

## The structural model for physical activity in urban neighborhoods

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### ABSTRACT

*Physical activities improve public health by bringing people out of their houses and encourage them to communicate and exercise with their neighbors. Previous studies showed that no model has ever considered all factors and their effects concurrently on physical activities of a neighborhood. This research aimed to identify and prioritize the effective factors on physical activity in Tehran urban neighborhoods. Primary data were collected using survey questionnaires administered to 380 respondents in three neighborhoods of Tehran Metropolis and analyzed using Structural Equation Modeling (SEM) by Smart Partial Least Squares (PLS) software. This research had established the path coefficient of research constructs to predict the significant factors affecting people's involvement in physical activity. The findings showed that safety, aesthetical aspects, existence; accessibility; and opportunities of physical facilities, physical environmental characteristics, social; cultural and psychological attributes, demographic variables of residents, and weather have a significant impact on physical activity in Tehran urban neighborhoods with coefficients of influence of 0.262, 0.204, 0.179, 0.168, 0.103, 0.091 and 0.048, respectively. The output of this study can be used as a decision support tool for urban planners and urban designers to improve physical activity in the urban neighborhoods of Tehran Metropolis.*

## **1. INTRODUCTION**

Physical inactivity is recognized as a causal factor to the current widespread obesity epidemic (Friedenreich et al., 2021). Nevertheless, public health can be improved if people are encouraged to go out of their houses to exercise. A neighborhood should therefore be equipped with facilities that allow the residents to walk, jog, run, and cycle. These physical activities help to prevent diseases and associated increase in healthcare expenditures (Wang and Wu, 2020). Its other physiological and psychological health benefits include reduced risk of cardiovascular diseases, hypertension, cancers, osteoporosis, diabetes, mental illnesses, and most importantly, better weight control (Mitchell et al., 2018; Carron et al., 2003).

Studies has shown a wide range of factors that influence physical activities including aesthetical aspects, social; cultural and psychological attributes, demographic variables of residents, existence; accessibility and opportunities of physical facilities, physical environmental characteristics, weather and safety (Fiscella et al., 2021; Herbolsheimer et al., 2021; Zheng et al., 2021; Bonaccorsi et al., 2020; Aliyas, 2020; Orstad et al., 2017; Macniven et al., 2016; Timperio et al., 2014; Rad et al., 2012). However, a detailed study on the factors that influence physical activities particularly in developing countries was not considered adequately. Thus, this study aimed on exploring the factors affecting physical activity among residents of Tehran urban neighborhoods.

## **2. LITERATURE REVIEW**

### *2.1. Neighborhood's Physical Activity*

According to Caspersen et al. (1985), the meaning of physical activity is whichever movement exerted by the skeletal muscles which needed the use of energy. Physical activities include any activity that involves the bodily movement, whether during leisure, getting from one place to another or recreation. Exercise, on the other hand, falls under the subset of physical activity. It is a set of designed movements done on a regular basis with a purpose of achieving a better physical state of the body. A collective perspective of the society, not individual, should be considered on the problem of the lack of physical activity. Hence, an approach which is relevant to the population, multi-sectors, a variety of disciplines and culture is needed (Herbolsheimer et al., 2021; Garriguet et al., 2011).

To date, the studies that have concentrated on different kinds of physical activities within a neighborhood can be generally classified into: (1) Walking for leisure, jogging and running; (2) Walking for exercise and cycling; and (3) Window Shopping (Cairney et al., 2018; Thivel et al., 2018; Daskalopoulou et al., 2017; Diaz and Shimbo, 2013). Other than the apparent health benefits, involvement in physical

activities encourages social interactions among the participants. When the residents interact with each other, it creates a stronger bonding and sense of belonging with the society. These collectively create a more vibrant and lively community. Therefore, it becomes clear that investigating the factors affecting physical activity in a neighborhood is crucial. However, a detailed study on the factors that influence physical activities particularly in developing countries was not considered adequately. Thus, this study aimed on exploring the factors affecting physical activity among residents of Tehran urban neighborhoods.

## *2.2. Factors Affecting Physical Activity*

In the review by the Task Force on Community Preventive Service reported in Kahn et al. (2002), an improvement was reported in the levels of physical activities that include buddy systems, exercise contracts with another person and walking groups, frequency of exercise, and time spent in physical activity due to social supports. In addition to that, there are also studies that highlighted a positive association of having supportive friends and families with physical activity (Orstad et al., 2017; Sallis et al., 2008). Generally, Macniven et al. (2013); Trapp et al. (2012) have both showed that the social and cultural aspects, the demographic characteristics, the behavioral attributes and skills, the physical environment, the safety and psychological factors are the most significant factors affecting people's involvement in physical activities. To affirm this, this study has reviewed considerable review papers, research articles, and scholar works. The major difference here is that this research intended to provide a holistic approach in conducting the different views reported by former researchers, and the outcome is as presented in the following sections and Table 1 in terms of the factors affecting physical activity and their relative references.

### *2.2.1. Aesthetical Aspects*

The strong relationship between aesthetic attributes and physical activity has been confirmed by Bonaccorsi et al. (2020); Orstad et al. (2017); Frumkin et al. (2014). The study of Sallis et al. (2008) has touched on aesthetics of neighborhoods, and these have been extended further by Spence and Lee. (2003) to include the influence of aesthetic attributes and accessibility of physical facilities on physical activity. It is also worth noting that, in the study of Clifton et al. (2001), the authors have discovered that enjoyable scenery or aesthetically pleasing neighborhood is closely related to increased level of physical activity among adults and rural women.

### *2.2.2. Demographic Variables*

Herbolsheimer et al. (2021); An et al. (2020) reported that active involvement in physical activity between demographic variables is more prominent among respondents who are young, male, more educated, healthier, and have leaner bodies. Moreover, researchers like Garrett et al. (2020); Huang et al. (2020) have also highlighted the association between family income, and participation in leisure activities as well as Van Naarden et al. (2006) agreed that people with economic disadvantages participate less in leisure activities. In addition, Bauman et al. (2012) argued that income status is more significantly related to greater participation in leisure and physical activities.

### *2.2.3. Existence, Accessibility, and Opportunities of Physical Facilities*

In terms of the relationship between existences, characteristics, and accessibility of physical facilities and participation in physical activities, Balogun (2021); Orstad et al. (2017); Verschuren et al. (2012); Humpel et al. (2002) confirmed a strong positive relationship. More specifically, Salliis et al. (2008); Gebel et al. (2007) have highlighted the importance of footpaths, swimming pools, and cycling paths while Mowen et al. (2007) have particularly mentioned the availability of a park within vicinity as being closely related to visiting frequencies among men and women in the United States.

### *2.2.4. Physical Environmental Characteristics*

Based on Wang and Wu (2020), Pont et al. (2009), Saelens and Handy (2008), and Wendel-Vos et al.'s (2007) researches, the consistent association between characteristics of physical environment and physical activity is obvious. Additionally, Duncan et al. (2002) highlighted the positive association between physical activity and sidewalks, presence of physical activity, shops, and services. Instead of a solid positive relationship, Bonaccorsi et al. (2020) discovered a partially confirmed positive association between the connectivity of the streets and physical activity. Chad et al. (2005) highlighted that Canadian urban female and male living in residential neighborhoods are physically more active in comparison to those who live in mixed or commercial neighborhoods. In his research on 56 neighborhoods of Portland (US), Li et al. (2005) highlighted a positive association between physical activity and density of employment's places, residential density, and total neighborhood's open and green spaces.

#### *2.2.5. Safety*

The relationship between safety and physical activity as reported by the Centers for Disease Control and Prevention (1999) in the United States found that people who perceived their neighborhood to be unsafe were more likely to be physically inactive. Moreover, with street lighting, lack of safe places for exercise, problem with unattended dogs, and victimization experience, being involved in physical activities is especially dangerous for rural women than urban women, as reported by the authors. In addition, Park. (2020) found that high speed traffic are negatively and low speed traffic are inversely associated with walking, while streets with medium speed traffic were not related to walking. In other researches, Fiscella et al. (2021); Marquet et al. (2020); Lee et al. (2012) highlighted that residents who feel safe in their neighborhoods are more interested to be physically active.

#### *2.2.6. Social; Cultural and Psychological Attributes*

The some sub-factors in this category include social capital, social support from family, neighbor and friend, social cohesion, self-efficacy and seeing others active. As discussed by Bian (2020); Edwardson et al. (2013), societies with abundant social capital are possibly better in reinforcing positive social norms for healthy behaviors such as involving physical activity. Considering both environmental and social influences, Aliyas (2020); Trapp et al. (2012) highlighted increased physical activity due to increased social support from healthcare providers, friends, and families. Moreover, psychosocial factors, like self-efficacy and social support, have also been consistently related to physical activity (Orstad et al., 2017). Yancey et al. (2004) have also stated positive association between social support and higher rate of participation in leisure activities.

#### *2.2.7. Weather*

The relationship between weather and physical activity is clear in Blanchette et al. (2021). Aspvik et al. (2018) found that physical activity differs by seasonality and they identified that extreme or poor weather is its barrier in most cases. Witham et al. (2014) reported the association among physical activity, climate and enjoyable scenery. In addition, Zheng et al. (2021) undertook techniques that measure objective environmental factors and Feinglass et al. (2011) evaluated the effects of weather on physical activity.

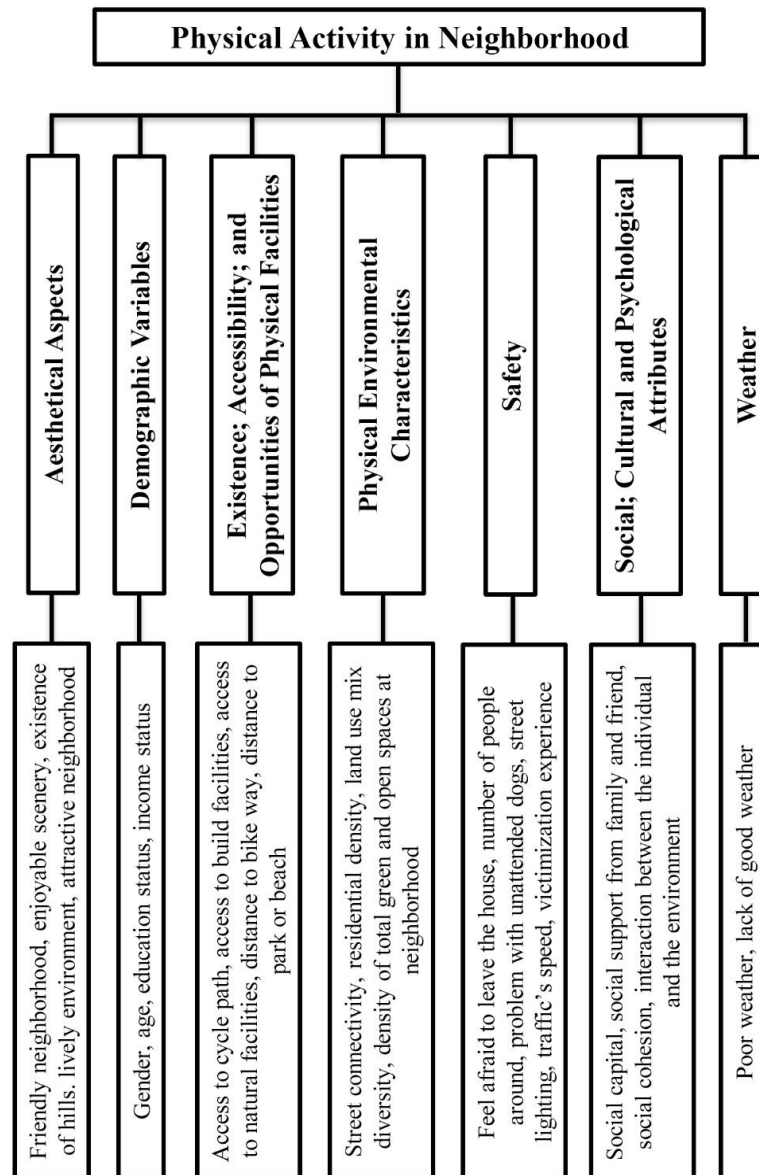
**Table 1-Factors Affecting Physical Activity**

No	Physical Activity Factors	Sub-Factors	References
1	Aesthetical Aspects	Friendly neighborhood, enjoyable scenery, existence of hills, lively environment, attractive neighborhood	Bonaccorsi et al. (2020), Orstad et al. (2017), Frumkin et al. (2014), Lee et al. (2012), Rad et al. (2012), Sallis et al. (2008), Vernez Moudon et al. (2007), Clifton et al. (2007), Spence and Lee. (2003), and Humpel et al. (2002).
2	Demographic Variables	Gender, age, education status, income status	Herbolsheimer et al. (2021), An et al. (2020), Huang et al. (2020), Garrett et al. (2020), Bauman et al. (2012), Rad et al. (2012), Garriguet et al. (2011), Tremblay et al. (2011), Van Naarden et al. (2006), Ahmed et al. (2005), and Cordes and Howard. (2005).
3	Existence; Accessibility; and Opportunities of Physical Facilities	Access to cycle path, access to build facilities, access to natural facilities, distance to bike way, distance to park or beach	Balogun (2021), Orstad et al. (2017), Verschuren et al. (2012), Rad et al. (2012), Sugiyama et al. (2009), Nagel et al. (2008), Sallis et al. (2008), Gebel et al. (2007), Mowen et al. (2007), Berke et al. (2006), Chad et al. (2005), Humpel et al. (2002), and Booth et al. (2000).
4	Physical Environmental Characteristics	Street connectivity, residential density, land use mix diversity, density of total green and open spaces at neighborhood	Wang and Wu (2020), Bonaccorsi et al. (2020), Orstad et al. (2017), Macniven et al. (2016), Lorenz et al. (2014), Rad et al. (2012), Van Cauwenberg et al. (2011), Pont et al. (2009), Saelens and Handy. (2008), Wendel-Vos et al. (2007), Li et al. (2005), and Duncan et al. (2002).
5	Safety	Feel afraid to leave the house, number of people around, problem with unattended dogs, street lighting, traffic's speed, victimization experience	Fiscella et al. (2021), Marquet et al. (2020), Park. (2020), Cheval et al. (2019), Timperio et al. (2014), Carlson et al. (2012), Rad et al. (2012), Lee et al. (2012), Oh et al. (2010), Piro et al. (2006), Foster et al. (2004), Spence and Lee. (2003), Berrigan et al. (2002), and Troped et al. (2001).
6	Social; Cultural and Psychological Attributes	Social capital, social support from family and friend, social cohesion, interaction between the individual and the environment	Aliyas (2020), Bian (2020), Orstad et al. (2017), Macniven et al. (2016), Edwardson et al. (2013), Trapp et al. (2012), Rad et al. (2012), Sallis et al. (2008), Buttimer and Tierney. (2005), Titze et al. (2005), Yancey et al. (2004), Brennan et al. (2003), King et al. (2000), and Wilcox et al. (2000).
7	Weather	Poor weather, lack of good weather	Blanchette et al. (2021), Zheng et al. (2021), Lanza et al. (2020), Aspvik et al. (2018), Wu et al. (2017), Lewis et al. (2016), Witham et al. (2014), Wolff et al. (2012), and Feinglass et al. (2011).

Source: Author

Identification of factors Influencing physical activity historically discussed based on the thoughts and researches from several scholars. In order to achieve this objective, the theoretical and empirical studies related to physical activity in neighborhood that was reviewed from many sources in the section 2.3. As result, the theoretical framework of the factors influencing on neighborhood's physical activity is illustrated in Fig.1.

**Figure 1-Theoretical Framework of the Factors and Sub-Factors Influencing on Neighborhood’s Physical Activity**



Source: Author

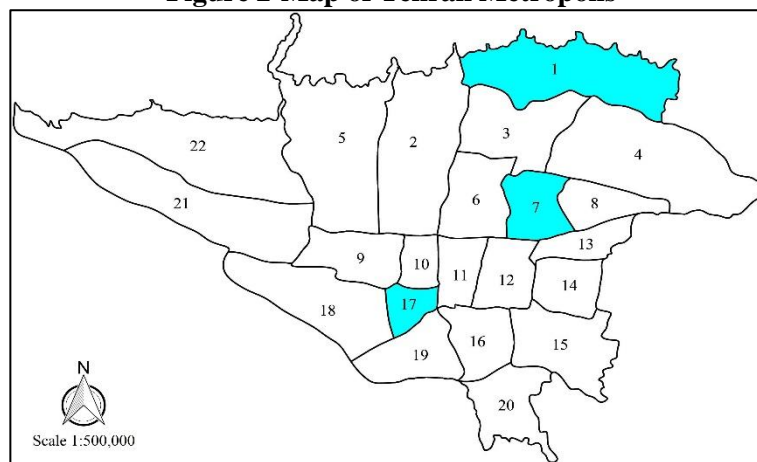
### 3. STUDY AREA

Nowadays, Tehran’s residents have been more accustomed to gadgets of high technology. Many people have spent their time sitting behind computers rather than engaging in physical activities. In addition, many citizens spend their free time on hobbies with minimum physical activities like watching movies, surfing internet, and playing computer game. This leads to inactivity within the society (Kushkestani et al., 2020; Rahnamaei and Hosseyni, 2006). Therefore, it is imperative to have a

comprehensive plan that addresses the issue of residents' inactivity and encourages them to have more physical activities throughout a week (Ahmadipour et al., 2021; Hassanzadeh et al., 2012). Thus, this study aimed on exploring the factors affecting physical activity among residents of Tehran urban neighborhoods.

Tehran is the center of the Tehran province, the capital of Iran. This study covered the Tajrish, Abbas Abad, and Abouzar Gharbi neighborhoods located at the north, center, and south parts of Tehran respectively. These neighborhoods were chosen to allow a comprehensive analysis to be conducted on different sides of Tehran with respect to the historical, social, economic and geographical aspects of Tehran urban neighborhoods. The city of Tehran is divided into three separated regions (North, Center and South). Tajrish is located at the uptown area and is a more expensive part of a city, an affluent area with high quality living standards. Abbas Abad is located at the city center, a mid-quality urban area of moderate standards of living. Finally yet importantly, Abouzar Gharbi, located at the downtown area, is a low-quality urban area that has a lower standard of living. Fig.2 illustrates the Tajrish, Abbas Abad, and Abouzar Gharbi neighborhoods; these areas are located within districts 1, 7, and 17 of Tehran Metropolis respectively.

**Figure 2-Map of Tehran Metropolis**



Source: Author

#### **4. MATERIAL AND METHODS OF RESEARCH**

The comprehensive analysis among extracted factors affecting physical activity in Tehran urban neighborhoods using Structural Equation Modeling (SEM) approach is the nature of analysis section of this research. For this purpose, essential data were gathered from Tehran residents. The specific relationships between variables were tested through examining and fitting the model by the application of the structural equation modeling (SEM) with partial least squares (PLS). Data analysis was done at a confidence level of 95% in two phases for verifying their reliability and validity.



First, the reliability of the reflective measurement model was assessed by applying the three indicators including factor loading test (reliability of observed variables), composite reliability, and Cronbach's alpha. The convergent and discriminant validity methods were applied for the assessment of the model validity.

#### *4.1. PLS Software*

Various statistical software programs have been introduced to analyze research data such as the SPSS, Systat, Minitab, BMDP and Statistical Analysis System (SAS); however, the aforementioned programs are not in line with the objectives of this research. Furthermore, some of them deal with the problems better compared to others. Given the objectives and principles of this research, the Smart PLS software was selected.

The Partial Least Squares (PLS) applies a principal-component-based estimation approach technique for this research (Cheah., et al. 2020). Hair et al. (2021); Ringle et al. (2015); Petter et al. (2007); Hulland (1999) considering the importance of internal consistency for reflective constructs, highlighted that other values should move to the same direction if one measure's value out of all the items measuring the same factor changes. Thus, undertaking the composite reliability and other reliability measurement tests such as Cronbach's alpha coefficient or internal consistency is needed for this research. So, the first step of the reflective constructs analysis is conducting the factor loading, composite reliability, Cronbach's Alpha, Average Variance Extracted (AVE), convergent validity, discriminant validity assisted this research to examine the reliability and validity of research model by undertaking the constructs' loadings.

#### *4.2. Selecting the statistical population to respond questions*

Assessing the minimum sample size is among the most significant issues in SEM. The sample size influences most of the indices. Factors applied for determining the sample size are the significance level, statistical power, minimum coefficient of determination, and the maximum number of arrows pointing out a latent variable (Hair et al., 2021). It is possible to apply these parameters to calculate the minimum sample size procedures given in the literature. The SEM literature suggested a minimum sample size of 150 (Bentler and Chou, 1987). Nevertheless, some studies have envisioned a minimum sample size of 200 and a sample size of 200 to 500 (Civelek, 2018). It is generally agreed that the minimum sample size used in SEM ought to be 10 times of those parameters estimated by the model. Obviously, a minimum sample size of 10 times of parameters has also been suggested for more accurate results (Hair et al., 2021; Civelek, 2018; Barclay et al., 1995; Marcoulides and Saunders, 2006; Wong, 2016). According to the number of variables, a sample

size of 380 was established (10 times of variables) (Busu and Busu, 2019; Loehlin, 2004; Fabrigar et al., 2010).

The statistical population of this study includes all the people who lived in the Tajrish, Abbas Abad and Abouzar Gharbi neighborhoods. The random sample of respondents was selected through a random selection of residents in order to minimize the uncontrolled effects (Cochran, 2007). The calculated sample size for this research resulted at 380 for the questionnaire survey. This amount of questionnaire were divided into three and distributed between three chosen urban neighborhoods in Tehran.

According to existing population for each chosen neighborhoods, 149 questionnaires were collected from Tajrish, 124 questionnaires were collected from Abbas Abad and 107 questionnaires were collected from Abouzar Gharbi. Table 2 highlights the demographic and economic backgrounds of Tehran residents according to last census report (The Statistical Centre of Iran, 2021) and also, the respondents' backgrounds for this study.

**Table 2-Tehran Residents Backgrounds and the Respondents' Backgrounds**

Characteristics		Tehran Residents		Study Respondents	
		Frequency	Percentage	Frequency	Percentage
Gender	Male	4324155	49.74%	261	68.7%
	Female	4369551	50.26%	119	31.3%
Age	≤ 18	2026905	23.31%	8	2.1%
	18-29	1426711	16.41%	114	30%
	30-39	1852218	21.31%	167	44%
	40-49	1261037	14.51%	78	20.5%
	50 ≤	2126835	24.46%	13	3.4%
Educational Status	High School or Below	782019	9%	28	7.4%
	Diploma	2426825	27.91%	149	39.2%
	Bachelor	3517521	40.46%	171	45%
	Master or Above	1967341	22.63%	32	8.4%
Monthly Income (Million Toman)	Monthly Income < 1	432672	4.98%	16	4.2%
	1 ≤ Monthly Income < 2	1026182	11.8%	120	31.6%
	2 ≤ Monthly Income < 3	1863901	21.44%	132	34.7%
	3 ≤ Monthly Income < 4	3218514	37.02%	98	25.8%
	Monthly Income ≥ 4	2152437	24.76%	14	3.7%

Source: Author

## 5. DATA ANALYSIS AND RESULTS

### 5.1. Measurement model

#### 5.1.1. Reliability of observable variables (Outer Loadings)

Factor loads are calculated by calculating the correlation of indices of a structure (Hair et al., 2021). Cheah (2020); Gefen and Straub (2005) highlighted the value of 0.70 as standard value for outer loading approach. Therefore, those outer loadings with values of 0.70 or higher were considered as acceptable values and are valid for research indicators.

**Table 3-Outer Loadings of Research Indicators with Values 0.7 or higher (Questions)**

F.N	Research Construct	Question Number	Outer Loadings	F.N	Research Construct	Question Number	Outer Loadings
1	<b>Physical Activity</b>	Q1	0.931	20	Street Connectivity	Q39	0.861
		Q2	0.949			Q40	0.852
2	<b>Aesthetical Aspects</b>	Q3	0.918	21	Residential Density	Q41	0.835
		Q4	0.922			Q42	0.844
3	Friendly Neighborhood	Q5	0.842	22	Land Use Mix Diversity	Q43	0.902
		Q6	0.839			Q44	0.885
4	Enjoyable Scenery	Q7	0.929	23	Density of Total Green and Open Spaces at Neighborhood	Q45	0.871
		Q8	0.835			Q46	0.883
5	Existence of Hills	Q9	0.941	24	<b>Safety</b>	Q47	0.863
		Q10	0.937			Q48	0.858
6	Lively Environment	Q11	0.952	25	Feel Afraid to Leave the House	Q49	0.864
		Q12	0.946			Q50	0.869
7	Attractive Neighborhood	Q13	0.950	26	Number of People Around	Q51	0.934
		Q14	0.961			Q52	0.962
8	<b>Demographic Variables</b>	Q15	0.954	27	Problem with Unattended Dogs	Q53	0.909
		Q16	0.959			Q54	0.886
9	Gender	Q17	0.939	28	Street Lighting	Q55	0.842
		Q18	0.952			Q56	0.813
10	Age	Q109	0.891	29	Traffic's Speed	Q57	0.928
		Q20	0.845			Q58	0.941
11	Education Status	Q21	0.873	30	Victimization Experience	Q59	0.962
		Q22	0.861			Q60	0.937
12	Income Status	Q23	0.942	31	<b>Social; Cultural and Psychological Attributes</b>	Q61	0.844
		Q24	0.934			Q62	0.868
13	<b>Existence; Accessibility; and Opportunities of Physical Facilities</b>	Q25	0.939	32	Social Capital	Q63	0.879
		Q26	0.946			Q64	0.862
14	Access to Cycle Path	Q27	0.947	33	Social Support from Family and Friend	Q65	0.911
		Q28	0.933			Q66	0.937
15	Access to Build Facilities	Q29	0.901	34	Social Cohesion	Q67	0.955
		Q30	0.893			Q68	0.946
16	Access to Natural Facilities	Q31	0.875	35	Interaction between the Individual and the Environment	Q69	0.879
		Q32	0.887			Q70	0.911
17	Distance to Bike Way	Q33	0.845	36	<b>Weather</b>	Q71	0.895
		Q34	0.841			Q72	0.869
18	Distance to Park or Beach	Q35	0.867	37	Poor Weather	Q73	0.872
		Q36	0.855			Q74	0.865
19	<b>Physical Environmental Characteristics</b>	Q37	0.950	38	Lack of Good Weather	Q75	0.851
		Q38	0.942			Q76	0.849

Source: Author by PLS Software

As seen from Table 3, all the research indicators met the standard criteria. Thus, the research model was valid. Although the research model have met the standard criteria of outer loading, examining the items were loaded only on the intended construct is necessary. Therefore, the research underwent the cross-loading of latent variable approach to ensure that the indicators were loaded equally on the other constructs as well as their theorized construct. To obtain the cross-validated indicators to be included in the final data set, the loading must be larger on the intended construct than any other construct (Henseler et al., 2010). According to Table 4, the loadings on the intended construct which is highlighted in red are all more than other existing loadings of each column.





Alpha and composite reliability must be equal or above 0.60 and 0.80, in the respective order. According to Table 5, all the research variables were in line with the standard criteria of Cronbach's Alpha (0.6 and above) and composite reliability (0.8 and above) implying reliability of the research model.

**Table 5-Cronbach’s Alpha and Composite Reliabilities of Constructs in Model**

F.N	Construct	Cronbach’s Alpha	Composite Reliability	F.N	Construct	Cronbach’s Alpha	Composite Reliability
1	<b>Physical Activity</b>	0.924	0.963	20	Street Connectivity	0.851	0.864
2	<b>Aesthetical Aspects</b>	0.912	0.926	21	Residential Density	0.834	0.849
3	Friendly Neighborhood	0.836	0.851	22	Land Use Mix Diversity	0.893	0.897
4	Enjoyable Scenery	0.829	0.844	23	Density of Total Green and Open Spaces at Neighborhood	0.873	0.881
5	Existence of Hills	0.937	0.947	24	<b>Safety</b>	0.855	0.868
6	Lively Environment	0.949	0.959	25	Feel Afraid to Leave the House	0.860	0.872
7	Attractive Neighborhood	0.954	0.963	26	Number of People Around	0.945	0.955
8	<b>Demographic Variables</b>	0.952	0.961	27	Problem with Unattended Dogs	0.897	0.901
9	Gender	0.942	0.952	28	Street Lighting	0.818	0.833
10	Age	0.871	0.879	29	Traffic’s Speed	0.931	0.941
11	Education Status	0.866	0.878	30	<b>Social; Cultural and Psychological Attributes</b>	0.946	0.956
12	Income Status	0.935	0.945	31	Social Capital	0.848	0.861
13	<b>Existence; Accessibility; and Opportunities of Physical Facilities</b>	0.940	0.950	32	Social Support from Family and Friend	0.863	0.875
14	Access to Cycle Path	0.939	0.949	33	Social Cohesion	0.920	0.934
15	Access to Build Facilities	0.898	0.902	34	Interaction between the Individual and the Environment	0.948	0.958
16	Access to Natural Facilities	0.879	0.887	35	Victimization Experience	0.895	0.899
17	Distance to Bike Way	0.840	0.855	36	<b>Weather</b>	0.877	0.885
18	Distance to Park or Beach	0.857	0.870	37	Poor Weather	0.868	0.880
19	<b>Physical Environmental Characteristics</b>	0.943	0.953	38	Lack of Good Weather	0.842	0.857

Source: Author by PLS Software

*5.1.3. Validity evaluation: Convergent [average variance extracted (AVE)] and discriminant (AVE square root) validity*

Applying the convergent validity and discriminant validity involves testing the validity of research model. They are of tremendous importance for testing the constructs for measuring the feature of the research prior to testing any relationship. Convergent validity is dependent on estimating what should be related theoretically and the presence of the correlation among the scales relating to the items. Besides, discriminant validity considers the degree that two or more measurements conducted for examining the different theoretical constructs are unrelated (Ringle., et al. 2015). It is essential to expand the Average Variance Extended (AVE) approach for examining the convergent validity and assess the discriminant validity, which is defined as shared average variance between the measures and constructs (Hulland. 1999). The equal and above AVE values of 0.50 were recognized by Cheah (2020); Henseler et al. (2010); Ringle et al. (2015) as acceptable values for confirming the convergent validation. Furthermore, for testing the discriminant validity, calculating the Average Variance Extracted (AVE) values of the research model and the square roots of those values is essential. According to Jak and Cheung (2020); Ringle et al.



Table 7-(Continued)

	20*	21*	22*	23*	24*	25*	26*	27*	28*	29*	30*	31*	32*	33*	34*	35*	36*	37*	38*
1*																			
2*																			
3*																			
4*																			
5*																			
6*																			
7*																			
8*																			
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12*																			
13*																			
14*																			
15*																			
16*																			
17*																			
18*																			
19*																			
20*	0.325																		
21*	0.501	0.914																	
22*	0.467	0.502	0.942																
23*	0.605	0.640	0.693	0.939															
24*	0.457	0.492	0.455	0.471	0.927														
25*	0.307	0.342	0.305	0.321	0.369	0.930													
26*	0.620	0.655	0.618	0.634	0.682	0.651	0.976												
27*	0.526	0.561	0.524	0.540	0.588	0.557	0.515	0.934											
28*	0.414	0.449	0.412	0.428	0.476	0.445	0.403	0.433	0.905										
29*	0.391	0.426	0.389	0.405	0.453	0.422	0.380	0.410	0.438	0.964									
30*	0.380	0.415	0.378	0.394	0.442	0.411	0.369	0.399	0.427	0.602	0.990								
31*	0.524	0.559	0.522	0.538	0.586	0.555	0.513	0.543	0.571	0.508	0.546	0.925							
32*	0.247	0.282	0.245	0.261	0.309	0.278	0.236	0.266	0.294	0.396	0.269	0.462	0.958						
33*	0.170	0.205	0.168	0.184	0.232	0.201	0.159	0.189	0.217	0.373	0.192	0.606	0.458	0.978					
34*	0.633	0.668	0.631	0.647	0.695	0.664	0.622	0.652	0.683	0.362	0.655	0.252	0.642	0.588	0.981				
35*	0.569	0.604	0.567	0.583	0.631	0.600	0.558	0.588	0.616	0.506	0.591	0.715	0.539	0.440	0.608	0.977			
36*	0.378	0.413	0.376	0.392	0.440	0.409	0.367	0.397	0.425	0.229	0.400	0.651	0.687	0.290	0.460	0.528	0.940		
37*	0.724	0.759	0.722	0.738	0.786	0.755	0.713	0.743	0.771	0.152	0.746	0.460	0.496	0.603	0.310	0.491	0.492	0.984	
38*	0.590	0.625	0.588	0.604	0.652	0.621	0.579	0.609	0.637	0.615	0.612	0.806	0.842	0.509	0.623	0.612	0.384	0.582	0.970

Source: Author by PLS Software

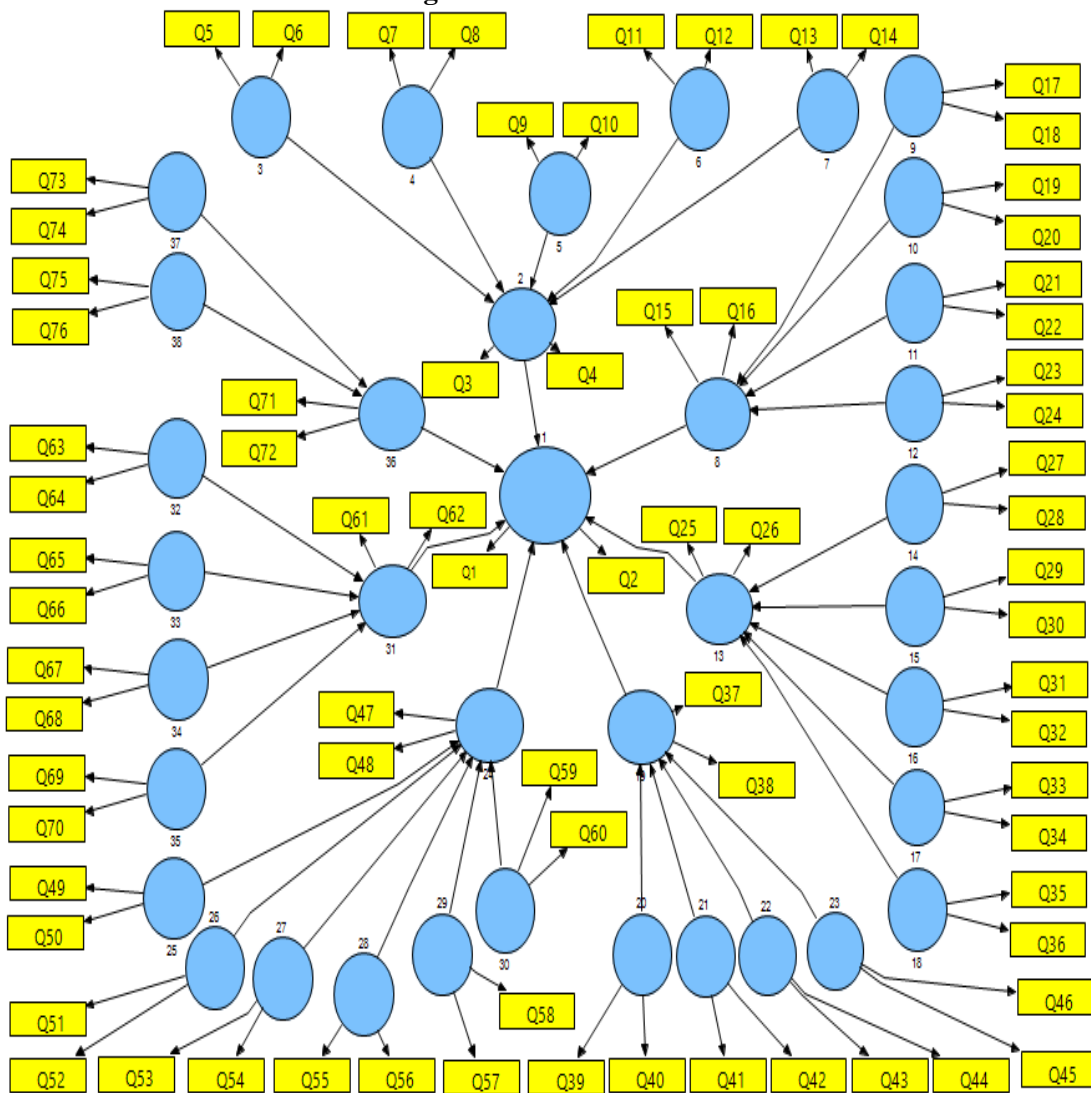
\*Note: 1: Physical Activity, 2: Aesthetical Aspects, 3: Friendly Neighborhood, 4: Enjoyable Scenery, 5: Existence of Hills, 6: Lively Environment, 7: Attractive Neighborhood, 8: Demographic Variables, 9: Gender, 10: Age, 11: Education Status, 12: Income Status, 13: Existence; Accessibility; and Opportunities of Physical Facilities, 14: Access to Cycle Path, 15: Access to Build Facilities, 16: Access to Natural Facilities, 17: Distance to Bike Way, 18: Distance to Park or Beach, 19: Physical Environmental Characteristics, 20: Street Connectivity, 21: Residential Density, 22: Land Use Mix Diversity, 23: Density of Total Green and Open Spaces at Neighborhood, 24: Safety, 25: Feel Afraid to Leave the House, 26: Number of People Around, 27: Problem with Unattended Dogs, 28: Street Lighting, 29: Traffic's Speed, 30: Victimization Experience, 31: Social; Cultural and Psychological Attributes, 32: Social Capital, 33: Social Support from Family and Friend, 34: Social Cohesion, 35: Interaction between the Individual and the Environment, 36: Weather, 37: Poor Weather, 38: Lack of Good Weather.

5.2. Analysis of the structural model

Smart PLS was applied for assessing the research model (Fig.3) for achieving the objective in this section. The path coefficients extracted are recognized as standard beta coefficients from the ordinary least squares regression (Henseler and Fassott, 2010; Ringle et al., 2020). The path coefficients or T-Values must be assessed regarding magnitude, sign, and significance. The magnitude of T-Value shows the strength of correlation. Setting up of indirect relationships reduces the magnitude of a path coefficient. Consequently, some studies highlight the overall influences as a combination of direct (path coefficient) and indirect effects. If T-Value is considered greater than the minimum value of a statistic at intended confidence level, the relationship or hypothesis is verified. This value is, in the respective order, compared with a minimum T-Value of 1.64, 1.96 and 2.58 at a significance level of 90, 95 and 99% (Hair et al., 2021; Henseler et al., 2009). In this part, the effect of each variable on physical activity in neighborhood identified in previous sections is identified by the assessment of the relationships among latent variables and the dependent variable. T-Values and the impact factors of different variables are shown in Table 8.



Figure 3-Research Model



Author by PLS Software

\*Note: 1: Physical Activity, 2: Aesthetical Aspects, 3: Friendly Neighborhood, 4: Enjoyable Scenery, 5: Existence of Hills, 6: Lively Environment, 7: Attractive Neighborhood, 8: Demographic Variables, 9: Gender, 10: Age, 11: Education Status, 12: Income Status, 13: Existence; Accessibility; and Opportunities of Physical Facilities, 14: Access to Cycle Path, 15: Access to Build Facilities, 16: Access to Natural Facilities, 17: Distance to Bike Way, 18: Distance to Park or Beach, 19: Physical Environmental Characteristics, 20: Street Connectivity, 21: Residential Density, 22: Land Use Mix Diversity, 23: Density of Total Green and Open Spaces at Neighborhood, 24: Safety, 25: Feel Afraid to Leave the House, 26: Number of People Around, 27: Problem with Unattended Dogs, 28: Street Lighting, 29: Traffic's Speed, 30: Victimization Experience, 31: Social; Cultural and Psychological Attributes, 32: Social Capital, 33: Social Support from Family and Friend, 34: Social Cohesion, 35: Interaction between the Individual and the Environment, 36: Weather, 37: Poor Weather, 38: Lack of Good Weather.

In this research, hypothesis testing were utilized for examining the proposed hypothesizes of research model (Fig.3) that was considered by examining the hypothesized association between research constructs. In the next section, the accuracy of specified connections among physical activity and factors and sub-factors (hypothesis testing) in Tehran neighborhoods and the significance of these connections are shown in Table 8.

**Table 8-Path Coefficient of Factors Affecting Physical Activity in Neighborhoods**

F.N	Connection Model		Original Sample (Path Coefficient)	T Statistics (O/STERR)	The Test Result	
1	<b>Aesthetical Aspects</b>	=>	<b>Physical Activity</b>	0.204	3.367	Pass
2	Friendly Neighborhood	=>	Aesthetical Aspects	0.256	2.481	Pass
3	Enjoyable Scenery	=>	Aesthetical Aspects	0.143	2.349	Pass
4	Existence of Hills	=>	Aesthetical Aspects	0.047	3.572	Pass
5	Lively Environment	=>	Aesthetical Aspects	0.158	3.948	Pass
6	Attractive Neighborhood	=>	Aesthetical Aspects	0.092	4.349	Pass
7	<b>Demographic Variables</b>	=>	<b>Physical Activity</b>	0.091	4.056	Pass
8	Gender	=>	Demographic Variables	0.081	3.672	Pass
9	Age	=>	Demographic Variables	-0.070	2.921	Pass
10	Education Status	=>	Demographic Variables	0.003	2.870	Pass
11	Income Status	=>	Demographic Variables	0.009	3.482	Pass
12	<b>Existence; Accessibility; and Opportunities of Physical Facilities</b>	=>	<b>Physical Activity</b>	0.179	3.651	Pass
13	Access to Cycle Path	=>	Existence; Accessibility; and Opportunities of Physical Facilities	0.068	3.583	Pass
14	Access to Build Facilities	=>	Existence; Accessibility; and Opportunities of Physical Facilities	0.139	3.107	Pass
15	Access to Natural Facilities	=>	Existence; Accessibility; and Opportunities of Physical Facilities	0.177	2.986	Pass
16	Distance to Bike Way	=>	Existence; Accessibility; and Opportunities of Physical Facilities	-0.030	2.561	Pass
17	Distance to Park or Beach	=>	Existence; Accessibility; and Opportunities of Physical Facilities	-0.098	2.832	Pass
18	<b>Physical Environmental Characteristics</b>	=>	<b>Physical Activity</b>	0.168	3.701	Pass
19	Street Connectivity	=>	Physical Environmental Characteristics	0.121	2.780	Pass
20	Residential Density	=>	Physical Environmental Characteristics	0.102	2.381	Pass
21	Land Use Mix Diversity	=>	Physical Environmental Characteristics	0.076	3.004	Pass
22	Density of Total Green and Open Spaces at Neighborhood	=>	Physical Environmental Characteristics	0.079	2.958	Pass
23	<b>Safety</b>	=>	<b>Physical Activity</b>	0.262	2.784	Pass
24	Feel Afraid to Leave the House	=>	Safety	-0.201	2.836	Pass
25	Number of People Around	=>	Safety	0.084	3.721	Pass
26	Problem with Unattended Dogs	=>	Safety	-0.065	3.029	Pass
27	Street Lighting	=>	Safety	0.149	2.245	Pass
28	Traffic's Speed	=>	Safety	-0.107	3.395	Pass
29	Victimization Experience	=>	Safety	-0.276	3.893	Pass
30	<b>Social; Cultural and Psychological Attributes</b>	=>	<b>Physical Activity</b>	0.103	2.742	Pass
31	Social Capital	=>	Social; Cultural and Psychological Attributes	0.023	2.849	Pass
32	Social Support from Family and Friend	=>	Social; Cultural and Psychological Attributes	0.090	3.385	Pass
33	Social Cohesion	=>	Social; Cultural and Psychological Attributes	0.051	3.904	Pass
34	Interaction between the Individual and the Environment	=>	Social; Cultural and Psychological Attributes	0.011	3.023	Pass
35	<b>Weather</b>	=>	<b>Physical Activity</b>	0.048	2.967	Pass
36	Poor Weather	=>	Weather	-0.014	2.893	Pass
37	Lack of Good Weather	=>	Weather	-0.007	2.692	Pass

Source: Author by PLS Software

**Table 9-The Order of Impact of Factors Affecting Physical Activity in Neighborhoods**

Rank	Factors Affecting Physical Activity in Neighborhoods	Original Sample (Path Coefficient)	Rank	Factors Affecting Physical Activity in Neighborhoods	Original Sample (Path Coefficient)
1	Safety	0.262	5	Social; Cultural and Psychological Attributes	0.103
2	Aesthetical Aspects	0.204	6	Demographic Variables	0.091
3	Existence; Accessibility; and Opportunities of Physical Facilities	0.179	7	Weather	0.048
4	Physical Environmental Characteristics	0.168			

Source: Author by PLS Software

As discussed in section 5.2, the T-Statistic above the value of 1.96 was considered as acceptable. According to Table 8, all T-Statistics (above 1.96) are acceptable. Additionally, path coefficients allowed this research to expand the effect of specified factors and sub-factors on physical activity in Tehran urban neighborhoods. In spite of the negative and positive effects of factors on physical activity, this research measured the larger numerical coefficient as the more effective factor in comparison with those with low values. The effects of factors and sub-factors on physical activity and their relative significance of the influence in Tehran urban neighborhoods from the highest to the lowest, in the respective order, are shown in Table 9 and Table 10.

**Table 10-The Order of Impact of Sub-Factors Affecting Physical Activity in Neighborhoods**

Rank	Sub-Factors Affecting Physical Activity in Neighborhoods	Original Sample (Path Coefficient)	Rank	Sub-Factors Affecting Physical Activity in Neighborhoods	original Sample (Path Coefficient)
1	Victimization Experience	-0.276	16	Gender	0.081
2	Friendly Neighborhood	0.256	17	Density of Total Green and Open Spaces at Neighborhood	0.079
3	Feel Afraid to Leave the House	-0.201	18	Land Use Mix Diversity	0.076
4	Access to Natural Facilities	0.177	19	Age	-0.070
5	Lively Environment	0.158	20	Access to Cycle Path	0.068
6	Street Lighting	0.149	21	Problem with Unattended Dogs	-0.065
7	Enjoyable Scenery	0.143	22	Social Cohesion	0.051
8	Access to Build Facilities	0.139	23	Existence of Hills	0.047
9	Street Connectivity	0.121	24	Distance to Bike Way	-0.030
10	Traffic's Speed	-0.107	25	Social Capital	0.023
11	Residential Density	0.102	26	Poor Weather	-0.014
12	Distance to Park or Beach	-0.098	27	Interaction between the Individual and the Environment	0.011
13	Attractive Neighborhood	0.092	28	Income Status	0.009
14	Social Support from Family and Friend	0.090	29	Lack of Good Weather	-0.007
15	Number of People Around	0.084	30	Education Status	0.003

Source: Author by PLS Software

Table 11 consists of the coefficient effect of aesthetical aspects for physical activity from the most to the least. According to the results, all factors are directly related with increasing physical activity in Tehran urban neighborhoods.

**Table 11-The Order of Impact of Aesthetical Aspects Sub-Factors on Physical Activity**

Rank	Aesthetical Aspects Sub-Factors Affecting Physical Activity	Original Sample (Path Coefficient)	Rank	Aesthetical Aspects Sub-Factors Affecting Physical Activity	Original Sample (Path Coefficient)
1	Friendly Neighborhood	0.256	4	Attractive Neighborhood	0.092
2	Lively Environment	0.158	5	Existence of Hills	0.047
3	Enjoyable Scenery	0.143			

Source: Author by PLS Software

In Table 12, all 4 factors affecting physical activity show an acceptable significance level, and thus are accepted. According to the results higher income status, and higher educational status cause an increase physical activity. In contrast, with increasing age of residents, physical activity decrease in Tehran urban

neighborhoods. It is also worth noting that, Participation rates among female are much lower than among male.

**Table 12-The Order of Impact of Demographic Variables Sub-Factors on Physical Activity**

Rank	Demographic Variables Sub-Factors Affecting Physical Activity	Original Sample (Path Coefficient)	Rank	Demographic Variables Sub-Factors Affecting Physical Activity	Original Sample (Path Coefficient)
1	Gender	0.081	3	Income Status	0.009
2	Age	-0.070	4	Education Status	0.003

Source: Author by PLS Software

Table 13 presents that access to natural facilities, access to build facilities, and access to cycle path had positive effect on residents' physical activity of Tehran urban neighborhoods. In contrast, with increasing distance to park or beach, and distance to bike way, physical activity decrease in Tehran urban neighborhoods.

**Table 13-The Order of Impact of Existence; Accessibility; and Opportunities of Physical Facilities Sub-Factors on Physical Activity**

Rank	Existence; Accessibility; and Opportunities of Physical Facilities Sub-Factors Affecting Physical Activity	Original Sample (Path Coefficient)	Rank	Existence; Accessibility; and Opportunities of Physical Facilities Sub-Factors Affecting Physical Activity	Original Sample (Path Coefficient)
1	Access to Natural Facilities	0.177	4	Access to Cycle Path	0.068
2	Access to Build Facilities	0.139	5	Distance to Bike Way	-0.030
3	Distance to Park or Beach	-0.098			

Source: Author by PLS Software

According to Table 14, all factors had positive effect in physical activity. So, street connectivity, residential density, density of total green and open spaces at neighborhood, and land use mix diversity cause an increase residents' physical activity of Tehran urban neighborhoods.

**Table 14-The Order of Impact of Physical Environmental Characteristics Sub-Factors on Physical Activity**

Rank	Physical Environmental Characteristics Sub-Factors Affecting Physical Activity	Original Sample (Path Coefficient)	Rank	Physical Environmental Characteristics Sub-Factors Affecting Physical Activity	Original Sample (Path Coefficient)
1	Street Connectivity	0.121	3	Density of Total Green and Open Spaces at Neighborhood	0.079
2	Residential Density	0.102	4	Land Use Mix Diversity	0.076

Source: Author by PLS Software

Table 15 shows the street lighting and number of people around had positive effect on residents' physical activity of Tehran urban neighborhoods, while, victimization experience, feeling afraid to leave the house, traffic's speed, and problem with unattended dogs had negative effects user's physical activity of Tehran neighborhoods.

**Table 15-The Order of Impact of Safety Sub-Factors on Physical Activity**

Rank	Safety Sub-Factors Affecting Physical Activity	Original Sample (Path Coefficient)	Rank	Safety Sub-Factors Affecting Physical Activity	Original Sample (Path Coefficient)
1	Victimization Experience	-0.276	4	Traffic's Speed	-0.107
2	Feel Afraid to Leave the House	-0.201	5	Number of People Around	0.084
3	Street Lighting	0.149	6	Problem with Unattended Dogs	-0.065

Source: Author by PLS Software

In the case of social; cultural and psychological attributes sub-factors (Table 16), all factors had positive effect. So, social support from family and friend, social cohesion, social capital, and interaction between the individual and the environment cause an increase residents' physical activity of Tehran urban neighborhoods.

**Table 16-The Order of Impact of Social; Cultural and Psychological Attributes Sub-Factors on Physical Activity**

Rank	Social; Cultural and Psychological Attributes Sub-Factors Affecting Physical Activity	Original Sample (Path Coefficient)	Rank	Social; Cultural and Psychological Attributes Sub-Factors Affecting Physical Activity	Original Sample (Path Coefficient)
1	Social Support from Family and Friend	0.090	3	Social Capital	0.023
2	Social Cohesion	0.051	4	Interaction between the Individual and the Environment	0.011

Source: Author by PLS Software

According to Table 17, poor weather, and lack of good weather are inversely related with physical activity in Tehran urban neighborhoods. So these conditions leading to a decrease in physical activity of Tehran urban neighborhoods' residents.

**Table 17-The Order of Impact of Weather Sub-Factors on Physical Activity**

Rank	Weather Sub-Factors Affecting Physical Activity	Original Sample (Path Coefficient)	Rank	Weather Sub-Factors Affecting Physical Activity	Original Sample (Path Coefficient)
1	Poor Weather	-0.014	2	Lack of Good Weather	-0.007

Source: Author by PLS Software

In the next step, the R square approach was used to examine how well the physical activity were predicted by the constructs. As result, the R square value for physical activity associating with its constructs calculated with the value of 0.632901 out of 1. Finally, Variance Inflated Factor (VIF) was examined using regression result to detect collinearity. Hair et al. (2011) and Cassel et al. (1999) recommended that the collinearity is an acceptable if VIF value is smaller than 5. In this research, all VIF value met the standard value (below 5), which means that the research model is collinearity.

## 6. DISCUSSION

As presented in previous section, the importance and path coefficients of all research constructs were examined. As result, safety, aesthetical aspects, existence; accessibility; and opportunities of physical facilities, physical environmental characteristics, social; cultural and psychological attributes, demographic variables of residents, and weather respectively are highlighted as sensitive factors on all research respondents. The following section discusses the findings of this research.

The relationship between physical activity and safety as reported by the Centers for Disease Control and Prevention (1999) in the United States. Moreover, Marquet et al. (2020) also presented the strong association between perceived safety from crime and physical activity behavior, which is needed to provide further categories of safety from injury or crime. In addition, Timperio et al. (2014) highlighted

association between physical activities with perceived general safety among women. On the other hand, Sallis et al. (2008) found no significant association between variables of safety and local environment's character with physical activity. Although, the results of this research revealed that safety is seen as the first most significant factor affecting the physical activity in Tehran urban neighborhoods.

Review of the research literature showed that the strong relationship between aesthetic attributes and physical activity has been confirmed by Bonaccorsi et al. (2020); Humpel et al., (2002). The study of Orstad et al. (2017) has touched on aesthetics of neighborhoods, and these have been extended further by Clifton et al. (2007) to include the influence of aesthetic attributes and accessibility of physical facilities on physical activity. It is also worth noting that, in this study discovered that aesthetical aspects as an important and relevant factor for residents' physical activities in Tehran urban neighborhoods.

In terms of the relationship between existences, characteristics, and accessibility of physical facilities and participation in physical activities, Humpel et al. (2002) confirmed a strong positive relationship. More specifically, Balogun (2021), Orstad et al. (2017), Sallis et al. (2008); Gebel et al. (2007) have highlighted the importance of footpaths, swimming pools, and cycling paths while Mowen et al. (2007) have particularly mentioned the availability of a park within vicinity as being closely related to visiting frequencies among men and women in the United States. Also, the results of this research revealed positive association between this factor and physical activity for residents of Tehran urban neighborhoods as third significant factor.

Based on Bonaccorsi et al. (2020); Pont et al. (2009); Saelens and Handy (2008); and Wendel-Vos et al.'s (2007) researches on adolescents, children, and adult, the consistent association between characteristics of physical environment and physical activity is obvious. Additionally, Duncan et al. (2002) highlighted the positive association between physical activity and sidewalks, shops, and services. Other researches on the relationship between adults' physical activity and physical environment include Wang and Wu (2020); Van Cauwenberg et al. (2011). Finally, the research finding of this study indicated the consistent linkage between physical environment and physical activity among residents of Tehran urban neighborhood.

Considering the previous researches, psychosocial factors, like self-efficacy and social support, have been consistently related to physical activity (Hartman et al., 2020; Aliyas, 2020). Yancey et al. (2004) have also stated positive association between social support and higher rate of participation in leisure activities. In another research, King et al. (2000) presented a positive association between physical activity and presence of active people in the neighborhoods. Moreover, the research results revealed that this factor could lead to the motivation (positive) on people to go for physical activity in their neighborhoods.

In this step of the research discussion was focused on realizing which demographic variables of residents were effective about physical activity in urban neighborhoods. These results confirm that people with higher income status and higher educational status participate more in physical activities. On the other hand, female and elderly residents are less motivation to do physical activities. However, Tremblay et al. (2011); An et al. (2020) reported that active involvement in physical activity between demographic variables is more prominent among respondents who are young, non-smoking, male, more educated, healthier, and have leaner bodies. In addition, Bauman et al. (2012); Huang et al. (2020) argued that income status is more significantly related to greater participation in leisure and physical activities.

According to the previous studies, the relationship between weather and physical activity is clear in Lanza et al. (2020); Aspvik et al. (2018). Tucker and Gilliland (2007) found that physical activity differs by seasonality and they identified that extreme or poor weather is its barrier in most cases. Zheng et al. (2021); Witham et al. (2014) reported the association among physical activity, climate and enjoyable scenery. Although, the results of this research demonstrated that weather conditions is the least effective factor on physical activity in Tehran urban neighborhoods.

## **7. CONCLUSION**

Physical activities such as walking, jogging, running and cycling in the neighborhood enhances public health because it encourages residents to communicate with their neighbors while exercising together. Various studies discussed on the effect of some factors such as aesthetical aspects, existence; accessibility; and opportunities of physical facilities, physical environmental characteristics, safety, social; cultural and psychological attributes, and weather in neighborhoods and demographic variables of people in physical activities. From study on previous models, it was observed that, these models did not consider all the specified factors and their effect at same time on physical activity. Moreover, in terms of physical activity in neighborhood, the assessment factors and models of Tehran neighborhoods are neither standardized nor readily available. Therefore, this current research intends to fill this gap to enhance the physical activity in Tehran neighborhoods. The aim of this research was to examine the relationship between physical activity and aforementioned factors among the residents in the urban neighborhoods of Tehran. This research was developed to assess the degree of relationship between the research constructs and physical activity in the urban neighborhoods of Tehran. The research model was created using Smart PLS Software and can evaluate the effectiveness of each research construct on the current physical activity in the urban neighborhoods of Tehran. Because of that, it is a comprehensive model as it considered all specified factors associating with physical activity and analyzing them as whole; something

which was never considered by other researchers. The output of this model can be used as a decision support tool for urban planners, urban designers and architectures as well as anyone who wants to improve physical activity in the urban neighborhoods of Tehran.

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### **Annex: Questionnaire Form**

#### **Title: The structural model for physical activity in urban neighborhoods**

This questionnaire has been undertaken just for my article and there are no other benefits to get from it. Therefore, I assure you that all information will be held as documentary and confidential for my research. I deeply appreciate your kind efforts and cooperation.

Please, when answering the questions, put tick (✓) on the appropriate space and leave other spaces blank.

Thank you for filling this questionnaire.

Notice: The Table below identifies the different types of physical activities for this research.

<b>The Different types of physical activities in neighborhoods</b>
1- Walking (for leisure or exercise)
2- Jogging (for leisure or exercise)
3- Running (for exercise)
4- Bicycling (for leisure or exercise)
5- Window Shopping (for leisure)
6- Doing exercises in sport sections of neighborhoods



<b>Demographic Information</b>									
Please describe your gender:									
Male	1	Female	2						
Please specify your current age:									
Below 18	1	18-29	2	30-39	3	40-49	4	50 or Above	5
Please specify your educational status:									
High School or below	1	Diploma	2	Bachelor	3	Master or Above	4		
Please specify the total monthly income (MI) of your household (Million Toman):									
$MI < 1$	1	$1 \leq MI < 2$	2	$2 \leq MI < 3$	3	$3 \leq MI < 4$	4	$MI \geq 4$	5
<b>Physical Activity in Neighborhood</b>									
1- How likely is it for you to do physical activity in your neighborhood?									
Very Unlikely	1	Unlikely	2	Neutral	3	Likely	4	Very Likely	5
2- Please specify how interesting it is to do physical activity in your neighborhood for you.									
Very Uninteresting	1	Uninteresting	2	Neutral	3	Interesting	4	Very Interesting	5
<b>Aesthetical Aspects</b>									
3- How do aesthetical aspects affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
4- How is the importance of aesthetical aspects for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
<b>Friendly Neighborhood</b>									
5- How do friendly neighborhood affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
6- How is the importance of friendly neighborhood for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
<b>Enjoyable Scenery</b>									

7- How do enjoyable scenery affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
8- How is the importance of enjoyable scenery for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
<b>Existence of Hills</b>									
9- How do existence of hills affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
10- How is the importance of existence of hills for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
<b>Lively Environment</b>									
11- How do lively environment affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
12- How is the importance of lively environment for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
<b>Attractive Neighborhood</b>									
13- How do attractive neighborhood affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
14- How is the importance of attractive neighborhood for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
<b>Demographic Variables</b>									
15- How do demographic variables affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
16- How is the importance of demographic variables for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
<b>Gender</b>									
17- How do your gender affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5

18- How is the importance of your gender for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
Age									
19- How do your age affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
20- How is the importance of your age for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
Education Status									
21- How do your education status affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
22- How is the importance of your education status for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
Income Status									
23- How do your income status affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
24- How is the importance of your income status for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
<b>Existence; Accessibility; and Opportunities of Physical Facilities</b>									
25- How do physical facilities affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
26- How is the importance of physical facilities for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
Access to Cycle Path									
27- How do access to cycle path affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
28- How is the importance of access to cycle path for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5

Access to Build Facilities									
29- How do access to build facilities affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
30- How is the importance of access to build facilities for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
Access to Natural Facilities									
31- How do access to natural facilities affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
32- How is the importance of access to natural facilities for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
Distance to Bike Way									
33- How do distance to bike way affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
34- How is the importance of distance to bike way for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
Distance to Park or Beach									
35- How do distance to park or beach affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
36- How is the importance of distance to park or beach for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
Physical Environmental Characteristics									
37- How do physical environmental characteristics affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
38- How is the importance of physical environmental characteristics for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
Street Connectivity									
39- How do street connectivity affect on doing physical activity in your neighborhood?									

Very Low	1	Low	2	Medium	3	High	4	Very High	5
40- How is the importance of street connectivity for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
<b>Residential Density</b>									
41- How do residential density affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
42- How is the importance of residential density for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
<b>Land Use Mix Diversity</b>									
43- How do land use mix diversity affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
44- How is the importance of land use mix diversity for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
<b>Density of Total Green and Open Spaces at Neighborhood</b>									
45- How do density of total green and open spaces affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
46- How is the importance of density of total green and open spaces for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
<b>Safety</b>									
47- How do safety affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
48- How is the importance of safety for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
<b>Feel Afraid to Leave the House</b>									
49- How do feel afraid to leave the house affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5

50- How is the importance of feel afraid to leave the house for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
Number of People Around									
51- How do number of people around affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
52- How is the importance of number of people around for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
Problem with Unattended Dogs									
53- How do problem with unattended dogs affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
54- How is the importance of problem with unattended dogs for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
Street Lighting									
55- How do street lighting affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
56- How is the importance of street lighting for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
Traffic's Speed									
57- How do traffic's speed affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
58- How is the importance of traffic's speed for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
Victimization Experience									
59- How do victimization experience affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
60- How is the importance of victimization experience for doing physical activity in your neighborhood?									

Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
<b>Social; Cultural and Psychological Attributes</b>									
61- How do social; cultural and psychological attributes affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
62- How is the importance of social; cultural and psychological attributes for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
<b>Social Capital</b>									
63- How do social capital affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
64- How is the importance of social capital for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
<b>Social Support from Family and Friend</b>									
65- How do social support from family and friend affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
66- How is the importance of social support from family and friend for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
<b>Social Cohesion</b>									
67- How do social cohesion affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
68- How is the importance of social cohesion for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
<b>Interaction between the Individual and the Environment</b>									
69- How do interaction between the individual and the environment affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
70- How is the importance of interaction between the individual and the environment for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5

<b>Weather</b>									
71- How do weather affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
72- How is the importance of weather for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
<b>Poor Weather</b>									
73- How do poor weather affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
74- How is the importance of poor weather for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5
<b>Lack of Good Weather</b>									
75- How do lack of good weather affect on doing physical activity in your neighborhood?									
Very Low	1	Low	2	Medium	3	High	4	Very High	5
76- How is the importance of lack of good weather for doing physical activity in your neighborhood?									
Not Very Important	1	Slightly Important	2	Neutral	3	Moderately Important	4	Very Important	5