

Araştırma Makalesi

The Relationship Between Occupational Sitting Time, Physical Activity Level and Bowel Functions in Office Workers

Ofis Çalışanlarında Mesleki Oturma Süresi, Fiziksel Aktivite Seviyesi ve Bağırsak Fonksiyonları Arasındaki İlişki

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Öz

Amaç: Bu çalışmanın amacı, ofis çalışanları arasında mesleki oturma süresi, fiziksel aktivite düzeyleri ve bağırsak fonksiyonu arasındaki ilişkiyi incelemektir. **Gereç ve Yöntem:** Çalışmaya 152 ofis çalışanı dahil edildi. Katılımcıların sosyodemografik ve klinik özellikleri ayrıntılı olarak kaydedildi. Fiziksel aktivite düzeyini belirlemek için Uluslararası Fiziksel Aktivite Anketi (UFAA), bağırsak fonksiyonlarını belirlemek için gayta günlüğü, dışkı tipini belirlemek için Bristol Dışkı Ölçeği (BDÖ) ve kabızlık şikayeti olan bireylerde kabızlık semptomlarının şiddetini belirlemek için Konstipasyon Şiddet Ölçeği (KŞÖ) kullanıldı. **Sonuçlar:** Kabızlığı olan ve olmayan ofis çalışanları arasında fiziksel aktivite seviyesi ve mesleki günlük oturma süresinde fark yoktu; ancak mesleki oturma süresi açısından iki grup arasında fark vardı ($p=0,018$). Mesleki oturma süresi, kabızlık şikayetlerinin süresi ve KŞÖ-ağrı arasında pozitif, zayıf düzeyde bir korelasyon bulundu ($p_1=0,045$, $r_1=0,163$; $p_2=0,041$, $r_2=0,167$). Ancak; diğer parametreler arasında korelasyon bulunamadı. **Tartışma:** Mesleki günlük oturma süresi arttıkça ofis çalışanlarında kabızlık şikâyetlerinin süresi ve kabızlığa bağlı ağrı semptomu artmaktadır. Ofis çalışanlarına, ofis ortamında oturma süresini ve sedanter yaşam tarzını azaltma konusunda eğitim verilmesi bağırsak fonksiyonlarını iyileştirme açısından faydalı olabilir.

Anahtar Kelimeler: Bağırsak Sağlığı; Konstipasyon; Egzersiz; Fiziksel İnaktivite; Sedanter Yaşam; Meslekler.

ABSTRACT

Purpose: This study was conducted to investigate the relationships among occupational sitting time, physical activity level and bowel function in office workers. **Material and Methods:** The study included 152 office workers. Sociodemographic and clinical characteristics of the participants were recorded in detail. The International Physical Activity Questionnaire (IPAQ) was used to determine the level of physical activity, a bowel diary was used to determine bowel functions, the Bristol Stool Scale (BSS) was used to determine stool type, and the Constipation Severity Scale (CSS) was used to determine the severity of constipation symptoms in individuals with constipation complaints. **Results:** There was no difference in physical activity level and occupational daily sitting time between office workers with and without constipation; however, there was a difference between the two groups in terms of occupational sitting duration ($p=0.018$). A positive, weak relationship was found between occupational sitting time, duration of constipation complaints, and CSS-pain ($p_1=0.045$, $r_1=0.163$; $p_2=0.041$, $r_2=0.167$). However; no correlation was found between other parameters. **Discussion:** As the daily sitting time increases, the duration of constipation complaints and the pain symptom of constipation increase in office workers. Providing training to office workers to reduce sitting time and sedentary lifestyle in the office environment may be beneficial in terms of improving bowel functions.

Keywords: Bowel Health; Constipation; Exercise; Physical inactivity; Sedentary Behavior; Occupations.

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Physical activity is defined as body movement produced by skeletal muscles and resulting in energy expenditure. Decreased physical activity levels and sedentary lifestyles affect colonic transit time (World Health Organization, 2020). In a 2013 review by the American Gastroenterological Association, it was stated that physical inactivity is a risk factor for constipation and that light exercise increases gas clearance in the intestine (Bharucha et al., 2013). Some studies have stated that increased physical activity is important in reducing chronic constipation, and moderate-level evidence has been presented that physical activity can be used as an adjunct treatment for chronic constipation (Dukas et al., 2003; Serrano Falcón et al., 2017; Wilson, 2020). On the other hand, it has been stated that the evidence that physical activity is associated with constipation is insufficient and that better-designed prospective observational studies are needed on this subject (Sheth, M. and Dey, K., 2024).

The increase in sitting time is an important parameter reflecting sedentary behavior (Tremblay et al., 2010). Sedentary behavior constitutes the lowest end of the physical activity spectrum and refers to the situation that generally requires less than 1.5 metabolic equivalents of energy expenditure, especially while sitting or lying down during waking hours (Barnes et al., 2012). It has been stated that the risk of Type 2 diabetes, cardiovascular diseases, some cancers and death increases due to sedentary life (Ekelund et al., 2016). Light physical activity stimulates the gastrocolic reflex to facilitate high-intensity peristaltic contraction that promotes defecation. In people who sit for longer periods, the stimulation of this reflex may decrease and colon motility may also slow down. With prolonged sitting, the blood flow to the intestines decreases and the functioning mechanism of the intestines may be disrupted; it has been reported that this situation may cause problems such as gas accumulation in the intestines, constipation and irritable bowel syndrome (Simons et al., 2013).

Regardless of the intensity of physical activity, it provides positive developments for a person with a sedentary life. Increased desk work intensity, monotonous and less active working environment brought about by technology and mechanization with the increase in industrialization rates in countries, heavy traffic and frequent use of transportation vehicles, factors that accustom people to inactivity in social life, increase in unemployment and retirement, time spent in front of the television, addiction to digital technology, etc. cause an increase in the sitting time of individuals (İlhan, 2010; McLaughlin et al., 2020). In the study conducted by McLaughlin et al. (2020), 7641 people from

62 countries were examined and 47% of the participants reported their sitting time. According to the number of those who reported, the average daily sitting time was found to be 4.7 hours. Increased sitting time can negatively affect bowel functions. Zainordin et al. (2021) reported that restricting sitting time will reduce constipation symptoms. Chien et al. (2011) stated that reducing sitting time for constipation treatment may be more important than increasing severe/moderate physical activity according to the results of their study on adolescents. In a study examining women with and without constipation, the sitting time of women with constipation was found to be longer than that of women without constipation (Karaaslan et al., 2023). However, no occupational evaluation was made in the study. One of the reasons for the long sitting time may be the person's occupational activities (Karaaslan et al., 2023).

Nowadays, with the advancement of technology, the number of office workers has increased (Faruque et al., 2024). The fact that human beings, who are programmed to move, remain in static and fixed positions for long periods of time causes health problems and negatively affects the quality of life (Janwantanakul et al., 2011). It has been determined in the literature that studies on office workers mostly examine musculoskeletal system problems and develop solution suggestions for these problems (Küçük et al., 2018). In a study examining the relationship between fibrous food consumption and physical activity level with bowel habits in office workers, 100 office workers were evaluated and no relationship was found between physical activity level and defecation frequency in office workers (Deniz et al., 2023). It is thought that constipation may be more common in office workers due to sedentary and stressful work life. To the best of our knowledge, there is no study in the literature examining the relationship between occupational sitting time and physical activity level with bowel functions in office workers. The aim of this study is to examine the relationship between occupational sitting time and physical activity level with bowel functions in office workers. This study will reveal the relationship between occupational sitting time and physical activity level with bowel functions in office workers. However, the results obtained from the study will guide clinicians in creating lifestyle modification programs to improve bowel functions in office workers, considering long occupational sitting periods.

MATERIAL AND METHODS

This study was conducted on office workers with different sitting time and physical activity levels between April 2024 and September 2024 at the Health Sciences University, Gülhane Faculty of Physiotherapy and

Rehabilitation. It was approved by the scientific research ethics committee of the university on 27.02.2024 with the decision number 2024-46. A screening form specific to the study was developed, including eligibility criteria, and individuals were enrolled in order of convenience. Individuals who met the inclusion criteria were invited to the physiotherapy unit after being informed about the study and signed a consent form according to the principles stated in the Declaration of Helsinki. The inclusion criterias were being the ages of 18-40, being literate and having a normal nutritional status by getting 12 points or more in the screening section of the Mini Nutritional Assessment-Short Form. Exclusion criterias were being pregnant, having orthopedic, neurological, endocrinological and metabolic, psychiatric, mental or systemic chronic diseases, having any disease accompanied by a colon problem (inflammatory bowel disease, intestinal perforation, intestinal obstruction, peritonitis, gastrointestinal bleeding, acute inflammation of abdominal organs...), having a history of abdominal surgery, and not volunteering to participate in the study. After the recording sociodemographic (age, weight, height, marital status, occupation, educational status) and medical (smoking and alcohol use, medications used, previous surgical operations, rheumatological, orthopedic, neurological... etc. chronic disease presence; number of main meals, daily water consumption) information of the volunteers included in the study, a bowel diary was used to determine bowel functions, the Bristol Stool Scale (BSS) was used to determine stool type, the Constipation Severity Scale (CSS) was used to determine the severity of constipation symptoms in individuals with constipation complaints, and the International Physical Activity Questionnaire (IPAQ) was used to determine the level of physical activity. Additionally, individuals will be asked about their daily sitting time at work.

International Physical Activity Questionnaire

Physical activity level was assessed with the International Physical Activity Questionnaire-Short Form (IPAQ-SF), the Turkish validity and reliability study of which was conducted by Saglam et al. (Saglam et al., 2010). This questionnaire consists of 7 questions (related to sitting, walking, moderate and vigorous activities). The IPAQ was provided to individuals, and they were asked to read it themselves and select the option that best suited them. The total score is given by the sum of the duration (min) and frequency (day) of walking, moderate and vigorous activity. Activities that can be included in the score must be performed for at least 10 minutes at a time. The standard MET values specific to these activities are as follows: 3.3 METs for walking, 4 METs for moderate and

vigorous physical activity, and 8 METs for vigorous physical activity. The physical activity level of individuals was calculated according to these values. The intraclass correlation coefficient (ICC) of the Turkish IPAQ-SF was 0.69 (Saglam et al., 2010).

Bowel Diary

Bowel functions were assessed using a bowel diary. The parameters in this chart are stool frequency, stool type, duration of time on the toilet, feeling of incomplete evacuation, medication use, changes in diet and fluid consumption. In order to obtain information about bowel habits, individuals were asked to mark each day they defecated in the last week, how long they spent on the toilet with each defecation, to mark if they felt incomplete evacuation, to note changes in diet and fluid consumption, and medication use (Doğan et al., 2022; Gürsen et al., 2015).

Bristol Stool Scale

The Bristol Stool Scale (BSS) was developed by Lewis and Heaton at the University of Bristol in 1997 and classifies human feces into 7 groups (Lewis and Heaton, 1997). Type 1 is the hardest and most fragmented form of feces, and towards Type 7, the feces turn into watery stools with no solid content. The shape of the feces changes according to the time it stays in the colon. Therefore, the BGS is a fast and reliable indicator of transit time. Bristol Stool Form Scale has been accepted as a reliable and fast indicator of transition time. The BSS divides human stool into 7 subtypes according to density: types 1 and 2 are classified as slow transit (hard stools), types 3 to 5 are classified as normal transit, and types 6 and 7 are classified as fast transit and impaired rectal tenderness (diarrhea). Although not completely scientific, this table helps health professionals to better perceive stool patterns when making a diagnosis (Lewis and Heaton, 1997). Participants were asked to record the type of stool by looking at it while filling out the bowel diary.

Constipation Severity Scale

The symptom severity of individuals with constipation symptoms was assessed with the "Constipation Severity Scale (CSS)", the Turkish validity and reliability of which was developed by Kaya and Turan. This scale, consisting of 16 questions, consists of 3 subheadings (stool obstruction, colonic inertia and pain). The CSS was provided to individuals, and they were asked to read it themselves and select the option that best suited them. A total score of 0-73 can be obtained from the scale. The higher the score obtained from the scale, the more severe the symptoms are. Test-retest correlation coefficients of Turkish CSS were 0.20-0.84; item-total score correlations were 0.40-0.82 and Cronbach alpha

coefficients were 0.92-0.93 (Kaya and Turan, 2011; Varma et al., 2008).

Statistical Analysis

The sample size of this study was calculated as at least 88 using the G*Power 3.1 program, with a power of 90% and a type 1 error level of 0.05 according to a study by Orhan et al. SPSS 22.0 (IBM Corp., Armonk, NY) statistical software was used for data analysis. Descriptive statistics were performed by giving mean \pm standard deviation, median and interquartile range (25-75 interquartile range: IQR). Descriptive statistics of categorical variables were expressed as frequency and percentage [%]. The Kolmogorov-Smirnov test was used to evaluate whether the outcome measurements were normally distributed. It was observed that the results did not show normal distribution. The relationships among occupational sitting time, physical activity level and bowel functions were evaluated by Spearman correlation analysis. The

significance level was accepted as $p < 0.05$ in all analyses.

RESULTS

A total of 162 participants were screened for eligibility. 10 participants did not meet the inclusion criteria (being pregnant [$n = 3$], having neurological disease [$n = 1$], having abdominal surgery [$n = 4$], and unwillingness to participate in study [$n = 2$]). Consequently, 152 office workers were included in this study. All included participants filled out the questionnaires.

The mean age of participants was 34.94 ± 11.01 years and the body mass index (BMI) (Khanna et al., 2022) of participants was 25.21 ± 4.37 kg/m². In terms the education level, 81.4% of all participants had \geq bachelor's degree. 49.7% of participants were married and 51% of participants were women. Detailed information on sociodemographic, clinical and medical characteristics is presented in Table 1.

Table 1. Sociodemographic, clinical and medical characteristics of participants

Variables (n=152)	Min-Max	X \pm SD
Age (years)	18-63	34.94 \pm 11.01
BMI (kg/m ²)	15.42-40.75	25.21 \pm 4.37
Occupational daily sitting (hours)	2-17	6,03 \pm 2.18
Occupational duration (year)	1-37	9.00 \pm 9.68
Amount of cigarette use (package \times year)	0-45	5.69 \pm 8.76
	N	%
Gender		
Female	77	51.0
Male	75	49.0
Marital status		
Married	75	49.7
Single	77	50.3
Education level		
Bachelor's degree	28	18.6
>Bachelor's degree	124	81.4
Smoking		
Yes	58	38.4
No	94	61.6
Alcohol consumption		
Yes	35	23.2
No	117	76.8
Regular exercise		
Yes	24	15.7
No	128	84.3
Daily Diet habits		
3 main meals	45	29.8
3 main meals and snacks	30	19.9
2 main meals	22	14.6
2 main meals and snacks	50	33.1
1 main meals	2	0.7
1 main meals and snacks	3	2.0
Daily Fluid Intake Habits		
1-5 glass	41	27.2
6-10 glass	73	48.3
11-15 glass	38	24.5

BMI: Body Mass Index; kg/m²: kilogram per meter squared; X \pm SD: Mean \pm Standard Deviation; n(%): frequency (percentage)

It was observed that the majority of the participants (80.8%) were physically inactive or minimally active according to IPAQ. In addition; 32.2% of office workers had complaints of constipation and the mean duration of

complaints was 1.15 ± 3.59 year. The results regarding the participants' physical activity level and bowel functions are shown in Table 2.

Table 2. Physical activity level and bowel function of participants.

Variables (n=152)	N	%
IPAQ		
<i>Inactive</i>	30	19.9
<i>Minimally active</i>	93	60.9
<i>Very active</i>	29	19.2
Constipation		
<i>Yes</i>	49	32.2
<i>No</i>	103	67.8
	Min-Max	X\pm SD
IPAQ (MET-min/week)	1680-60925	7858.13 \pm 4978.49
Constipation complaint duration (year) (n=49)	0-20	1.15 \pm 3.59
CSS (n=49)		
<i>Total</i>	0-55	17.57 \pm 11.12
<i>Stool obstruction</i>	0-22	9.25 \pm 5.30
<i>Colonic inertia</i>	0-32	7.82 \pm 5.83
<i>Pain</i>	0-16	1.23 \pm 2.52
Bowel dairy		
Defecation frequency	0-9	7.70 \pm 7.93
Defecation time (min)	1-22.86	6.60 \pm 4.27
Stool consistency (according to BSS)	1-7.43	3.84 \pm 1.34

n(%): frequency (percentage); IPAQ: International Physical Activity Questionnaire; CSS: Constipation Severity Scale; BSS: Bristol Stool Scale; X \pm SD: Mean \pm Standard Deviation.

When the participants were examined according to their constipation status, there was no difference in IPAQ and occupational daily sitting time between office workers with and without constipation;

however, there was a difference between the two groups in terms of occupational duration ($p=0.018$) (Table 3).

Table 3. Physical activity level, occupational daily sitting and occupational duration according to constipation status.

	Constipation	X \pm SD	p	t
IPAQ	<i>Yes (49)</i>	7426.7959 \pm 2040.95	0.462	-0.737
	<i>No(103)</i>	8065.3431 \pm 5890.39		
Occupational daily sitting	<i>Yes (49)</i>	6.36 \pm 2.51	0.202	1.282
	<i>No(103)</i>	5.88 \pm 1.99		
Occupational duration	<i>Yes (49)</i>	10.29 \pm 9.97	0.018*	-2.394
	<i>No(103)</i>	6.32 \pm 8.52		

IPAQ: International Physical Activity Questionnaire; X \pm SD: Mean \pm Standard Deviation; Independent Sample t-Test was used, * $p<0.05$

The relationships among occupational daily sitting time, physical activity level and bowel function were given in Table 4. According to Table 4, a positive, mild relationship was found between occupational sitting time, duration of

constipation complaints, and CSS-pain ($p_1=0.045$, $r_1=0.163$; $p_2=0.041$, $r_2=0.167$). However; no correlation was found between other parameters.

Table 4. The Relationship Between Occupational Sitting Time, Physical Activity Level and Bowel Functions

		Constipation complaint duration	CSS	CSS	CSS	CSS	Bowel dairy		
			Total	Stool obstruction	Colonic inertia	Pain	Defecation frequency	Defecation time	Stool consistency
IPAQ	p	0.810	0.923	0.421	0.952	0.617	0.621	0.994	0.467
	rho	-0.20	-0.008	-0.066	0.005	-0.041	-0.041	-0.001	-0.066
Occupational daily sitting time	p	0.045*	0.71	0.681	0.344	0.041*	0.075	0.100	0.576
	rho	0.163*	0.148	0.034	0.078	0.167*	0.023	-0.149	-0.051
Occupational duration	p	0.926	0.312	0.695	0.655	0.556	0.196	0.900	0.749
	rho	0.008	0.083	0.032	0.037	0.048	0.106	0.011	0.029

IPAQ: International Physical Activity Questionnaire; CSS: Constipation Severity Scale; Spearman was used, * $p < 0.05$. r : Spearman correlation coefficient.

DISCUSSION

In the current study, it has been showed that occupational time was longer in office workers with constipation, while occupational time was less in office workers without constipation. Additionally, as the daily sitting time increases, the duration of constipation complaints and the pain symptom of constipation increase in office workers. To our knowledge; this study is the first to examine physical activity and bowel function in office workers with a valid and reliable questionnaire.

Several studies have evaluated the association between physical activity and constipation symptoms or colon transit (Orhan et al., 2015; Tuteja et al., 2005; Wilson, 2020). Although the effect of physical activity on bowel functions has not been clearly explained, the underlying mechanism can be summarized as increased colonic motility, decreased blood flow in the intestine, increased biomechanical jumping movements of the intestine due to mechanical vibration of the body during activities such as running, increased compression applied by the abdominal muscles to the colon, and decreased constipation severity due to increased fiber consumption due to increased energy consumption (Peters et al., 2001). In a study conducted by Yurtdas et al. (Yurtdas et al., 2020); it has been determined that increased physical activity level is associated with a significant decrease in the prevalence of constipation (Yurtdas et al., 2020). In another population-based study, self-reported physical inactivity was not strongly associated with fewer than 3 defecations per week or hard/lumpy stools. Deniz et al. (Deniz et al., 2023); found no significant difference in BSS and frequency of defecation according to physical activity levels of office workers (Deniz et al., 2023). Similarly; in our study, no difference was found between physical activity level and daily occupational sitting time in office workers with and without constipation complaints. This

may be because constipation is affected by lifestyle factors such as diet, as well as being physically active or inactive. On the other hand, in our study, it was found that individuals who had been office workers for a longer period of time were more likely to experience constipation. Office workers' exposure to a sedentary and stressful work environment for long periods of time may have caused constipation.

Orhan et al. (Orhan et al., 2015), found a negative relationship between constipation severity and physical activity. Those who were physically inactive had higher scores on the CSS (Orhan et al., 2015). In a study conducted with geriatric population, it was reported that constipation was less common in physically active individuals (Donald et al., 1985). A systematic review found a low negative association between constipation and physical activity (Martin, 2011). However; in our study, conducted on an office worker population, no relationship was found between physical activity and duration of constipation complaints, constipation severity determined by CSS, defecation frequency, duration and stool consistency. Similar to our study, Meshkinpour et al. (Meshkinpour et al., 1998), in a study conducted on eight cases, showed that regular exercise did not play an effective role in the treatment of constipation (Meshkinpour et al., 1998). In another study, no difference was found between total energy consumption in cases with and without constipation (Klauser et al., 1992). The results of studies in the literature may conflict with each other due to insufficient samples or lack of standardization in the inclusion of patients.

Office workers have professional needs for long periods of sitting during the day so they may be prone to slow bowel function. However, there is no study on this in the literature. Our study showed that as occupational sitting time increased, the duration of constipation

complaints and pain-related symptoms of constipation increased. In a case-control study, similar to our study, women with constipation were found to have more sitting time (Karaaslan et al., 2023). Limiting sitting time can reduce symptoms of constipation. In fact, reducing sitting time may be more important for treating constipation than increasing moderate/vigorous physical activity. In relation to the results of our study, providing training to office workers to reduce sitting time and sedentary lifestyle and to increase the level of physical activity in the office environment may be beneficial in terms of improving bowel functions.

This study has some limitations. Firstly, physical activity level and occupational daily sitting time were assessed subjectively based on patient reports, which may introduce recall bias. In future studies, these variables can be assessed using more objective methods, such as accelerometers or pedometers, to enhance accuracy. Secondly, objective assessment methods, such as colonic transit time testing, could not be used in this study to diagnose constipation and evaluate colonic function. This limits the ability to provide more precise and clinically relevant measures of bowel function. Lastly, the cross-sectional design of this study prevents the establishment of causality between prolonged sitting time, physical activity, and bowel function outcomes. Despite these limitations, our study is important because it provides preliminary data for future studies.

In conclusion, people who have been working in an office for a long time may be more prone to constipation and increased occupational daily sitting time may increase the duration of constipation complaints and the severity of constipation-related pain symptoms. The result of this study highlights the importance of reducing occupational sitting time during the day can improve bowel functions in office workers. Future studies could be designed as long-term longitudinal studies to explore the causal relationship between prolonged occupational sitting and constipation symptoms would help better understand the chronic effects of sedentary behavior on bowel function. Additionally; intervention-based research can be planned to focus on strategies to reduce occupational sitting time, such as implementing standing desks or encouraging regular movement breaks, could evaluate their impact on improving bowel function and reducing constipation complaints among office workers.

Ethical approval

It was approved by the scientific research ethics committee of the Health Sciences University on 27.02.2024 with the decision number 2024-46.

Authors' Contribution

Esra Üzelpasacı: Design, Analysis, Manuscript Writing.
Ayşegül Dülger: Data Collection, Manuscript Writing.

Conflict of Interest Statement

There is no conflict of interest between the authors.

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