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RESEARCH ARTICLE

Investigation of Perceived Walkability of Neighborhood Environment According to Physical Activity Level and Body Composition of Adults during the COVID-19 Pandemic

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Abstract
This research examined the relationship between physical activity status and perceived walkability in the neighborhood environment during the Covid-19 pandemic. A total of 88 volunteer adults, 45 females and 43 males, aged 18-65 participated in the study. An online IPAQ-Short Form and Neighborhood Environment Walkability Scale were administered to the participants. In addition, daily step counts were determined to determine objective physical activity levels. The collected data were analyzed by correlation and t test in SPSS program. According to analysis of step counts, there was a significant difference between the physical activity groups ($p<0.05$). Only the aesthetics of neighborhood environment subscale scores were significantly different between those with high intensity physical activity compared to those with low and moderate intensity physical activity ($p<0.05$). According to the analysis results, mean step count and mean IPAQ scores were identified to have positive moderate level of correlation ($r = 0.27$, $p = 0.01$). There were no statistically significant differences between the mean walkability perception of the neighborhood environment subscale scores according to body composition ($p>0.05$). As a result, in this process, the status of adults' perceptions of the neighborhood environment regarding physical activity was examined; During the Covid-19 pandemic, features of the built environment did not increase physical activity and walking, and their effects were not as expected. In conclusion; the most important reasons for this are the measures taken by the administrators to protect people, the conditions affecting the pandemic such as the threat and uncertainty that the pandemic poses on people.

Keywords
COVID-19, Environment, Health, Physical activity, Perception, Walkability

INTRODUCTION

The COVID-19 pandemic was one of the most dramatic experiences of humanity in recent years in both health and social terms. In addition to the direct effects of coronavirus on human health, human life was deeply affected due to isolation precautions and psychological factors linked to the disease (Ozen et al., 2020; Demirci et al., 2022). Due to the rapid spread of the pandemic and high transmissivity, precautions were taken around the world in general and societies faced great changes. Precautions like social distancing, quarantines, masking and movement restrictions affected the daily lives of people and disrupted normal routines. In the first period of the struggle against the coronavirus, convalescent plasma and antiviral medications (e.g., remdesivir) were adopted as partial treatment methods, while later traditional and mRNA vaccinations provided significant advances in the treatment of COVID-19 patients (Scavone et al., 2020; Byambasuren et al., 2023). Many countries adopted social isolation and hygiene behavior strategies as the most effective method to limit spread of the virus and to reduce

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morbidity and mortality. In this period, perceptions of close surroundings and physical activity became important to sustain the health and welfare of individuals.

Public health advice (decisions to remain at home, closure of parks, gyms and fitness centers to prevent spread of the virus) have the potential to reduce daily physical activity. In this context, daily regular physical activity and exercise assist in the struggle against some diseases by strengthening the immune system, and preventing obesity, diabetes and hypertension and serious heart diseases that make people more susceptible to COVID-19 (Civil et al., 2021; Siordia, 2020). Exercise affects the immune system and improves morbidity and mortality due to infection (Lowder et al., 2005; Warren et al., 2015; Kohut et al., 2009). When situations like remaining at home and reduced physical activity are combined with a sedentary lifestyle, uncontrolled weight gain is an unavoidable outcome. Research in Italy including 41 child and adolescent obesity patients identified that participants did less exercise and increased unhealthy snack consumption as a result of remaining at home (Pietrobelli et al., 2020). A study in the United Kingdom concluded that adults with obesity had reduced belief in limited numbers of behaviors to prevent typical weight gain (e.g., physical activity) compared to before stay-at-home orders (Robinson et al., 2020). The importance of investigating behavior related to weight and understanding obstacles to weight management during the COVID-19 crisis was emphasized by the association of high BMI with increased risk of hospitalization and death due to coronavirus (Garg et al., 2020; Klang et al., 2020). Additionally, health reports by the World Health Organization (WHO) and other national health authorities showed a striking increase in the prevalence of obesity and other diseases related to physical immobility (USDHHS, 2000; WHO, 2010; Unuvar, 2004).

The COVID-19 pandemic caused people to remain at home more and to complete most of their daily activities in their close surroundings. Homes became safe harbors and the close environment played an important role in the struggle with the pandemic. In this process, people's perceptions of their close surroundings changed and their interest in their homes, neighborhoods and natural areas increased. According to research by Saelens et al. (2003), the quality and attractiveness of walkable areas near homes may affect people's level of physical activity. People tend to discover walking paths, cycle lanes and open areas in the close environment near their homes. According to Yin (2013), the activities and functions between the start and end points of walks affect the walkability, with path components listed as accessibility, socialization, security and image. The start and end points of a journey with the purpose of walking and the features of the route linking these two points make the space walkable. Running and walking comprise significant proportions among types of physical activity; for this reason, walking activities play an important role in determining the total amount of daily movement (Tremblay et al., 2001). Contrary to this, some factors preventing walking in cities include few areas where it is safe to be active, lack of access to physical activity equipment, distance to areas like parks and gyms, cost of physical activity and time limitations (Ferreira et al., 2007; Cavill et al., 2006; Motl et al., 2007). When all these negative aspects are resolved, physically active journey choices emerge and provide the opportunity for individuals to participate in physical activity. WHO (2021) stated that physical activity includes all movements in the daily routine including during leisure, when going places, for transport or as part of a person's job. Individuals going to work by bicycle have lower probability of mortality due to any cause; people walking to work have lower risk of cancer and individuals using active modes instead of vehicles have lower body mass index (BMI). Additionally, recent research showed that regular and continuous participation in physical activity was associated (Mutz et al., 2021; Brown et al., 2015; Anokye et al., 2012; Vagetti et al., 2014; Krzepota et al., 2018; Ho et al., 2019) with positive mental outcomes in terms of (Schuch et al., 2018) mental health (Whitelaw et al., 2010) and happiness (Dolan et al., 2014). In light of this information, the aim of our study was to investigate the perceived walkability of the neighborhood environment according to physical activity levels and body composition of adults during the COVID-19 pandemic.

MATERIALS AND METHODS

Procedure

Within the scope of this study, data obtained from September-December in 2021 during the COVID-19 pandemic were analyzed. In this research to investigate the close environment perceptions of adults according to physical activity level and body composition. The study was approved by the Scientific Research Ethics Committee of Çanakkale Onsekiz Mart University with the decision of 04/01/2021 and number 01/03

Participants

A total of 100 volunteer participants aged 18-65 years were reached. However, only 88 people fully completed the survey or gave consent with the consent form. Surveys were prepared with Google Forms and sent to individuals as the study was completed during the pandemic and due to the risk of transmission. People who did not complete the consent form were not included in the study. Height and weight information was obtained to determine obesity among participants and BMI was calculated. After calculations, the BMI classification table of the WHO was used (WHO, 2000). BMI is used to predict body weight according to height and does not provide information about the distribution of fat in the body.

Data Collection

IPAQ-Short-Form

This scale measuring the intensity of physical activity comprises nine questions. Questions provide information about physical activity, walking upstairs, walking, shopping and sitting during the last seven days. From this data, total weekly physical activity levels (MET/hr/wk) are classified as low, moderate and high. Individuals not doing physical activity have low physical activity of ≤600 MET-min/wk, while it is necessary to achieve ≥600-3000 MET-min/wk total physical activity for high intensity or moderate intensity of physical activity (Craig et al., 2003).

Total physical activity points: The MET-min score (MET-min/wk) for participants for the last 7 days was calculated using the formulas below for high intensity and moderate intensity physical activity and walking based on duration in minutes and number of days of that activity. Standard MET values were created for these physical activities.

- Walking score (MET-min/wk) = 3.3 * walking duration * number of days of walking
- Moderate intensity activity score (MET-min/wk) = 4.0 * duration of moderate intensity activity * number of days of moderate intensity activity
- High intensity activity score (MET-min/wk) = 8.0 * high intensity activity duration * number of days of high intensity activity
- Total physical activity score (MET-min/wk) = walking score + moderate intensity activity score + high intensity activity score

Step Count

To determine the objective physical activity levels and daily step counts of participants, daily step count data were requested by communicating with individuals. Individuals determined their daily step count using smart watches, smart wrist bands or mobile telephone applications.

Neighborhood Environment Walkability Scale (NEWS)

The NEWS was first developed by Cerin et al. (2006) in USA to measure perceptions of walkability neighborhood environments (Cerin et al., 2006). It comprises 6 subscales of access to services, street connections and walking/cycle routes, esthetics, traffic danger, crime rate and infrastructure. Responses to questions are given on a 4-point scale from 1 (definitely disagree) to 4 (definitely agree). Higher values for access to services, street connections and walking/cycle routes, esthetics and infrastructure are equivalent to a more walkable neighborhood, while higher values for traffic safety and crime indicate a less walkable neighborhood.

Statistical Analysis

Data analysis was performed through the SPSS 22.0 statistical package (SPSS Inc., Chicago, IL, USA). Means and SD were computed for all quantitative variables and percentages were computed for categorical variables. The Shapiro-Wilk test was used to inspect for the distributions of the variables. In statistical analysis, independent samples t-tests were used to test for group differences and One Way Anova tests for multiple group comparisons were used. In order to determine the group differences, Post-Hoc LSD test was used. Pearson correlation test was used to examine the relationship between the variables. Significance level was taken as $p < 0.05$ in statistical analysis.

RESULTS

The mean values for age, height, weight, BMI, access to facilities, streets in the neighborhood environment, walking and cycle routes, esthetics of neighborhood environment, traffic danger, crime, physical activity and 3-day step counts for 88 volunteer participants are given in Table 1.

Table 1. Descriptive statistics of participants

	X	SD
Age	39.76	12.431
Height	171.38	8.745
Weight	74.53	13.958
BMI	25.2749	3.74668
Access to facilities	3.0492	.86939
Streets in neighborhood environment	3.1534	.93267
Walking and bicycle routes	2.8995	.72344
Esthetics of neighborhood environment	2.5114	.88645
Traffic danger	2.3744	.74117
Crime	1.5981	.78157
IPAQ Score	1.6477	.67874
3-day step count	4398.85	4017.279

SD= Std. Deviation

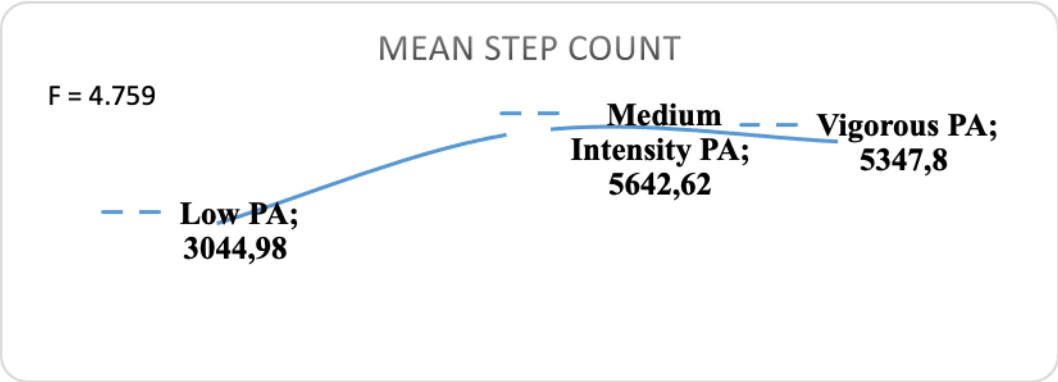

Figure 1: Difference between physical activity intensity and step count

According to analysis of step counts in Figure 1, there was a significant difference between the physical activity groups ($p<0.05$). When the source of the difference between the groups was investigated, the group with low physical activity had mean step counts that were lower by statistically significant level compared to the groups with moderate and high intensity physical activity ($f\ (2,85) = 4.75$, $p=0.011$).

Table 2 gives the mean body composition and perceptions of neighborhood environment walkability subscale scores according to physical activity levels for participants. Only the esthetics of neighborhood environment subscale scores were significantly different between those with high intensity physical activity compared to those with low and moderate intensity physical activity ($f(2, 85)= 5.25$, $p = 0.006$). The group with high intensity physical activity were identified to be the group with highest esthetic awareness of their environment.

Table 2: Difference in perceptions of neighborhood environment walkability according to physical activity levels

		N	X	SD	F	P	Differences
Facilities, shops in neighborhood environment	Low PA	41	3.7085	.87048	1.616	.205	-
	Moderate intensity PA	37	3.4516	.87976			
	High intensity PA	10	3.1820	1.23660			
Access to facilities	Low PA	41	3.0893	.90716	.081	.922	-
	Moderate intensity PA	37	3.0181	.77848			
	High intensity PA	10	3.0000	1.10039			
Streets in neighborhood environment	Low PA	41	3.2439	.90223	.397	.673	-
	Moderate intensity PA	37	3.0541	.95586			
	High intensity PA	10	3.1500	1.02875			
Walking and cycle routes	Low PA	41	2.8902	.75059	.007	.993	-
	Moderate intensity PA	37	2.9103	.65786			
	High intensity PA	10	2.8980	.90734			
Esthetics of neighborhood environment	Low PA	41	2.3110	.91135	5.525	**.006***	a<c
	Moderate intensity PA	37	2.5203	.82575			
	High intensity PA	10	3.3000	.55025			
Traffic danger	Low PA	41	2.4134	.68215	.290	.749	-
	Moderate intensity PA	37	2.3059	.68703			
	High intensity PA	10	2.4680	1.14810			
Crime	Low PA	41	1.7315	.89522	1.793	.173	-
	Moderate intensity PA	37	1.5489	.69461			
	High intensity PA	10	1.2330	.41713			
BMI	Low PA	41	25.0029	4.08955	.199	.820	-
	Moderate intensity PA	37	25.5243	3.11580			
	High intensity PA	10	25.4670	4.67970			

SD: Std. Deviation

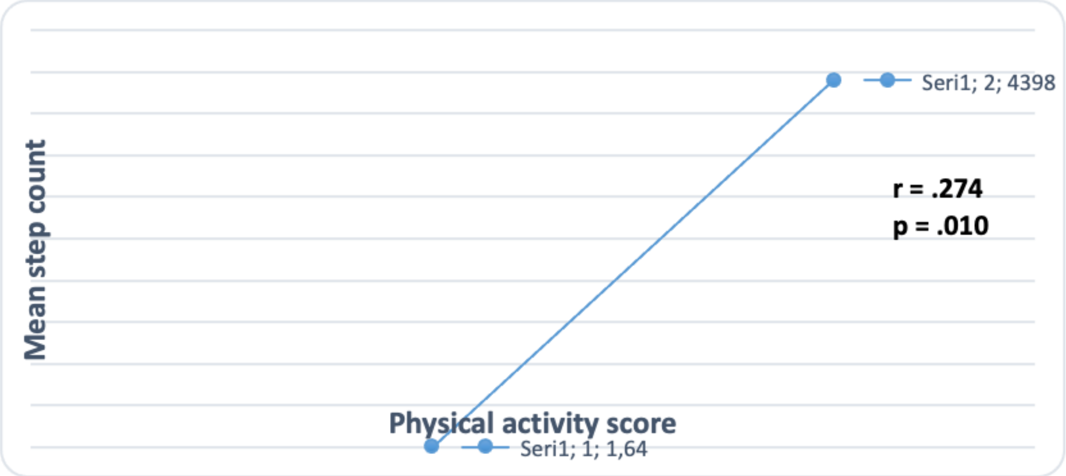

Figure 2: Correlation between step count and physical activity score

The correlation between mean step count and IPAQ scores of participants is presented in Figure 2. According to the analysis results, mean step count and mean IPAQ scores were identified to have positive moderate level of correlation (r = 0.27, p = 0.01).

Table 3: Correlation between NEWS sub-domain scores, PA scores, step count and BMI

Correlations				
		NEWS Score	3-day step count mean	BMI
Facilities, shops in neighborhood environment	r	-.191	**-.223***	**.308**
	p	.074	**.037**	**.003**
Access to facilities	r	-.042	**-.215**	-.205
	p	.700	**.044**	.056
Streets in neighborhood environment	r	-.068	-.129	.022
	p	.529	.231	.842
Walking and cycle routes	r	.009	-.126	.002
	p	.937	.243	.988
Esthetics of neighborhood environment	r	**.308**	.124	.062
	p	**.004**	.251	.564
Traffic danger	r	-.015	-.164	.030
	p	.889	.128	.780
Crime	r	-.198	-.046	.030
	p	.065	.669	.781

When the correlations between NEWS subscales with 3-day step count, physical activity scores and BMI are investigated, there was a significant, weak and negative correlation between access to facilities and 3-day step count (r = - .215 p = 0.044). Individuals with high access to facilities points were observed to have lower mean step counts. There was a significant correlation between the shops and facilities in the neighborhood environment subscale with step counts (r = -.223 , p = 0.037). There was a significant positive correlation between esthetics of the neighborhood environment with physical activity (r = .308, p = 0. 004). This means individuals living in esthetically organized environments were more physically active. There was a significant correlation between the survey subscale of shops and facilities in neighborhood environment with BMI (r = .308, p = 0. 003).

When the mean step count values in Table 4 are assessed according to body composition groups based on BMI of participants, those with normal body composition were found to have significantly different mean step counts compared to individuals in the overweight and obese groups (f (3,84) = 4.49, p = 0.006). The results of the analysis with the aim of determining the difference between the groups found that those with normal body composition had significantly lower mean step counts compared to individuals in the overweight and obese groups (p<0.05). There were no statistically significant differences between the mean walkability perception of the neighborhood environment subscale scores according to body composition (p>0.05).

Table 4: Difference in BMI classification and NEWS Scores

		N	x̄	Std.	F	P	Differences
Facilities, shops in neighborhood environment	Underweight	4	3.70	.742	2.053	.113	-
	Normal	40	3.72	.666			
	Overweight	36	3.46	1.115			
	Obese	8	2.88	1.000			
Access to facilities	Underweight	4	3.16	.576	2.362	.077	-
	Normal	40	3.30	.743			
	Overweight	36	2.82	.981			
	Obese	8	2.75	.792			
Streets in neighborhood environment	Underweight	4	2.87	.250	.869	.460	-
	Normal	40	3.26	.839			
	Overweight	36	3.00	1.108			
	Obese	8	3.43	.623			
Walking and cycle routes	Underweight	4	2.54	.342	1.031	.383	-
	Normal	40	3.02	.749			
	Overweight	36	2.78	.752			
	Obese	8	2.95	.518			
Esthetics of neighborhood environment	Underweight	4	2.25	.735	.659	.579	-
	Normal	40	2.41	.963			
	Overweight	36	2.66	.801			
	Obese	8	2.40	.963			
Traffic danger	Underweight	4	2.33	.980	.249	.862	-
	Normal	40	2.43	.771			
	Overweight	36	2.29	.729			
	Obese	8	2.45	.616			
Crime	Underweight	4	1.91	1.132	.680	.566	-
	Normal	40	1.58	.819			
	Overweight	36	1.51	.705			
	Obese	8	1.87	.794			
Mean step count	Underweight	4	2602.5	2181.929	4.490	**.006***	b<c,d
	Normal	40	3033.28	2995.067			
	Overweight	36	5488.22	4145.807			
	Obese	8	7222.75	5908.058			

*: p< 0.05, BMI classification based on World Health Organization reference values (WHO, 2000)

DISCUSSION

In recent years, the obesity pandemic has caused serious increases in morbidity and mortality in both developed and developing countries. With the increase in obesity prevalence, there has been an increase in the frequency of diseases linked to obesity (Kalan and Yeşil, 2010). The priority practices in the struggle against obesity are calorie control of nutrition and regular physical activity. In line with this, national and international health institutions have completed studies with the aim of creating awareness about physical activity to prevent obesity in society (WHO, 2021). In our study, during the COVID-19 pandemic, it was revealed that highest step counts were in the obese group, followed by the overweight group. The higher step counts for the obese and overweight groups are thought to be due to obese and overweight individuals being in the risk group due to chronic disease during COVID-19. The probability of greater effect from the coronavirus may have increased health anxiety among these individuals and as a result they achieved higher step counts compared to underweight and normal weight individuals. During the pandemic, no significant differentiation was identified between the perceptions of neighborhood environment in terms of body composition ($p>0.05$, Table 4). As mentioned previously, it is thought that sudden precautions because of the pandemic affecting the world in general and society being unprepared for this pandemic may have impacted this situation.

When the correlations between the NEWS subscales and physical activity are investigated, there were low and moderate significant correlations between built environment factors and physical activity. Similarly, Ewing and Cervero (2010) reported that street density and distance to close shops and services were strongly associated with walking for access. Yang et al. (2019) did not find consistent evidence about a correlation between any built environment feature with higher bicycle use for entertainment purposes; however, they found an association with the usability of cycle paths. The results obtained by McGrath et al. (2015) in studies researching the correlation between built environment and physical activity among young people found that the correlations between built environment features designed to encourage walking or playing and physical activity changed according to age. Three studies focusing on correlations between the built environment and physical activity of elderly adults (Barnett et al., 2017; Cerin et al., 2017; Van Cauwenberg et al., 2018) found significant positive correlations between total walking and walkability, availability of shops and services in the neighborhood and access to public transport in the neighborhood. Finally, access to facilities had a significant positive correlation with total physical activity; however, it was not associated with walking (Barnett et al., 2017; Cerin et al., 2017; Van Cauwenberg et al., 2018).

Restrictions to social life during the COVID-19 pandemic are known to cause a fall in the physical activity levels of individuals. Scientific data supporting this view are presented in the literature. Restrictions implemented in spring 2020 were reported to significantly reduce the physical activity levels of people in England (Strain et al., 2022). Instantaneous data obtained from FitBit users showed lower daily step counts in countries implementing stay-at-home rules (FitBit, 2020). Considering all of these, the results of our study did not find a statistically significant correlation between perceptions of walkability of the neighborhood environment with physical activity because of restrictions and increased time spent at home. This situation is thought to be a result of the pandemic precautions and the fall in general physical activity levels. The different health concerns of people may have suppressed walkability perceptions about the neighborhood environment.

Opportunities to participate in physical environment are related to the physical environment. The availability and accessibility of PA facilities and programs are associated with people's exercise behavior (Mullineaux et al., 2001). The easiest way for individuals to be physically active is to walk. The results of our study confirm this. There was a positive significant correlation between the step counts of physically active individuals. Individuals who walked had increased physical activity points (Figure 2). A study by Ewald et al. (2010) found a correlation between physical activity with step counts. A way to ensure that walking becomes regular is to include this activity in daily life. There is a need for built environment features to sustain this process in a healthy and continuous way.

The COVID-19 pandemic emphasized the importance of regular physical activity for health and fitness one more time. People focused more on their homes and close environment and searched for different solutions to remain active in these spaces. Walkability perceptions of the close environment, natural areas and social support have important roles to protect human health, to reduce stress and to improve general welfare. In this period, it is important during urban planning and policy-making to encourage walkable neighborhoods, to increase access to green spaces and to provide opportunities for people to be able to do physical activity close to their homes. In this process, great responsibilities fall to local administrations. It is necessary to improve situations like walking and cycle paths, street connections, access to facilities, esthetics of the environment, and to reduce traffic danger and crime safety in the environment. According to the results of our study, the most important reasons for the lack of expected effect of the built environment features on physical activity and walking during the COVID-19 pandemic appear to be the precautions taken by country administrations and situations like the threat and uncertainty induced by the pandemic.

Conflict of interest

There is no personal or financial conflict of interest within the scope of the study.

Ethics Committee

The study was approved by the Scientific Research Ethics Committee of Çanakkale Onsekiz Mart University with the decision of 04/01/2021 and number 01/03

Author Contributions

Planned by the author: Study Design, Data Collection, Statistical Analysis, Data Interpretation, Manuscript Preparation, Literature Search. Author have read and agreed to the published version of the manuscript.

REFERENCES

Anokye, N. K., Trueman, P., Green, C., Pavey, T. G., Taylor, R. S. (2012). Physical activity and health related quality of life. *BMC public health*, 12(1), 1-8.

Barnett, D. W., Barnett, A., Nathan, A., Van Cauwenberg, J., Cerin, E. (2017). Built environmental correlates of older adults' total physical activity and walking: a systematic review and meta-analysis. *International journal of behavioral nutrition and physical activity*, 14(1), 1-24.

Brown, J. L., MacDonald, R., Mitchell, R. (2015). Are people who participate in cultural activities more satisfied with life? *Social Indicators Research*, 122, 135-146.

Byambasuren, O., Stehlik, P., Clark, J., Alcorn, K., Glasziou, P. (2023). Effect of covid-19 vaccination on long covid: systematic review. *BMJ medicine*, 2(1).

Cavill, N., Kahlmeier, S., Racioppi, F. (2006). Physical activity and health in Europe: evidence for action. *World Health Organization.*

Cerin, E., Nathan, A., Van Cauwenberg, J., Barnett, D. W., Barnett, A. (2017). The neighbourhood physical environment and active travel in older adults: a systematic review and meta-analysis. *International journal of behavioral nutrition and physical activity*, 14(1), 1-23.

Cerin, E., Saelens, B. E., Sallis, J. F., Frank, L. D. (2006). Neighborhood Environment Walkability Scale: validity and development of a short form. *Medicine and science in sports and exercise*, 38(9), 1682.

Cervero, R., Duncan, M. (2003). Walking, bicycling, and urban landscapes: evidence from the San Francisco Bay Area. *American journal of public health*, 93(9), 1478-1483.

Civil, T., Özen, G., & Demirbilek, H., (2021). Intensive Physical Exercise And Ketosis In Type 1 Diabetes: Literature Review On A Case After Covid-19 Quarantine. *International journal of life science and pharma researc*h, 14(49), 276-280.

Craig, C. L., Marshall, A. L., Sjöström, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E., ... Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. *Medicine & science in sports & exercise*, 35(8), 1381-1395.

Dolan, P., Kavetsos, G., Vlaev, I. (2014). The happiness workout. *Social indicators research*, 119, 1363-1377.

Demirci, N., Demirci, P. T., Bjelica, B., & Güven, E. (2022). Investigation of Attitudes Towards Exercise Behavior Changes of Adults Registered with Fitness and Activity Centers under the COVID-19 Lockdown.

JUMORA: Jurnal Moderasi Olahraga, 2(2), 101114.https://doi.org/10.53863/morv2i2.430

Ewald, B., McEvoy, M., Attia, J. (2010). Pedometer counts superior to physical activity scale for identifying health markers in older adults. *British Journal of Sports Medicine*, 44(10), 756-761.

Ewing, R., Cervero, R. (2010). Travel and the built environment: A meta-analysis. Journal of the *American planning association*, 76(3), 265-294.

Ferreira, I., Van Der Horst, K., Wendel-Vos, W., Kremers, S., Van Lenthe, F. J., Brug, J. (2007). Environmental correlates of physical activity in youth–a review and update. *Obesity reviews*, 8(2), 129-154.

Fitbit., 2020 The Impact of Coronavirus on Global Activity [Internet] [cited 2021 Apr 28].. Available from: https://blog.fitbit.com/covid-19-global-activity/

Garg, S., Kim, L., Whitaker, M., O'Halloran, A., Cummings, C., Holstein, R., ... Fry, A. (2020). Hospitalization rates and characteristics of patients hospitalized with laboratory-confirmed coronavirus disease 2019—COVID-NET, 14 States, March 1–30, 2020. *Morbidity and mortality weekly report*, 69(15), 458.

Ho, K. Y., Li, W. H., Lam, K. W. K., Wei, X., Chiu, S. Y., Chan, C. F. G., Chung, O. K. J. (2019). Relationships among fatigue, physical activity, depressive symptoms, and quality of life in Chinese children and adolescents surviving cancer. *European Journal of Oncology Nursing*, 38, 21-27.

Kalan, I., Yeşil, Y. (2010). Chronic diseases associated with obesity. *Diabetes and obesity*, *78*.

Klang, E., Kassim, G., Soffer, S., Freeman, R., Levin, M. A., Reich, D. L. (2020). Morbid obesity as an independent risk factor for COVID-19 mortality in hospitalized patients younger than 50. *Obesity*. https://doi.org/10.1002/oby.22913

Kohut, M. L., Sim, Y. J., Yu, S., Yoon, K. J., Loiacono, C. M. (2009). Chronic exercise reduces illness severity, decreases viral load, and results in greater anti-inflammatory effects than acute exercise during influenza infection. *The Journal of infectious diseases*, *200*(9), 1434-1442.

Krzepota, J., Sadowska, D., Biernat, E. (2018). Relationships between physical activity and quality of life in pregnant women in the second and third trimester. *International journal of environmental research and public health*, 15(12), 2745.

Leslie, E., Coffee, N., Frank, L., Owen, N., Bauman, A., Hugo, G. (2007). Walkability of local communities: using geographic information systems to objectively assess relevant environmental attributes. *Health & place*, 13(1), 111-122.

Lowder, T., Padgett, D. A., Woods, J. A. (2005). Moderate exercise protects mice from death due to influenza virus. *Brain, behavior, and immunity*, 19(5), 377-380.

McGrath, L. J., Hopkins, W. G., Hinckson, E. A. (2015). Associations of objectively measured built-environment attributes with youth moderate–vigorous physical activity: a systematic review and meta-analysis. *Sports medicine*, 45, 841-865.

Motl, R. W., Dishman, R. K., Saunders, R. P., Dowda, M., Pate, R. R. (2007). Perceptions of physical and social environment variables and self-efficacy as correlates of self-reported physical activity among adolescent girls. *Journal of pediatric psychology*, 32(1), 6-12.

Mullineaux, D. R., Barnes, C. A., Barnes, E. F. (2001). Factors affecting the likelihood to engage in adequate physical activity to promote health. *Journal of sports sciences*, 19(4), 279

Mutz, M., Reimers, A. K., Demetriou, Y. (2021). Leisure time sports activities and life satisfaction: deeper insights based on a representative survey from Germany. *Applied Research in Quality of Life*, 16, 2155-2171.

Ozen, G., Koc, H., Aksoy, C. (2020). Health anxiety status of elite athletes in COVID-19 social isolation period. *Bratislavske lekarske listy*, 121(12), 888-893. DOI: 10.4149/bll_2020_146. PMID: 33300359.

Pietrobelli, A., Pecoraro, L., Ferruzzi, A., Heo, M., Faith, M., Zoller, T., Heymsfield, S. B. (2020). Effects of COVID-19 lockdown on lifestyle behaviors in children with obesity living in Verona, Italy: a longitudinal study. *Obesity*, 28(8), 1382-1385.

Robinson, E., Gillespie, S., Jones, A. (2020). Weight-related lifestyle behaviours and the COVID-19 crisis: An online survey study of UK adults during social lockdown. *Obesity science & practice*, 6(6), 735-740.

Saelens, B. E., Sallis, J. F., Black, J. B., Chen, D. (2003). Neighborhood-based differences in physical activity: an environment scale evaluation. *American journal of public health*, 93(9), 1552-1558.

Scavone, C., Brusco, S., Bertini, M., Sportiello, L., Rafaniello, C., Zoccoli, A., ... Capuano, A. (2020). Current pharmacological treatments for COVID-19: What's next?. *British journal of pharmacology*, 177(21), 4813-4824.

Schuch, F. B., Vancampfort, D., Firth, J., Rosenbaum, S., Ward, P. B., Silva, E. S., ... Stubbs, B. (2018). Physical activity and incident depression: a meta-analysis of prospective cohort studies. *American Journal of Psychiatry*, 175(7), 631-648.

Siordia Jr, J. A. (2020). Epidemiology and clinical features of COVID-19: A review of current literature. *Journal of Clinical Virology*, 127, 104357.

Strain, T., Sharp, S. J., Spiers, A., Price, H., Williams, C., Fraser, C., ... Kelly, P. (2022). Population level physical activity before and during the first national COVID-19 lockdown: A nationally representative repeat cross-sectional study of 5 years of Active Lives data in England. *The Lancet Regional Health-Europe*, 12, 100265.

Tremblay, M. S., Shephard, R. J., McKenzie, T. L., Gledhill, N. (2001). Physical activity assessment options within the context of the Canadian Physical Activity, Fitness, and Lifestyle Appraisal. *Canadian journal of applied physiology*, 26(4), 388-407.

U.S. Department of Health and Human Services. (2000). *Healthy people 2010*. Washington, DC: Author.

Unuvar, N., Mollahaliloğlu, S., Yardım, N., (2004). *Türkiye disease burden study.* Ministry of Health Publishing House

Vagetti, G. C., Barbosa Filho, V. C., Moreira, N. B., Oliveira, V. D., Mazzardo, O., Campos, W. D. (2014). Association between physical activity and quality of life in the elderly: a systematic review, 2000-2012. *Brazilian Journal of Psychiatry*, 36, 76-88.

Van Cauwenberg, J., Nathan, A., Barnett, A., Barnett, D. W., Cerin, E. (2018). Council on Environment and Physical Activity (CEPA)-Older Adults Working Group. Relationships between neighbourhood physical environmental attributes and older adults' leisure-time physical activity: a systematic review and meta-analysis. *Sports Med*, *48*(7), 1635-60.

Warren, K. J., Olson, M. M., Thompson, N. J., Cahill, M. L., Wyatt, T. A., Yoon, K. J., ... Kohut, M. L. (2015). Exercise improves host response to influenza viral infection in obese and non-obese mice through different mechanisms. *PloS one*, *10*(6), e0129713.

Whitelaw, S., Teuton, J., Swift, J., Scobie, G. (2010). The physical activity–mental wellbeing association in young people: a case study in dealing with a complex public health topic using a 'realistic evaluation'framework. *Mental health and physical activity*, 3(2), 61-66.

WHO. (2000). World Health Organizaion. *Obesity: Preventing and Managing the Gobal Epidemic*, Genova, Switzerland

World Health Organization. (2010). World health statistics 2010. World Health Organization.

World Health Organization. (2021). Obesity and Overwight.https://www.who.int/news-room /fact-sheets/detail/obesity-and-overweight

Yang, Y., Wu, X., Zhou, P., Gou, Z., Lu, Y. (2019). Towards a cycling-friendly city: An updated review of the associations between built environment and cycling behaviors (2007–2017). Journal of Transport & Health, 14, 100613.

Yin, L. (2013). Assessing walkability in the city of Buffalo: Application of agent-based simulation. Journal of urban Planning and Development, 139(3), 166-175.

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