaposleni izvajali ustrezne vaje, torej tiste, ki preprečujejo negativne posledice dolgotrajnega sedenja, smo v raziskavi razvili vadbene karte za aktivni odmor. Večina anketiranih je karte ocenila kot vizualno privlačne (izgled, barvna paleta, izbira tipografije itd.) in uporabne. Tretjina anketiranih je zatrdila, da bo vadbene karte zagotovo uporabljala za izvedbo kratkih aktivnih odmorov pri daljšem sedenju med delom, nekaj več kot tretjina pa je bila glede uporabe neopredeljena. Večina sodelujočih (64,5 %) tudi verjame, da bi pogosta izvedba aktivnih odmorov s pomočjo vadbenih kart pri daljšem sedenju med delom dejansko prispevala k povečanju njihove telesne aktivnosti. Vadbene karte so bile v začetku študijskega leta razdeljene zaposlenim skupaj z informacijo o posledicah dolgotrajnega sedenja, vendar pa to zagotovo še ne bo dovolj. Za uvedbo kulture rednih aktivnih odmorov bo potrebno nadaljnje osveščanje zaposlenih, pri čemer so vadbene karte vsekakor dober začetek.

Ključne besede: dolgotrajno sedenje, sedentarno vedenje, aktivni odmor, vadbene karte

1 Introduction

Rapid technological advancement over recent decades has reshaped not only our way of life but also the organisation of work, working hours and workplaces. The environments in which we work, spend our leisure time or commute often compel us to remain seated for long periods of time. Society is becoming increasingly sedentary, presenting new challenges at both the psychosocial level and in terms of employees' physical health. The growing seriousness of prolonged sitting as a contemporary societal issue is further reflected in the substantial increase in scientific publications on the topic, which rose by more than fifteenfold between 2010 and 2020 [1].

The European Agency for Safety and Health at Work (hereinafter EU-OSHA) [2] defines prolonged sitting (also referred to as sedentary behaviour) as behaviour lasting at least two hours and characterised by three main features: low energy expenditure, a seated posture and physical strain resulting from a limited range of movement (i.e. effort required to maintain a static position). A more precise and widely used definition, however, describes sedentary behaviour as any waking behaviour characterised by low energy expenditure (≤ 1.5 MET[1]) while in a sitting, reclining or lying posture [3].

1 MET (Metabolic Equivalent of Task) represents the amount of energy required by an individual to perform a given activity. One MET corresponds to the energy expenditure (oxygen consumption) of an average 70 kg man at rest (3.5 ml $O_2 \cdot kg^{-1} \cdot min^{-1}$) [44].

According to statistical data [4], residents of Slovenia spend an average of 5 hours per day sitting during the working week and 4 hours per day at weekends (sedentary behaviour). Sitting time during the working week decreases with age, with individuals aged 25 to 39 spending the most time seated, averaging 6 hours per day. The analysis reveals that sitting time is most strongly influenced by the level of education, type of employment and nature of work; similar findings have been reported at the level of European Union Member States in a meta-analysis by Beller et al. [5]. As noted in the report, sitting time has increased linearly over the years covered by the research. In 2020, average sitting time on a working day was by 0.4 hours higher than in 2012, while weekend sitting time remained relatively unchanged.

It should also be noted that the COVID-19 pandemic contributed significantly to increased sitting time, as a large proportion of work was performed from home, typically in a seated position in front of computer screens. Moreover, as remote working often brings economic benefits for companies, the number of jobs performed from home within the European Union has, as expected and as confirmed by EU-OSHA research [6], nearly doubled since 2019, reaching 23% in 2024 (exceeding 40% in Finland and the Netherlands). This proportion varies across sectors, with the highest shares observed in information and communication activities (53%), followed by professional, technical and scientific activities (39%).

Prolonged sitting is most commonly encountered among office and administrative workers and employees in the transport sector; however, workers in the textile industry – garment manufacturing – are not exempt. In this sector, prolonged sitting, e.g. at sewing machines, has a substantial impact on workers' health, especially when workstations are not ergonomically designed [7–9]. A study by Šajnović et al. [10] found that Slovenian textile workers are also at increased risk of musculoskeletal disorders (e.g. pain in the back, neck and shoulders), which is reflected in higher rates of sick leave, hospitalisation and work-related disability. As suggested by the authors, these conditions could be mitigated through ergonomic workplace design and effective reorganisation of working time, including more frequent and shorter (active) breaks. The effectiveness of performing stretching exercises during working hours among textile workers is also reported in a study by Ismayenti et al. [11].

1.1 Consequences of prolonged sitting

Prolonged sitting has numerous negative consequences. In recent years, EU-OSHA has conducted research aimed at identifying workplace risk factors across various sectors [6]. Prolonged sitting (reported in 64% of analysed workplaces) and repetitive movements of the wrist/fingers or the entire arm (reported in 63% of analysed workplaces) have been identified as the most prevalent risk factors associated with musculoskeletal disorders. Daneshmandi et al. [12] report that prolonged sitting is associated with fatigue during the working day, reduced job satisfaction, hypertension and musculoskeletal disorders affecting the shoulders, lower back, thighs and knees among office workers. A study by Gao et al. [13] found that workers who predominantly sit during working hours have a 16% higher risk of all-cause mortality and a 34% higher risk of cardiovascular disease mortality compared to employees whose work is not exclusively sedentary. Furthermore, a systematic meta-analysis by Nasir et al. [14] revealed that prolonged sedentary behaviour in the workplace is associated with an increased risk (ranging from 34% to 85%) of mental health problems, including psychological distress, depression, stress, profound sadness, burnout and anxiety.

1.2 Active breaks aimed at promoting workplace health

Prolonged daily sitting must be balanced through ergonomic principles, including popular solutions such as active workstations [12], as well as regular short – primarily active – breaks, which help ensure adequate physical activity among employees.

Active breaks, often also referred to as micro-breaks, are defined by Fritz et al. [15] as planned rest periods during working hours that alleviate worker fatigue and physical discomfort. Their duration may vary from a few seconds to several minutes; however, they are all intended to support employees' well-being, job satisfaction and attitudes towards work. A study by Fischetti et al. [16] demonstrated that a 10-minute break involving outdoor physical activity or guided exercise is effective in improving selective attention and executive functions among healthcare workers. Wayne et al. [13] found that interrupting prolonged sitting every 20–30 minutes with a few minutes of light physical activity (e.g. walking or stretching) can lead to improvements in glucose levels, insulin regulation, blood pressure and other metabolic parameters over a short period of time (e.g. within a single working day). Furthermore, research by Chang et al. [17] indicates that short breaks reduce the risk of developing various health conditions (e.g. cancer, cardiovascular disease, respiratory diseases), while also emphasising the importance of individualising exercises according to workers' physical condition.

The workplace, where employees spend at least one third of their day, represents an appropriate setting for health promotion [18]. Active breaks incorporating physical activity in the workplace can be implemented in various ways, e.g. outdoor breaks, walking within the workplace, using stairs instead of lifts and performing specific stretching exercises. The latter do not require additional exercise equipment or dedicated spaces, as existing workplace elements such as chairs, tables or walls can be used to support the exercises.

Experts in the field (e.g. kinesiologists, physical education specialists, physiotherapists etc.) recommend structuring exercises for prolonged sitting into three categories, i.e. first, stretching exercises, followed by strengthening exercises and finally relaxation exercises, which involve deep breathing, calming the body and preparing to resume work [19]. Active breaks may be performed individually or in groups. In the former case in particular, it is recommended that employees perform exercises tailored to the type of work and the associated physical demands.

1.3 Exercise cards for physical activity

Cards are a combination of images, text, symbols or numbers. Unlike mobile applications, cards are simple, accessible and portable; they occupy little space, contain no distracting elements, are not dependent on an internet connection and provide clear instructions. As a medium, cards enable physical interaction, as they can be shuffled and arranged in ways that users find appropriate, engaging, and consistently varied. The information presented on the cards is concise, clearly structured and logically divided into distinct sections, which facilitates comprehension [20].

In the market analysis conducted as part of this research, we found that exercise cards in the Slovenian language are not currently available on the Slovenian market, whereas the range of exercise cards in foreign languages is considerably broader. Most available exercise card sets are of a general nature, focusing on fitness or yoga, while no card sets specifically designed for exercises during active breaks were identified. From the exercise card sets identified, five examples are presented below, all of which are intended for exercises and meditation during seated work.

The "Desk Yoga Deck" cards (Figure 1A) were first published in 2021 by Chronicle Books [21]. The overall concept was developed by two yoga enthusiasts, namely Darrin Zeer and Daisy Talleur-Zeer. The illustrations were created by the illustrator Subin Yang. One year later, the card set received a silver award at the Society of Illustrator 65 competition in the product design category. [22] The cards are organised into four categories, i.e. chair yoga, standing exercises, meditation, and Pranayama and Mudra exercises, which focus on breathing and hand movements. The exercises are suitable for office workers and are not restricted by age.

"Desk Workout Cards for Home and Office" (Figure 1B) are an exercise card brand by Zinsk, developed by a group of designers under the name Upgraded Us [23]. The company has released several sets of physical activity cards under this brand, with the set examined in this study being specifically designed for movement in the workplace. The package consists of 75 cards and the described exercises are divided into two categories, i.e. exercises performed using body weight and exercises aimed at pain relief and relaxation.

"Animal Moves Office Fitness Deck" (Figure 1C) is a set of exercise cards [24] featuring exercises inspired by animal movements, based on the book "Animal Moves Book" by Darryl Edwards [25]. The card set includes 54 cards designed to promote movement, entertainment and games. The 41 cards describe exercises performed while seated or standing at a desk, five cards present challenge-based activities and the final seven cards outline games. The exercises are suitable for both beginners and more experienced users.

"The Work Wellness Deck" (Figure 1D) is a card set developed by a business consultant and wellness mentor Landre Bickley Eliopoulos and published by Chronicle Books [26]. The set comprises 60 cards divided into three categories: Refresh, which focuses on mental health (e.g. breathing exercises); Connect, which addresses workplace relationships (e.g. practical activities for fostering positive working relationships); and Flow, which is dedicated to physical relaxation (i.e. movement and stretching exercises aimed at maintaining proper posture). The three recurring illustrations featured on the front of each category were created by the illustrator Gracie Lam [27].

The "Desk Yoga Card Deck" (Figure 1E) [28] was developed by a yoga instructor Maria Rojas [29]. The set contains 106 cards featuring exercises primarily intended for office workers who experience prolonged sitting, as well as stress and mental burnout. The cards are organised into six categories, i.e. mindful movement for relieving tension and improving posture, breathing exercises for calming the mind, meditations for refocusing, short exercises to enhance clarity and creativity, and mantras and affirmations for positive motivation. The illustrations were created by a graphic designer Irene Izquierda [30].

Figure 1: Examples of exercise card sets: "Desk Yoga Deck" (A) [21], "Desk Workout Cards for Home and Office" (B) [23], "Animal Moves Office Fitness Deck" (C) [24], "The Work Wellness Deck" (D) [26], "Desk Yoga Card Deck" (E) [28]

The aim of the present study was to analyse the current state of active breaks among employees and to develop and produce exercise cards as a means of encouraging more regular engagement in active breaks in response to prolonged sitting in the workplace.

2 Methodology

The research was conducted in three phases, each phase defining objectives that contributed to the final results.

1. The **preliminary analysis** was performed in three steps: in the first step, we administered a survey questionnaire among employees regarding their daily activity (a more detailed description is provided in section 2.1.1); in the second step, we analysed the Slovenian market for exercise cards and examined five selected sets of foreign exercise cards (a more detailed description is provided in section 2.1.2); based on the survey results and market research, we defined the **guidelines** for the design of exercise cards in the final step.
2. The process of **designing exercise cards** proceeded through several steps, which are described in detail in section 2.2.
3. The **card appearance and usability analysis** was conducted using a survey questionnaire (a more detailed description of this phase is provided in section 2.3).

2.1 Preliminary analysis

2.1.1 Survey questionnaire for assessing employees' daily activity

Software used and the foundations of the questions. The survey questionnaire for assessing employees' daily activity was developed using the Arnes 1KA application (Centre for Social Informatics, University of Ljubljana). The questions were designed based on the results of the internal employee satisfaction survey at the Faculty of Natural Sciences and Engineering, University of Ljubljana (UL NTF), which is annually conducted by the Faculty Committee for Quality and Self-Evaluation at UL NTF, and on the facts that the faculty has a reserved gym time which employees may use once per week but generally do not take advantage of, that the faculty does not offer organised exercise sessions for employees, that no active breaks are provided, and that, given the nature of their work, most employees likely perform their tasks in a prolonged sitting position, which can lead to specific physical strains. The aim of the questionnaire was therefore to determine the extent to which employees are burdened by their work in relation to its demands, how much time they spend sitting at the workplace, and whether they consequently experience pain in specific parts of the body. We were also interested in whether they engage in physical activity during working hours in the form of active breaks or outside working hours.

The questionnaire was approved by the UL NTF Research Ethics Committee at its meeting on 10 May 2025.

Survey questionnaire structure. In the first part of the questionnaire, employees used a 5-point Likert scale to assess their workload (1 – not burdensome at all, 5 – very burdensome) and the demands of their work (1 – not demanding at all, 5 – extremely demanding).

The questionnaire was then divided into items concerning work performed in a sitting or standing position. In both cases, employees reported the average number of hours per day and the types of tasks they perform while sitting or standing. For work performed in a sitting position, they also indicated any consequences they experience as a result of prolonged sitting.

The questionnaire continued with questions on the frequency and type of physical activity performed during employees' free time. For frequency, respondents chose among the following options: 1 – often, 2 – occasionally, 3 – rarely, 4 – never. If they selected options 1, 2 or 3, they were also required to indicate how many times they engage in physical activity (1 – 1–2 times per month, 2 – 1–2 times per week, 3 – 3–4 times per week or more).

This was followed by questions on active breaks. We were interested in how often they take short active breaks during working hours (1 – every half hour, 2 – every hour, 3 – every 2–3 hours, 4 – rarely, 5 – never). If employees selected options 1–4, they were asked whether they use any instructions, recommendations or similar guidance when choosing exercises for these short active breaks. If they selected option 5, they were asked to provide written explanations for why they do not take short active breaks during working hours.

Finally, employees answered a question regarding whether they would like to change their work, workplace or working environment.

Target group. The survey was active from 11 to 19 March 2025. The target group, i.e. all employees, received a link to the survey by email. A total of 59 employees voluntarily completed the survey, representing 33.5% of all employees (this is a typical response rate for employee questionnaires). Both genders were equally represented among the respondents (50.8% female and 49.2% male). 25.4% of the respondents were under 45 years of age, while the majority (74.6%) were over 45 years old.

Statistical analysis. The survey results were organised using Microsoft Excel, while some data were statistically analysed using the Chi-square test in IBM SPSS Statistics.

2.1.2 Market analysis for exercise cards for exercises during prolonged sitting

In our analysis, we first focused on the Slovenian market. We reviewed online stores offering exercise cards and found that these are primarily intended for performing yoga exercises (e.g., Libristo.si (https://www.libristo.si), Temu (https://www.temu.com), Nakitko.si (https://www.nakitko.si) etc.), and that most of them are available only in English. An exception are certain yoga exercise cards by foreign authors that have been translated into Slovenian and can be purchased in online stores, such as "Joga karte za otroke od 3 do 103 let" in the online shop Food for the mind (https://foodforthemind-si.com), "Avocado joga karte za dva in psa" in the online shop Avokado (https://www.avocado-center.si/), and "Joga za otroke – kartice gibalna abeceda" in the online shop Jogaline (https://www.jogaline.si) etc. We also identified an exception among the cards, i.e. Joga kartice Mali Ganeša (https://maliganesa.si), authored by the Slovenian creator Maja Podpečan and illustrated by Urška Kalčič.

Since we did not find any exercise cards in Slovenian designed for performing exercises after prolonged sitting, we searched for English-language examples in foreign online stores. Among the cards identified that prescribe exercises for prolonged sitting, we selected five sets for analysis, i.e. "Desk Yoga Deck", "Desk Workout Cards for Home and Office", "Animal Moves Office Fitness Deck", "The Work Wellness Deck", and "Desk Yoga Card Deck". A brief description of these sets has already been provided in section 1.3.

In the analysis of the cards, we highlighted their basic characteristics (box and card dimensions, number of cards), the elements present on the cards (images, text, symbols etc.), the illustration style, the colour palette and any additional features. The results are presented in section 3.2.

Following the survey on employees' daily activity and the analysis of the selected card sets, we formulated guidelines for the design of exercise cards, which are described in detail in section 3.2.

2.2 Design process for exercise cards

The design process for the exercise cards is presented in Table 1. As shown in the table, based on the established guidelines, we began by generating ideas for the content and visual design of the exercise cards intended for active breaks. The illustrations were created in a simplified manner, using a two-dimensional illustration style. Once the illustrations were completed, we proceeded with selecting the colour palette and typefaces. This was followed by determining the composition between the typographic and graphic elements, designing the front and back sides of the cards, and preparing the layout for print. In the final stage of the process, the design of the cardboard tuck box, created in accordance with the overall visual identity of the card set, was included as well.

Table 1: Workflow for production of cards

Phase of process	Brief description	Use of hardware/ software
Categories and exercises	Determination of the number of exercise categories, selection of exercises within each category and preparation of instructions (in collaboration with a physiotherapist).	/
Ideas	Collecting ideas for the design of the exercise cards based on the established guidelines.	/
Sketches	Based on simulated real human movements, drawing initial sketches with appropriate proportions of body structure, head shape and arm length.	Wacom tablet/Adobe Photoshop
Design of final characters and additional elements	Vectorisation of the sketches and determination of the basic appearance; design of all remaining characters.	Computer/Adobe Photoshop, Adobe Illustrator CC
Card layout and design	Determination of the basic grid for card layout; selection of typefaces and colours, and defining the composition between typographic and graphic elements.	Computer/Adobe InDesign CC
Packaging design	Adjustment of standard box grid dimensions; design of the box in accordance with the overall visual identity of the cards.	Adobe Illustrator

2.3 Survey questionnaire on appearance and usability of cards

Software used and question framework. The survey questionnaire on the appearance and usability of the exercise cards was developed using the Arnes 1KA application (Centre for Social Informatics, University of Ljubljana). The purpose of the questionnaire was to assess the appropriateness of the visual design of the exercise cards (illustrations, typology, colour palette), the comprehensibility of the exercises presented and the usability of the cards among end users. The questions were formulated on the basis of the designed prototype.

The survey questionnaire was approved by the Research Ethics Committee UL NTF at its session on 10 May 2025.

Structure of the survey questionnaire. The questionnaire was divided into six sections. In the first section, respondents evaluated the general appearance of the cards and their packaging on a 7-point Likert scale (1 – I do not like the appearance at all, 7 – I like the appearance very much). In the next section, respondents assessed the comprehensibility of the exercises across all three categories on a 5-point Likert scale (1 – strongly disagree, 5 – strongly agree). They evaluated the following statements: "The written instructions for performing the exercise are understandable.", "The instructions are too long.", "The illustrative depiction contributes to a better understanding of how to perform the exercise.", "Based on the illustrative depiction, it is possible to perform the exercise even without written instructions." and "The exercise can be performed at my workplace." Subsequently, respondents evaluated the visual appearance of the illustrations on a 7-point Likert scale (1 – The illustrations are not appealing to me, 7 – The illustrations are very appealing to me) and, in a multiple-choice question, indicated how they perceived the illustrated characters (fun, professional, realistic or simple). In the next part of the questionnaire, respondents were asked about the appropriateness of the selected colour palette. They evaluated four statements on a 5-point Likert scale (1 – strongly disagree, 5 – strongly agree): "The colour palette of the categories is sufficiently clear to distinguish between categories.", "The colour palette is visually appealing.", "The colours complement each other well." and 'The colours are playful yet calming." The following category addressed the appropriateness of the fonts. Respondents evaluated four statements on a 5-point Likert scale (1 – strongly disagree, 5 – strongly agree): "The text is sufficiently legible.", "The contrast between the text and the background is appropriate (enabling smooth reading).", "The choice of fonts aligns with the overall visual identity of the

cards." and "The design hierarchy between headings and body text is clear/appropriate." The final section of the questionnaire focused on the usability of the cards. Through single-choice questions, we aimed to determine whether respondents would use the cards to carry out short active breaks during prolonged sitting at work (possible answers: yes, maybe, no), in what manner they would perform such active breaks (possible answers: as a team break or individually) and whether, in their view, frequent implementation of active breaks supported by the exercise cards during prolonged sitting would increase their level of physical activity (possible answers: yes, maybe, no).

Target group. The survey was active from 19 to 25 March 2025. It was distributed to a broader target group, i.e. employees and students of UL NTF. We opted for a larger target group for two reasons: (1) the exercise cards were originally intended for UL NTF employees; nevertheless, access will later also be provided to students whose curricula do not include physical education; and (2) to increase the number of responses, including both younger and older generations of respondents. A link to the survey was sent to the target group by email. A total of 138 respondents completed the questionnaire voluntarily. No demographic data were collected in the survey.

Statistical analysis. The survey results were processed in Microsoft Excel, while the data were analysed using IBM SPSS Statistics.

3 Results and discussion

3.1 Survey results on employees' daily activity

In the survey, we examined whether there is a relationship between job demands and employee workload (Figure 2). To test the association between the two variables, we conducted a chi-square test of independence. Based on Pearson's chi-square test ($\chi^2 = 34{,}91$, $p < 0.001$), we rejected the null hypothesis that the variables are independent, as the results indicate a statistically significant association between perceived workload and perceived job demands; higher levels of job demands coincide with higher perceived workload among the respondents.

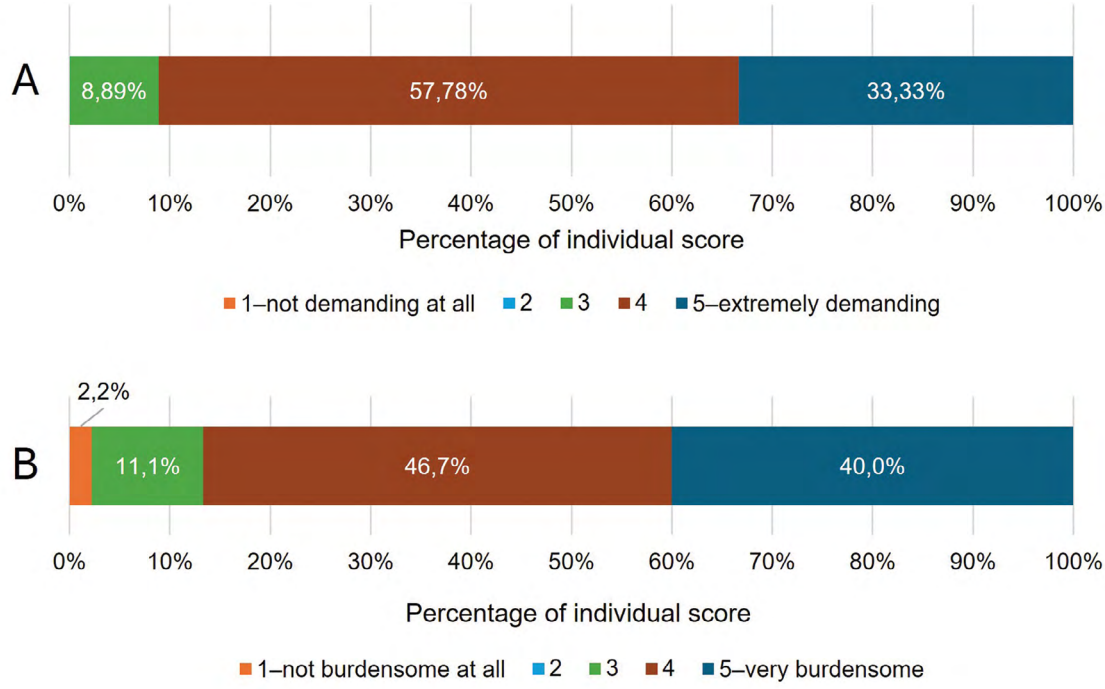

Figure 2: Job demands (A) and workload (B) of respondents

From the results, we found that 11.7% of respondents perform their work in a standing position, while the majority (88.3%) work in a seated position. Standing work is performed, e.g., in laboratories (sample preparation, practical sessions, operating equipment etc.), in other rooms where various types of practical work are conducted, during lectures, student consultations and in other forms of technical support. Seated work most commonly includes working with computers and analytical devices, as well as other desk-based tasks (reviewing seminar papers, exams, articles, proofreading etc.), attending meetings and similar activities. Respondents spend on average 2 hours per day working in a standing position ($\overline{x}$ = 2.0 h/day, SD = 0.58 h/day), while they spend on average 2.9 hours per day working in a seated position ($\overline{x}$ = 2.9 h/day, SD = 0.77 h/day).

We compared the results on time spent working in a seated position with the findings from the 2022 Eurobarometer survey [32], which showed that 19.0% of Slovenia's population spend 2 h 30 min or less seated, 43.0% spend between 2 h 31 min and 5 h 30 min, 27% between 5 h 31 min and 8 h 30 min, and the remaining 11.0% more than 8 h 30 min per day. Our results indicate that the participants in our study spend approximately the same amount of time seated as the largest share of the Slovenian population.

The survey results showed that the respondents engage in physical activity during their leisure time, with 55.9% doing so frequently, 28.8% occasionally and 15.3% rarely. We compared these findings with the Eurobarometer survey [32], which indicates that 11.0% of Slovenia's population are regularly physically active, 41.0% are almost regularly (frequently) physically active and 23.0% are rarely active, while as many as 25.0% are completely inactive. These comparisons suggest that the respondents in our survey are more physically active than the average Slovenian population. We additionally note that 10.2% of respondents engage in physical activity 1–2 times per month, 39.0% 1–2 times per week, while 50.8% engage in physical activity 3–4 times per week or more.

Despite the relatively high levels of reported physical activity outside working hours, only 7.5% of respondents do not experience any consequences of working in a seated position. As many as 30.2% of respondents report back pain, 18.1% report neck pain, 14.7% have dry and burning eyes, primarily due to computer work, 13.8% experience wrist pain, 12.1% leg pain and 11.2% of respondents suffer from headaches.

The pains reported by the respondents could be alleviated through more frequent active breaks, which, however, are rarely performed. Only 1.7% of respondents take active breaks every half hour, 20.0% every hour and 10.0% every 2–3 hours. As many as 50.0% of respondents take active breaks very rarely, while 18.3% do not take them at all. The exercises performed during active breaks are performed freely, without instructions, and only one respondent follows exercises recommended by a physiotherapist. Respondents who do not take active breaks report that they either forget about them or do not take the time due to a heavy workload, while some believe they do not need active breaks since they are sufficiently active in their free time.

A total of 48.9% of respondents do not wish to change their work, workplace or working environment, while the remaining respondents would like to better balance work and rest, spend less time at the computer and have more active breaks. Some also expressed the desire for more appropriate work equipment, particularly a height-adjustable desk and an ergonomic chair.

3.2 Analysis results of selected sets of exercise cards and establishment of guidelines for designing exercise cards for active breaks

The results of the analysis of the five selected sets of exercise cards are presented in Appendix 1. Based on these findings, we subsequently formulated guidelines for the design of exercise cards.

Designing the content and number of exercise cards:

- Selection of appropriate exercises for per-

forming active breaks during prolonged sitting, along with proposals for short exercise programmes.
- The number of exercise cards is determined based on the number of selected exercises. An additional card with short programmes and a card containing instructions for using the exercise cards will be included.
- The exercise cards will be of functional size (proposed dimensions: 70 mm × 110 mm).

General aspects of design:
- A system of categorising the cards will be used, with each category marked by its own colour scheme.
- The colour scheme of the exercise cards will be adapted to the target group (male and female users).
- For longer texts, predominantly sans-serif typefaces will be used, as they are legible, simple and convey a sense of modernity, while serif typefaces will be used for headings.
- In the design of graphic elements and their composition, consistency will be ensured (placement of graphic elements, uniform typeface selection and a consistent colour scheme).

The front side of the card will enable a quick overview of the exercise; therefore, it will include the following information: the name of the exercise, a simple and clear illustration showing how the exercise is performed, and a sequential number that will allow easy sorting of the cards as well as easier retrieval when using pre-designed exercise programmes. The entire front side will be designed with clearly indicated sections to ensure quick recognition of the content.

The reverse side of the card will include information necessary for performing the exercises. For this purpose, the following elements will be provided on the reverse side: a brief and comprehensible description of the exercise (preferably presented in numbered steps), tips on correct posture or on how to avoid common mistakes, and the recommended number of repetitions and duration of the exercise. The content on the reverse side will also be designed with clearly indicated sections, enabling quick and intuitive understanding and recognition of the information.

Packaging – the cardboard tuck box is in direct contact with the cards and protects them from abrasions and damage. It is the main marketing element and the first point of contact for new users; hence, its design must be careful and well considered. The packaging will have a simple form with a top-opening mechanism. The design of the packaging will follow the visual elements used on the cards: typography, colour palette and graphics. The packaging will display the name of the card set, an illustration of a selected exercise and office-related objects that indicate the intended use of the cards. A short description informing the user about the content/theme of the cards will also be included, e.g. "33 exercise cards for movement during work".

Based on the established guidelines, we designed the final prototype of the exercise cards.

3.3 Designing exercise card prototype

3.3.1 Selection of categories and exercises

Following the physiotherapist's recommendations, the exercises were divided into three categories, i.e. exercises for stretching and strengthening the legs; exercises for the trunk; and exercises for the upper body, i.e. the neck and arms. Each category included 11 exercises. The instructions for performing the exercises were prepared in a clear manner, using no more than four bullet points. For certain exercises, additional notes were provided to facilitate execution in cases where the original version might be too difficult for the user.

The exercise card set comprised 33 cards, to which we added two additional cards, namely one with instructions for use and one listing recommended exercise programmes.

3.3.2 Arranging elements on cards

In arranging the elements on the cards, we followed the guidelines outlined in section 3.2. All cards share the same layout style (Figure 3A), with only the colour palette varying according to the exercise category. On the front side, the exercise illustration is placed within a rounded frame; the card number is positioned in the wider upper margin and the exercise name in the wider lower margin. On the reverse side, also within a bordered frame, we included the exercise name and its description; the card number is again positioned in the wider upper margin and the number of repetitions and exercise duration in the wider lower margin. The two additional cards (Figures 3B and 3C) follow the same intended layout, except they do not include illustrations. On the first of these cards, one side contains instructions related to exercise performance, while the other side provides information about the contents of the set. The second additional card contains descriptions of the pre-prepared exercise sequences.

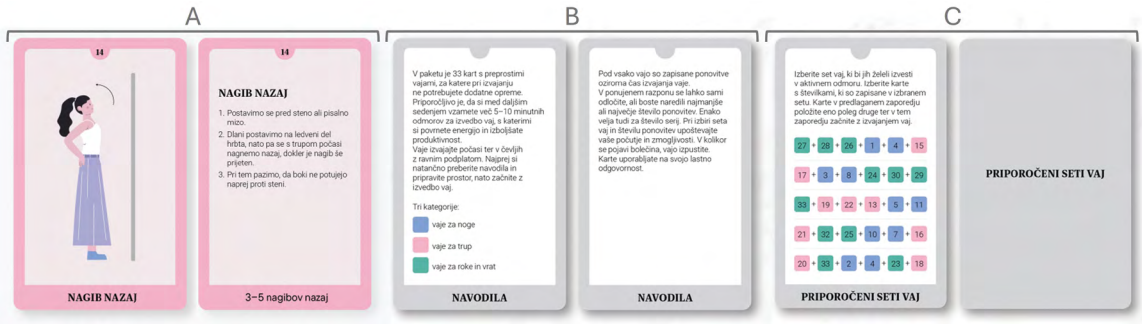

Figure 3: Front and reverse side of exercise cards (A), cards with instructions (B) and cards with recommended sets of exercises (C)

3.3.3 Illustrations

The illustrations (Figure 4) are created in a simple flat illustrative style, without the use of textures or shading. The application of line drawing with curved lines ensures that each depicted movement is clear, simple and easy to execute. Arrows are additionally included to facilitate the understanding of the exercise performance and to illustrate the movement pathway. Stylised figures with minimal detail enable users to focus on the execution of the exercise. The use of lighter and darker tonal values indicates which limb is positioned in the foreground and which in the background. The figures are predominantly depicted from a side view, allowing the movement sequences to be more clearly perceived.

In illustrating the figures, diversity was taken into account: female and male figures are differentiated on the basis of body size, head structure, variations in clothing, hairstyles and related features. Facial expressions are neutral and relaxed. In most cases, the figures are depicted as full-body representations, with the exception of the arm and neck categories, where the focus is placed on the upper body.

The figures are situated within a spatial context, thereby presenting users with the possibility of performing the exercises in everyday environments, e.g. office or home. For this purpose, elements including chairs, tables, a wall, a computer and plants are incorporated using a grey colour palette.

3.3.4 Colour palette

The selected colour palette consists of 19 colours, predominantly pastel tones, which are visually calming (Figure 5). Three distinct colours are used to differentiate the three exercise categories. The category of leg exercises is denoted by blue, which is associated with calmness and relaxation. The category of arm and neck exercises is indicated by green, representing health and vitality, while the category of trunk exercises is marked by pink, reflecting warmth and a soothing effect [33]. Grey is used for objects depicted in the background.

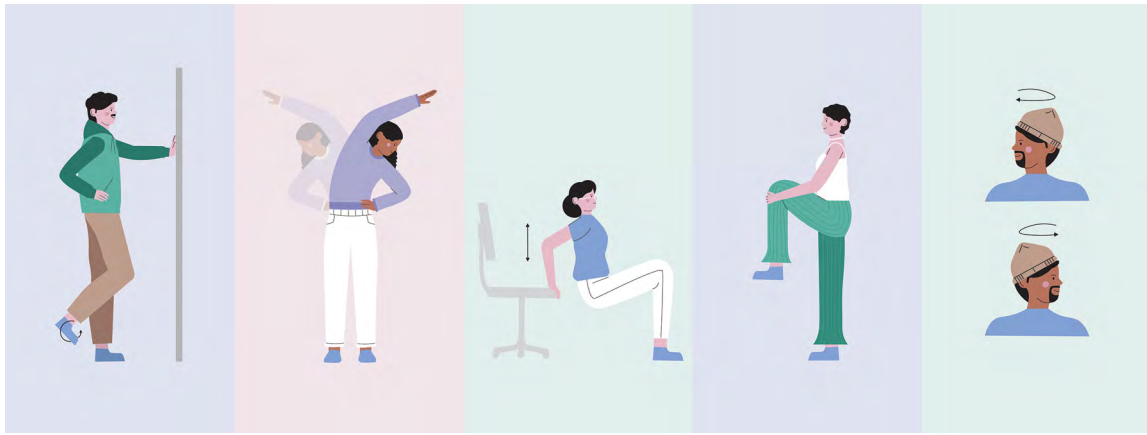

Figure 4: Diversity of figures and background elements (wall, chair)

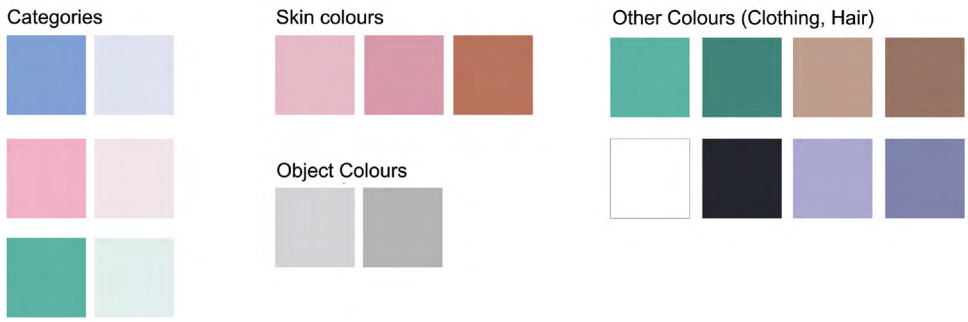

Figure 5: Selected colour palette

3.3.5 Typography

The overall visual identity of the cards is characterised by the use of two typefaces, i.e. the serif typeface Dashiell Bright for headings and the sans-serif typeface Roboto for longer bodies of text (Figure 6). Dashiell Bright is used for the exercise titles in bold uppercase letters, while Roboto, which ensures good legibility, is employed for the exercise instructions and repetitions in both light and bold weights. Both typefaces are also applied in the design of the packaging.

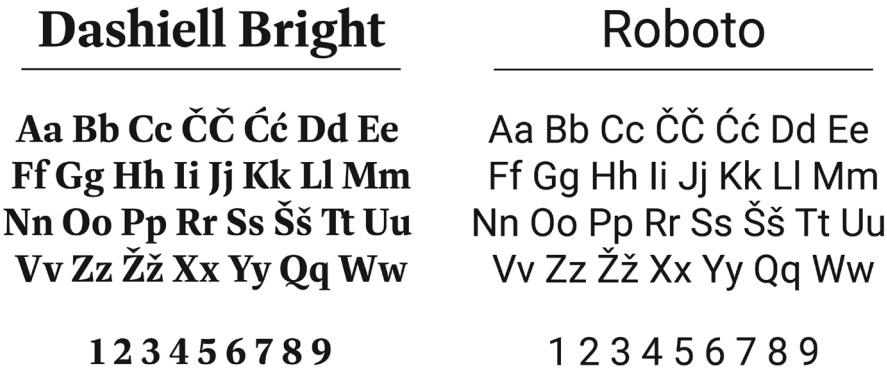

Figure 6: Selected typefaces Dashiell Bright and Roboto

3.3.6 Tuck box

For the visual design of the cardboard tuck box, the same typefaces and colour palette as those used on the cards were applied (Figure 7), with blue selected as the primary colour of the box. The front panel features the name of the exercise cards and an illustration of a person performing an exercise. The side panels include the required logos and a statement describing the project within which the cards were physically produced and used. The back panel also features an illustration of a person performing an exercise, along with information on the number of exercises included in each category. The packaging is designed in a minimalist and orderly manner. The box follows a classic tuck-end structure, with top and bottom tuck-in flaps. The dieline was exported from the Templatemaker website [34], which allows the specification of packaging dimensions and the adjustment of flap sizes. The box measures 113 mm × 72 mm × 20 mm.

Figure 7: Cardboard tuck box (packaging)

3.4 Survey results on visual design and usability of cards

The developed prototype of the card set was evaluated using a questionnaire survey. The overall appearance of the cards and packaging was rated highly by the respondents on a Likert scale, with a high mean score ($\bar{x}$ = 5.51). As shown in Figure 8, responses are concentrated at the higher end of the scale (scores 5, 6 and 7), indicating a strongly positive overall perception of the visual appearance of the card set.

The clarity and comprehensibility of the visual representation and written instructions of the exercises were evaluated using selected cards from each category (Figure 9).

As shown in Table 2, the respondents rated the clarity of the written instructions for performing the exercises in all three card examples with high mean scores ($\bar{x}$ = 4.55/4.69/4.55), indicating well-designed textual descriptions of the exercises. The contribution of the illustrative representations to improved understanding of exercise performance is confirmed by the similarly high mean scores ($\bar{x}$= 4.66/4.75/4.65), underscoring the important role of visual representations in the effective communication of instructions. Based on the low mean scores ($\bar{x}$ = 2.52/2.39/2.34), it can be concluded that the respondents generally agreed that the instructions were not overly long. However, the relatively high standard deviation values (SD = 1.52–1.63) should not be overlooked, as they indicate considerable variability in respondents' opinions and suggest that some participants may have perceived the instructions differently from the majority.

Based on the results presented in Table 2, it can be concluded that an illustrative representation without

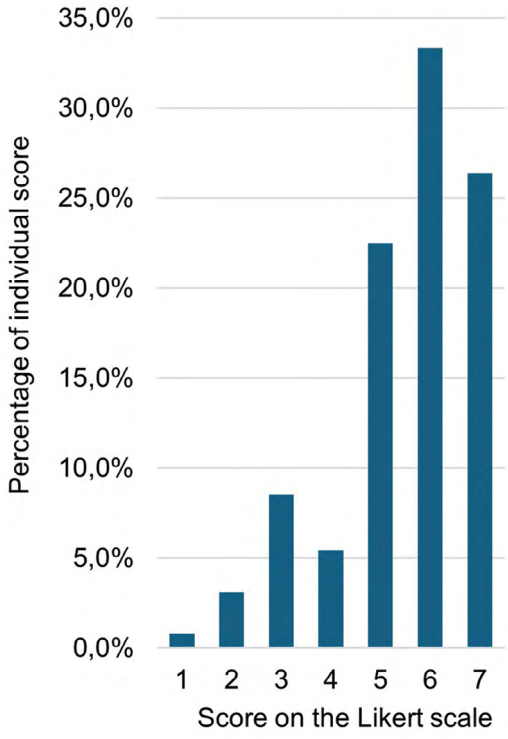

Figure 8: Distribution of ratings of overall appearance of card set on Likert scale (1 – I do not like the appearance at all, 7 – I like the appearance very much) (n = 129, Mo = 6, SD = 1.94)

written instructions is sufficient for performing the exercise. The highest level of agreement with this statement was observed for the exercise "Table push-ups" ($\bar{x}$ = 4.41, Mo = 5.0), for which the ratings were also the most consistent (SD = 0.73). High ratings indicating agreement with the statement were also reported for the exercises "Chair squat" ($\bar{x}$ = 3.79, Mo = 4.0) and "Triangle" ($\bar{x}$ = 4.10, Mo = 5.0); however, in these cases, the ratings were somewhat more dispersed (SD = 1.11), which may suggest that an illustrative representation alone is not always sufficient for understanding the exercises.

The respondents indicated that most of the presented exercises could be performed in their workplace, as reflected by the high mean feasibility rating for the exercise "Chair squat" ($\bar{x}$ = 4.31, Mo = 5.0). A similar pattern was observed for the exercise "Triangle"; however, a slightly greater variability in responses was noted (SD = 1.24), which may indicate differences in spatial or ergonomic conditions across workplaces. The lowest feasibility rating was assigned to the exercise "Table push-ups" ($\bar{x}$ = 3.94, SD = 1.31), suggesting that this exercise may be more dependent on specific spatial or technical conditions.

Figure 9: Selected cards from individual categories on the basis of which the clarity and comprehensibility of the exercise representations were evaluated: "Chair squat" (A; blue), "Triangle" (B; pink) and "Table push-ups" (C; green).

The respondents further evaluated the visual appearance of three illustrations on the exercise cards (Figure 10) using a 7-point Likert scale. The visual appearance of the illustrations received a high mean rating ($\bar{x}$ = 5.89, n = 116), the most frequent rating being 6 (Mo). Although the ratings were predominantly high, the relatively large standard deviation (SD = 1.53) indicates some variability in respondents' opinions, suggesting that the visual appearance of the illustrations was not perceived as equally appealing by all respondents. As shown in the diagram in Figure 10, respondents most fre-

Table 2: Ratings of clarity-related statements

Statement	Card category	n [a]	Distribution of ratings on Likert scale (1 – strongly disagree, 5 – strongly agree)					$\bar{x}$ [b]	SD [c]	M_o [d]
			1	2	3	4	5			
The written instructions for performing the exercise are clear.	Blue	130	0.00	0.77	6.15	30.77	62.31	**4.55**	0.42	5.00
	Green	124	0.00	0.00	2.42	26.61	70.97	**4.69**	0.27	5.00
	Pink	121	0.00	0.00	6.61	32.23	61.16	**4.55**	0.38	5.00
The instructions are too long.	Blue	129	27.13	24.03	24.03	19.38	5.43	**2.52**	1.52	1.00
	Green	125	31.20	28.80	15.20	19.20	5.60	**2.39**	1.60	1.00
	Pink	121	33.06	28.93	16.53	14.05	7.44	**2.34**	1.63	1.00
The illustrative representation contributes to a better understanding of how to perform the exercise.	Blue	129	1.55	0.00	6.98	13.95	77.52	**4.66**	0.55	5.00
	Green	124	0.81	0.00	4.03	13.71	81.45	**4.75**	0.37	5.00
	Pink	121	0.83	0.83	8.26	12.40	77.69	**4.65**	0.55	5.00
Based on the illustrative representation, the exercise can be performed even without written instructions.	Blue	130	1.54	12.31	21.54	34.62	30.00	**3.79**	1.11	4.00
	Green	124	0.81	2.42	12.10	24.19	60.48	**4.41**	0.73	5.00
	Pink	121	3.31	4.13	18.18	28.10	46.28	**4.10**	1.11	5.00
The exercise can be performed at my workplace.	Blue	130	1.54	5.38	12.31	22.31	58.46	**4.31**	0.97	5.00
	Green	124	4.03	6.45	25.00	20.97	43.55	**3.94**	1.31	5.00
	Pink	122	0.82	10.66	19.67	14.75	54.10	**4.11**	1.24	5.00

[a] number of respondents, [b] arithmetic mean of ratings, [c] standard deviation, [d] most frequently selected rating

quently described the illustrations as simple (42.3%) and fun (29.5%), while smaller proportions (14.1%) perceived them as realistic and professional.

The ratings of the suitability of the colour palette used for the exercise cards (Figure 11) were on average very high. The statements received mean ratings ranging from 4.31 to 4.52 on a 5-point Likert scale, the most frequent rating for all items being 5 (Mo). The participants evaluated the colour palette as sufficiently clear for distinguishing between categories, visually appealing and well balanced in terms of colour harmony. The palette was also perceived as playful and relaxing. Low to moderate standard deviation values indicate a relatively high level of consistency in the responses.

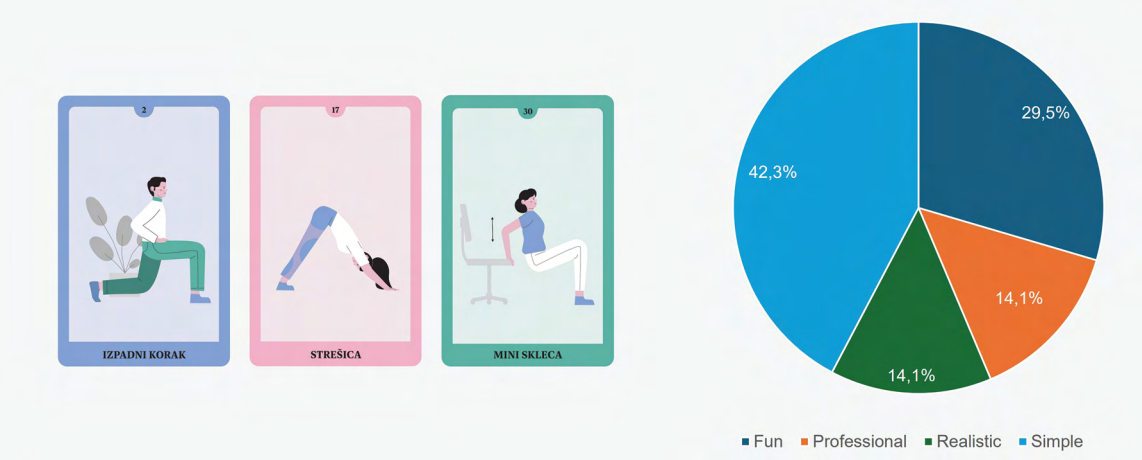

Figure 10: Illustrations of three exercise cards (left) and respondents' perceptions of illustrations (right) (n = 220)

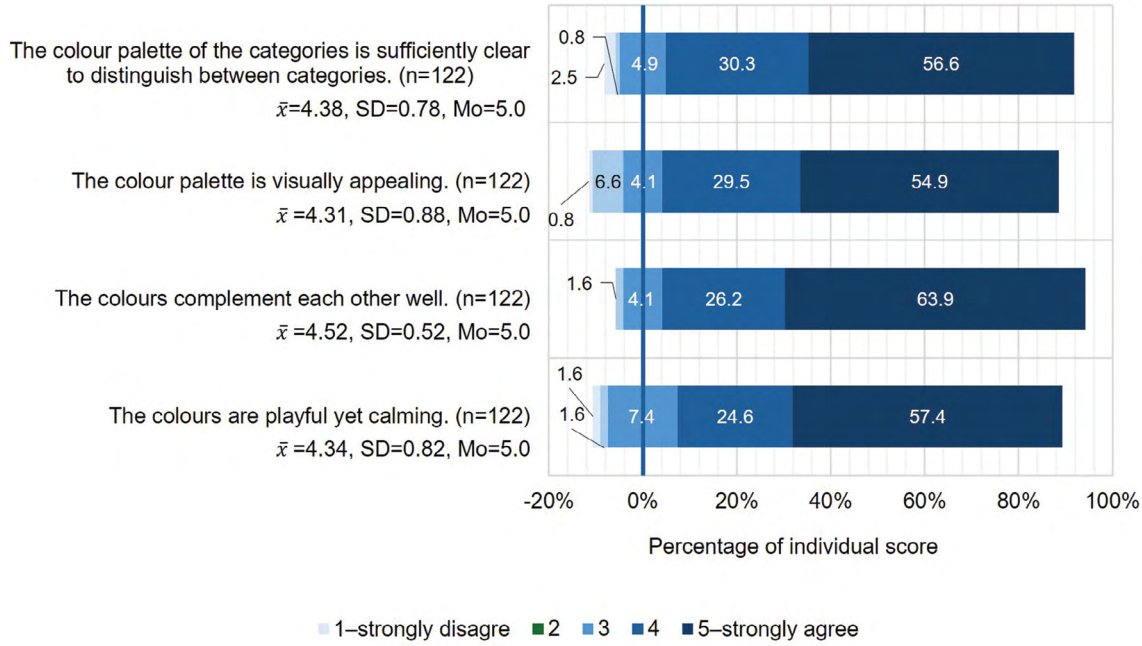

Figure 11: Colour palette suitability

The respondents rated the suitability of the selected typefaces (typography) used on the exercise cards predominantly with high mean scores (Figure 12). Text legibility received a mean rating of 4.47 (SD = 0.49), indicating clear typography with appropriate letter size and proportions. The relatively low standard deviation reflects a consistent opinion among respondents. The contrast between the text and the background received the highest mean rating (4.66, SD = 0.38), with a high level of agreement across the respondents. The alignment of the selected typefaces with the overall visual identity of the cards was rated slightly lower ($\bar{x}$ = 4.18, SD = 1.10), with greater variability in individual ratings. This outcome was expected, as this item represents a more subjective assessment related to individual aesthetic preferences and the perceived coherence of visual elements. The mean rating for the visual hierarchy between headings and body text was high ($\bar{x}$ = 4.53, SD = 0.55), indicating that the respondents were able to recognise the structure and distinguish between different textual elements, such as headings, subheadings and body text.

Approximately one third of the respondents (40.5% of n = 121) indicated that they would definitely use the exercise cards to perform short active breaks during prolonged sitting at work. The largest proportion of the respondents (43%) selected the response "maybe". This group is particularly important, as it reflects an openness towards using the exercise cards; however, additional information and motivation would be required to encourage a definitive decision regarding regular use. A total of 16.5% of respondents stated that they would not use the exercise cards. These responses may be associated with personal preferences, workplace conditions or a lack of interest in such activities.

Of those respondents who indicated that they would definitely or possibly use the cards for active breaks (n = 100), 76.0% expressed a preference for performing the breaks individually, as needed, while 21.0% would prefer to perform the exercises as part of a team break. A small proportion of the respondents (3.0%) indicated that they would perform the exercises both individually and as part of a team.

The majority of the respondents (64.5%, n = 121) believe that the frequent implementation of active breaks using the exercise cards during prolonged sit-

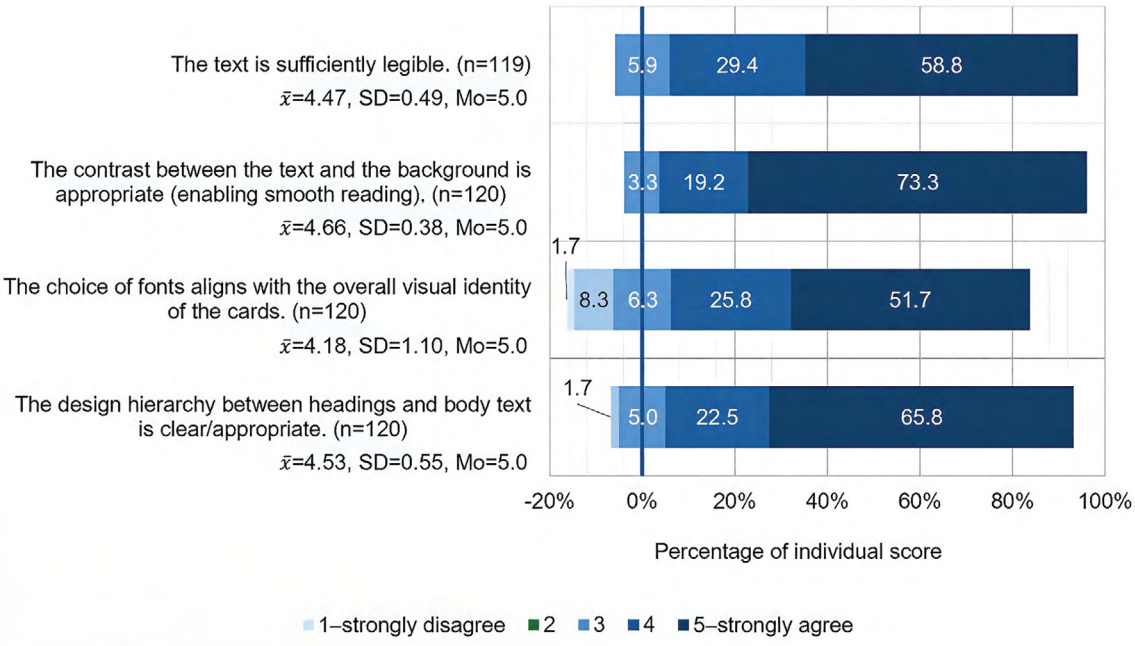

Figure 12: Suitability of selected typefaces (typography)

ting at work would indeed contribute to an increase in their physical activity. Although 28.9% of respondents were not entirely certain, they did not exclude the possibility of increased physical activity. This group represents a potential target, as appropriate presentation or positive user experience could encourage more frequent engagement in active breaks. Only a small proportion of the respondents (6.6%) felt that active breaks would not have an impact on their physical activity.

3.5 Final product

Following the analysis of the survey results on the appearance and usability of the exercise cards, the prototype was refined into its final form and prepared for printing. In selecting the materials, considerations included durability, tactile quality, visual appearance and functionality.

Card printing and finishing: 300 g/m² matte coated paper; double-sided digital printing; double-sided matte lamination; rounded corners.

Tuck box printing and finishing: 250 g/m² matte coated paper; single-sided digital printing; final die-cutting of the dieline and gluing.

The final appearance of the card set and tuck box is shown in Figure 13.

4 Conclusion

The research results confirm that prolonged sitting has a significant impact on employees' well-being and highlight the need for the introduction of short, structured active breaks. The results of the survey assessing respondents' daily activity revealed a statistically significant relationship between job demands and perceived workload, indicating that higher job demands are associated with increased levels of strain. Although the majority of respondents reported engaging in regular physical activity during their leisure time, a substantial proportion still experience discomfort in the back, neck or upper limbs during working hours.

The analysis of the current situation also showed that respondents rarely engage in active breaks. The most frequently cited reasons include a lack of time and motivation, as well as high workload, which consequently leads to prolonged sitting. For this reason, the concept of designing short, visually clear

Figure 13: Set of exercise cards for active breaks during prolonged sitting (photo: Lidija Svetek)

and quickly executable instructions in the form of exercise cards is particularly relevant, as it enables employees to incorporate movement into their working day in a quick and straightforward manner.

Based on the analysis of existing exercise card sets, guidelines were developed for the design of an original set of exercise cards for active breaks. These guidelines ensure a clearly structured, visually coherent and functional design. The exercise card set is organised into three exercise categories (legs, trunk and upper body) and includes a selection of illustrated exercises, written instructions and pre-defined programmes. Particular emphasis was placed on visual simplicity, clear and comprehensible descriptions, diversity in the illustrated figures, carefully considered colour coding of categories and typography that ensures good legibility.

The evaluation of the exercise card set prototype demonstrated a positive response from the respondents. The overall appearance of the cards was rated as very good, and high ratings were also assigned to the clarity and comprehensibility of both the instructions and the illustrations. The illustrations were perceived as simple, visually appealing and sufficiently informative for performing the exercises, while the colour palette was regarded as coherent and effective in distinguishing between categories. The majority of the respondents believed that the regular use of the cards in the form of active breaks could contribute to increased physical activity during working hours. In this context, respondents indicated a preference for performing active breaks individually, allowing them to self-regulate the timing of their breaks.

The results confirm that exercise cards have considerable potential to reduce the negative effects of prolonged sitting and to promote healthy movement habits in the workplace. The finalised exercise cards represent an effective tool that could be meaningfully integrated into broader workplace health promotion programmes. Future research would benefit from a long-term evaluation of the

effects of using the exercise cards, including the frequency of exercise performance in real workplace settings and the impact of active breaks facilitated by the cards on employee productivity and satisfaction, not only at our faculty but also in a wider range of organisational contexts.

Acknowledgements

The authors would like to thank the employees of the Faculty of Natural Sciences and Engineering, University of Ljubljana, for their participation in the survey. This research was conducted as part of the pilot project Digitalna in zelena prenova VSŠP: študija primera, performed within the ULTRA project and co-funded by the Republic of Slovenia, the Ministry of Higher Education, Science and Innovation, and the European Union – NextGenerationEU.

Data availability statement

The data supporting the findings of this study are publicly available in the Repository of the University of Ljubljana (RUL) as of 9 December 2025, under the persistent identifier (PID) 20.500.12556/RUL-176689 [35].

References

4. FANG, H., JING, Y., CHEN, J., WU, Y., WAN, Y. Recent trends in sedentary time: A systematic literature review. *Healthcare,* 2021, **9**(8), 1–19, doi: 10.3390/healthcare9080969.
5. PEEREBOOM, K., DE LANGEN, N. *Dolgotrajno sedeče delo z omejenim obsegom gibanja. Učinki na zdravje in nasveti o dobri praks*. Luxembourg : Urad za publikacije Evropske unije, 2021.
6. TREMBLAY, M.S., AUBERT, S., BARNES, J.D., SAUNDERS, T.J., CARSON, V., LATIMER-CHEUNG, A.E., CHASTIN, S.F., ALTENBURG, T.M., CHINAPAW, M.J. Sedentary behavior research network (SBRN) – terminology consensus project process and outcome. *International journal of behavioral nutrition and physical activity,* 2017, **14**(1), 1–17. doi: 10.1186/s12966-017-0525-8.
7. ZALETEL, M., VARDIČ, D., HLADNIK, M. *Zdravstveni statistični letopis 2023*. Ljubljana : Nacionalni inštitut za javno zdravje, 2025.
8. BELLER, J., GRAßHOFF, J., SAFIEDDINE, B. Differential trends in prolonged sitting time in Europe: a multilevel analysis of European Eurobarometer data from 2013 to 2022. *Journal of Public Health,* 2025, **33**(5), 943–951. doi: 10.1007/s10389-023-02090-1.
9. CARDÁS, T. First findings of the Fourth European Survey of Enterprises on New and Emerging Risks (Esener 2024). European Agency for Safety and Health at Work, 2025.
10. AVCIBAŞI, İ. M., DİNDAR, İ. Relationship between working posture and work injuries in a clothing factory workers in Edirne. *Karaelmas Journal of Occupational Health and Safety,* 2022, 2, 87–96. doi: 10.33720/kisgd.945387.
11. OPOKU, M., BAIDEN, S., ABOAGYE-WAA-NTIRI, J. Garment Production Processes and their Health Challenges: A Case of Tailors and Dressmakers in the Small-Scale Clothing Industries in Sunyani Municipality. *Journal of Health, Medicine and Nursing,* 2024, 72–81. doi: 10.7176/JHMN/113-08.
12. İMAMOĞLU, G., BESTEM, E. Ergonomic Risk Analysis of Working Postures for a Textile Factory Worker. *Journal of advanced research in natural and applied sciences,* 2024, **10**(3), 761–770. doi: 10.28979/jarnas.1502292.
13. ŠAJNOVIĆ, U., MARGAN, A., PETKOVSKA, V., DODIČ FIKFAK, M. Analiza zdravstvenega stanja tekstilnih delavcev. Univerzitetni klinični center Ljubljana, Klinični inštitut za medicino dela, prometa in športa, Ljubljana, 2021.
14. ISMAYENTI, L., SUWANDONO, A., MAHER DENNY, H., WIDJANARKO, B. Reduction of Fatigue and Musculoskeletal Complaints in Garment Sewing Operator through a Combination of Stretching Brain Gym® and Touch for Health. *International Journal of Environmental Research and Public Health*, **18**(17), 8931, 1–14. doi: 10.3390/ijerph18178931.

15. DANESHMANDI, H., CHOOBINEH, A., GHAEM, H., KARIMI, M. Adverse Effects of Prolonged Sitting Behavior on the General Health of Office Workers. *Journal of lifestyle medicine,* 2017, **7**(2), 69–75. doi. 10.15280/jlm.2017.7.2.69.
16. GAO, W., SANNA, M., CHEN, Y.H., TSAI, M.K., WEN, C.P. Occupational sitting time, leisure physical activity, and all-cause and cardiovascular disease mortality. *JAMA network open*, 2024, **7**(1), e2350680, doi: 10.1001/jamanetworkopen.2023.50680.
17. NASIR, H., DUCLOS, M., BAGHERI, R., COLE, A., BAKER, J. S., THIVEL, D., DUTHEIL, F. Impact of occupational sedentary behavior on mental health: A systematic review and meta-analysis. *PLoS One,* 2025, **20**(8), e0328678, 1–22. doi: 10.1371/journal.pone.0328678.
18. FRITZ, C., ELLIS, A.M., DEMSKY, C. A., LIN, B. C., GUROS, F. Embracing work breaks: Recovering from work stress. *Organizational Dynamics,* 2013, **42**(4), 274–280. doi: 10.1016/j.orgdyn.2013.07.005.
19. FISCHETTI, F., PEPE, I., GRECO, G., RANIERI, M., POLI, L., CATALDI, S., VIMERCATI, L. Ten-minute physical activity breaks improve attention and executive functions in healthcare workers. *Journal of Functional Morphology and Kinesiology,* 2024, **9**(2)102, 1–13. doi: 10.3390/jfmk9020102.
20. CHANG, Q., ZHU, Y., LUI, Z., CHENG, J., LIANG, H., LIN, F., LI, D., PENG, J., PAN, P., ZHANG, Y. Replacement of sedentary behavior with various physical activities and the risk of all-cause and cause-specific mortality. *BMC Medicine,* 2024, **22**(1), 385, 1–14. doi: 10.1186/s12916-024-03599-2.
21. ISPAH's eight investments that work for physical activity. 2020. [accessible from a distance]. International Society for Physical Activity and Health [accessed 23. 1. 2025]. Available on World Wide Web: https://ispah.org/wp-content/uploads/2020/11/English-Eight-Investments-That-Work-FINAL.pdf.
22. PUSTIVŠEK, S. Telesna dejavnost na delovnem mestu - kdaj bo praksa dohitela teorijo, 2017. [accessible from a distance]. Kineziolog, 30. 5. 2017 [accessed 13. 12. 2024]. Available on World Wide Web: https://www.kineziolog.si/telesna-dejavnost-na-delovnem-mestu-kdaj-bo-praksa-dohitela-teorijo/.
23. KELLET, N. What are card decks & why have cards become a popular medium, 2024. [accessible from a distance]. Deckible.com, 16. 9. 2024 [accessed 13. 12. 2024]. Available on World Wide Web: https://cards.deckible.com/what-are-card-decks-why-have-cards-become-a-popular-medium/.
24. Desk Yoga Deck, Chronicle books, 2024. [accessible from a distance]. Subin Yang Illustration [accessed 20. 11. 2025]. Available on World Wide Web: https://subinyang.cargo.site/Chronicle-Books-Desk-Yoga-Deck.
25. Illustrators 65. Surface-Product Design, 2022. [accessible from a distance]. The Society of Illustrators [accessed 1. 2. 2025]. Available on World Wide Web: https://societyillustrators.org/illustrators-65/desk-yoga-deck/.
26. Zinsk, Upgraded Us. [accessible from a distance]. Upgraded Us [accessed 1. 2. 2025]. Available on World Wide Web: https://upgradedus.com/zinsk/.
27. EDWARDS, D. Why Workout When You Can Playout? [accessible from a distance]. Primal Play [accessed 1. 2. 2025]. Available on World Wide Web: https://www.primalplay.com/.
28. EDWARDS, D. Animal Moves: How to move like an animal to get you leaner, fitter, stronger and healthier for life. 2018, Explorer Publishing, Dubai.
29. The Work Wellness Deck, 2021. [accessible from a distance]. Cronicle Books, 31. 8. 2021 [accessed 25. 3. 2025]. Available on World Wide Web: https://www.chroniclebooks.com/products/the-work-wellness-deck.

30. LAM, G. Gracia Lam. The Loud Cloud. [accessible from a distance]. The Loud Cloud [accessed 22. 4. 2025]. Available on World Wide Web: https://www.gracialam.com/info.
31. Desk Yoga Card Deck for Work and Home Offices. [accessible from a distance]. The Yoga Tool Kit [accessed 20. 11. 2025]. Available on World Wide Web: https://theyogatoolkit.com/.
32. ROJAS, M. Yoga tools for everyday life. [accessible from a distance]. [accessed 20. 11. 2025]. Available on World Wide Web: https://www.yogimaria.com/.
33. Holistic atelier. [accessible from a distance]. Holistic atelier [accessed 20. 11. 2025]. Available on World Wide Web: https://www.holisticatelier.co/about.
34. The Work Wellness Deck. [accessible from a distance]. Free People Movement [accessed 20. 11. 2025]. Available on World Wide Web: https://www.freepeople.com/fpmovement/shop/the-work-wellness-deck/.
35. Sport and physical activity. *Special Eurobarometer 525*. 2022. [accessible from a distance]. European Commission [accessed 18. 11. 2025]. Available on World Wide Web: https://europa.eu/eurobarometer/surveys/detail/2668.
36. BISTRICER, R. Color psychology: how to use it in your next design project, 2024. [accessible from a distance]. Wixel, 16. 4. 2024 [accessed 5. 4. 2025]. Available on World Wide Web: https://www.wix.com/wixel/resources/color-psychology.
37. Card Box. [accessible from a distance]. Templatemaker [accessed 6. 4. 2025]. Available on World Wide Web: https://www.templatemaker.nl/en/cardbox/.
38. MOŽE, L., LUŠTEK PRESKAR, B., JEDREJČIČ, A., STANKOVIĆ ELESINI, U., MEDVED, T. Naslov : research data underlying the article. *Repository of the University of Ljubljana*, 4 November 2025. Available on World Wide Web: https://repozitorij.uni-lj.si/IzpisGradiva.php?id=176689&lang=slv.

Appendix 1: Analysis results of five sets of exercise cards

Card set caharacteristcs	Sets of cards				
	Desk yoga deck [21]	**Desk workout cards for home and office [23]**	**Animal moves office fitness deck [24]**	**The work wellness deck [26]**	**Desk yoga card deck [28]**
Illustration style	Freehand drawing without strictly straight lines, featuring bold and colourful shapes.	Figures are digitally illustrated in vector format; shading is used in some instances; the illustration style is simple.	Clean line work with simple shading, emphasising functionality and correct exercise execution.	The illustration style conveys a sense of elegance. Illustrations are partly hand-drawn and partly digital, incorporating textures.	The illustrations are vector-based and digitally rendered in a two-dimensional flat style. The figures appear relaxed, simple and calm.
Card elements	The front side features an illustration demonstrating the exercise, supplemented with elements from the work environment (e.g. plants, lamps, desks, chairs). The top of the reverse side indicates the category name, followed by exercise instructions and a short motivational quote. The text is sometimes humorous and sometimes positively framed.	The front side displays an illustration of the exercise; more complex exercises are shown in multiple steps. Above the illustration are the exercise name, number of breaths, repetitions and duration; at the bottom, the targeted body part is indicated. The reverse side includes a smaller illustration, the exercise name, duration and a written description of the exercise sequence.	All key information is presented on the front side of the card. The upper section (a coloured rectangle) contains the exercise name and duration according to difficulty level. Below, on a white background, the exercise illustration and instructions are provided.	The front side includes an illustration and the category name, while the reverse side provides the exercise description. The environment and everyday objects are depicted using selective visual information.	In addition to an illustrated demonstration of the exercise within a white frame, the cards include the exercise name, category name, duration and a difficulty indicator in the upper right corner. Selected linear symbols (e.g. moon and sun) are also included.
Colour palette	The colour palette is highly diverse and varies by category.	The colour palette differentiates the categories: the first category is turquoise and the second orange. All elements are harmonised with the category colour.	Categories are marked with green or dark blue rectangles, while other elements and the box appear in various colours.	Dedicated illustrations for the three categories are presented on the front side, each using a distinct colour palette.	The colours of the six categories are visible in the backgrounds of the figures and vary between cool and warm tones.
Additional elements	A short guide with instructions for performing the exercises is included.	Three additional cards provide recommended stretching routines, body-part-specific routines and a suggested 5-minute workout.	Cards featuring challenges and games are included.	The content of the cards differs slightly from the others, as they include exercises focused on mental health and workplace relationships.	A small wooden card stand is included.
Card size		88 mm × 63 mm	88 mm × 63 mm	156 mm × 102 mm	80 mm × 110 mm
Number of cards	52	75	54	60	106
Box size	103 mm × 40 mm × 158 mm	95 mm × 76 mm × 36 mm	N/A	160 mm × 40 mm × 103 mm	N/A