

# The relationship between satisfaction with the accessibility of the living environment and depressive symptoms

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## ABSTRACT

The goal of the study was to explore the relationship between perceived accessibility (person-environment fit) and depressive symptoms as potentially mediated by satisfaction with social relationships and physical activity. A convenience sample of 422 older adults aged 65 and over was interviewed. Using bootstrapping, we tested the strength and significance of the conditional indirect effects of two simultaneous mediators of the relationship between perceived accessibility of the living environment and depressive symptoms. The results demonstrated a direct **negative** effect between perceived accessibility and depressive symptoms, and that the relationship between perceived accessibility and depressive symptoms was mediated by **negative connections between** satisfaction with social relationships and physical activity. The findings indicate that policy makers and professionals working with older adults should seek methods for enhancing both accessibility and social relationships in order to alleviate the depressive symptoms of older adults.

## 1. Introduction

Older adults tend to live in areas of restricted activity due to physical disability and obstacles preventing freedom of movement in their living environment (Turel, Yigit, & Altug, 2007; Valdemarsson, Jernryd, & Iwarsson, 2005). Living environment planning and design, including the broader surroundings, is particularly important to enable older adults to live safely and independently (Dobner, Sako, & Joos, 2016; Loo & Tsui, 2009; Morley, 2016). Although understanding of how the living environment affects physical and mental health is incomplete, there is growing recognition as to its importance (Ellen, Mijanovich, & Dillman, 2001; Vaughan, LaValley, AlHeresh, & Keysor, 2016).

**The current research focuses on how the living environment (represented by perceived accessibility) is connected to depressive symptoms via two mediators: satisfaction with social relationships and physical activity.** Previous studies have concentrated on the connection between living environment characteristics (poverty, crime, design, social aspects) and mental health (Ivey et al., 2015; Matheson et al., 2006; Saarloos, Alfonso, Giles-Corti, Middleton, & Almeida, 2011). **Important aspects, however, remained to be explored: One such aspect is how older adults, themselves, perceive their living environment (perceived accessibility). Another is the simultaneous**

**effect of relevant mediators.** The current study builds upon prior research by examining the connection between older adults' perceived accessibility of their living environment and depressive symptoms and whether this relationship is mediated by satisfaction with social relationships and physical activity. **The method used for data collection was a convenience sample of 450 older adults, aged 65 and over. The analysis process included three stages. In the first stage, univariate analyses were performed, and in the second stage, bivariate analyses were performed to examine connections between depressive symptoms and the study variables using Pearson correlation tests. The third stage included mediation analyses, in which the selected mediators (satisfaction with social relationships, physical activity) were entered, using the bootstrapping method to assess indirect effects.** The results demonstrated a direct connection between perceived accessibility and depressive symptoms, and that the relationship is partially accounted for by satisfaction with social relationships and physical activity.

## 2. Theoretical framework

Depression is a major health concern, particularly for older adults, and is one of the leading causes of the heavy burden of disability

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worldwide (Reyes Fernández, Rosero-Bixby, & Koivumaa-Honkanen, 2016). Studies using the Center for Epidemiologic Studies Depression Scale (CES-D) reported incidence rates of clinically significant depressive symptoms ranging between 8% and 16% in adults aged 65 or older (Blazer, 2003; Zivin et al., 2010). Depressive symptoms are more prevalent in women, people with lower income, and those with one or more chronic illnesses or physical disabilities (Mendes de Leon et al., 1998). Research has found that depressive symptoms make chronic disease care more complicated and exacerbate disability (Gerrits, van Oppen, van Marwijk, van der Horst, & Penninx, 2012; Moussavi et al., 2007).

The role of the physical and social environment in relation to health, including mental health, has been investigated previously. Research is not completely consistent, but there are many indications, based on objective and subjective socio-spatial measures and self-reported assessments, that specific components of the living environment are connected to depressive symptoms and to high levels of depressive symptoms among older adults (Echeverria, Diez-Roux, Shea, Borrell, & Jackson, 2008; Ellaway et al., 2009; Ivey et al., 2015; Mair et al., 2009; Matheson et al., 2006; Robison et al., 2009; Schulz et al., 2006). Negative living environment characteristics (poverty or perceptions of danger or crime) have been associated with higher levels of depressive symptoms (Echeverria et al., 2008; Greiner, Li, Kawachi, Hunt, & Ahluwalia, 2004; Mair et al., 2009; Matheson et al., 2006; Ross, 2000; Schulz et al., 2006).

Researchers have proposed different ways in which the living environment might be connected to depressive symptoms. Brown et al. (2009) found that a physical environment that promotes social interaction (the availability of porches, stoops, benches) was negatively associated with anxiety and depressive symptoms and that the connection was mediated by perceived social support. It also was found that walkable environments with higher density of retail and other shops were associated with lower percentages of older adults with depressive symptoms because these environments encourage physical activity and social interaction (Berke, Koepsell, Moudon, Hoskins, & Larson, 2007; Sakar, Gallacher, & Webster, 2013). Nonetheless, these findings are not consistent (Koohsari et al., 2018; Pun, Manjourides, & Suh, 2018), because these environments also increase traffic and crime and hence might increase depressive symptoms (Saarloos et al., 2011). A 2012 meta-review concerning the relationship between living environment characteristics and depressive symptoms among people, aged 65 and older, included 19 studies with a variety of sample sizes ranging from 301 to 77,930. All 19 studies reported that older adults in living environments characterized by low socioeconomic levels (financial barriers) and higher perceived environmental problems were more likely to be depressed, whereas their counterparts who lived in more walkable living environments with higher social capital were less likely to be depressed (Julien, Richard, Gauvin, & Kestens, 2012). From these examples, it can be seen that the living environment is connected to older adults' depressive symptoms, and different environments and characteristics of the environment interact differently with older adults' depressive symptoms.

This study is based upon the ecological model or ecological theory of ageing (Lawton & Nahemow, 1973), a pioneering model of the older person-living environment relationship. According to the ecological theory of aging (Lawton, 1999; Lawton & Nahemow, 1973), good compatibility and high perceived accessibility is defined by person-environment fit or the level of compatibility between one's personal abilities (physical abilities/disabilities) and needs and the environment, results in psychological well-being and better physical activity. Older adults are more vulnerable to environmental stressors and their living environment has significant impact because they tend to spend a large portion of the day at home due to retirement and reduced mobility (Glass & Balfour, 2003; Lawton, 1977).

The ecological theory of ageing model emphasizes the influence of perceived accessibility on the level of compatibility between older adults and their surroundings (Lawton, 1999; Lawton & Nahemow,

1973). Perceived accessibility is based on the individual's assessment of accessibility, which can be influenced by objective accessibility combined with by various preconditions elements (Lättman, Friman, & Olsson, 2016). Researchers have found that, frequently, older adults are not sufficiently mobile and less active than they want to be because their living environment is objectively not accessible and poses obstacles. For instance, paths and sidewalks may be cracked and/or the area may not be well lit (Turel et al., 2007; Valdemarsson et al., 2005). Under these circumstances, defined by the ecological model as the zone of under-performance, older adults perceive their living environment as inaccessible and avoid going outside, using essential services or taking part in social life. As a result, older adults might find themselves socially isolated (Lawton, 1990), preventing them from aging with dignity in their living environment.

Accessibility, perceived or actual, of the living environment and the ability to be active outside the home are critical to older adults and contribute to their well-being and quality of life (Cerin, Sit, Barnett, Cheung, & Chan, 2013; Cerin et al., 2014; Nagel, Carlson, Bosworth, & Michael, 2008; Rantakokko et al., 2010; Stoeckel & Litwin, 2015). This includes the enjoyment of outside fresh air and sunlight (for those who can only walk a few steps outside their home), preserving social ties and preventing loneliness (Kweon, Sullivan, & Wiley, 1998; Sugiyama & Thompson, 2007), and engaging in physical activity, which are known to reduce depressive symptoms (Lampinen, Heikkinen, & Ruoppila, 2000; Sakar et al., 2013; Barnett, Zhang, Johnston, & Cerin, 2017) and to contribute to overall well-being (Rejeski & Mihalko, 2001). Specifically, older adults' accessibility (perceived or actual) is a crucial element in determining their ability to overcome spatial, physical, and socioeconomic barriers to use and participate in outdoor activities (Wang, Brown, & Liu, 2015). The health benefits of access to outdoor services access include higher level of physical activity (Jauregui et al., 2016; Portegijs, Keskinen, Tsai, Rantanen, & Rantakokko, 2017; Thornton et al., 2017) and improved mental (Sturm & Cohen, 2014) and self-reported physical health (Mowen, Orsegasmith, Payne, Ainsworth, & Godbey, 2007). Relatedly, studies conducted in Western societies have found that older adults who perceived their living environment as more accessible and walkable to key services and amenities (high person-environment fit) were more likely to participate socially (Kruger, Reischl, & Gee, 2007; Richard, Gauvin, Gosselin, & Laforest, 2009). Conversely, older adults who perceived their local community amenities as poor (low person-environment fit) participated in fewer social activities (Bowling & Stafford, 2007). These findings are consistent with the ecological theory of ageing model (Lawton & Nahemow, 1973; Wahl, Iwarsson, & Oswald, 2012). High person-environment fit is important for good physical and mental health, well-being, quality of life, and even reduced mortality among older adults (Knapen, Van-campfort, Morien, & Marchal, 2015; Kruger et al., 2007; Lawton, 1991; Richard et al., 2009; WHO, 2007).

Importantly, perceived accessibility, rather than actual accessibility, has been identified as the most significant way to evaluate the accessibility of living environment services and sites (Gregory, Johnston, Pratt, Watts, & Whatmore, 2009; Stoeckel & Litwin, 2015; Wang et al., 2015) and has a major influence on the quality of life of older adults (Khalaila & Vitman-Schorr, 2018). Two possible mediating factors that potentially account for the relationship between perceived accessibility and subsequent depressed mood are satisfaction with social relationships and physical activity. According to the ecological theory of ageing model, perceived accessibility of the living environment determines whether or not older adults spend their time outside. This, in turn, determines whether or not they meet other people, enjoy social activities and spend time with friends and family (Vitman-Schorr, Iecovich, Alfasi, & Shamai, 2015). Similarly, perceived accessibility of the living environment is likely correlated with the engagement of older people in physical activity, impacting their level of depressive symptoms (Strohle, 2009). In contrast, not going outdoors might result in social isolation, loneliness, lack of physical activity and subsequent depressive symptoms (Cacioppo

et al., 2006; Dennis, Wakefield, Molloy, & Andrews, 2005; Golden et al., 2009; MacAuley et al., 2000). To date, there is little research on the interrelationships and mechanisms by which perceived accessibility contributes to depressive symptoms among older adults.

Based on the literature review, the research model is proposed in Fig. 1. It is important to note that this is a comprehensive model and that not all hypotheses are examined as part of this model.

### 3. The present study

The goal of this study was to examine the extent to which perceived accessibility (person-environment fit according to the ecological theory of ageing model) is correlated to depressive symptoms among older adults. We examined whether older adults who perceive their environment as less accessible (low person-environment fit) had higher levels of depressive symptoms and what potentially mediates this association. Such examination is important because the living environment has multiple implications upon the lives of older adults (Fitzgerald & Caro, 2014; Rowles, 1986; Vitman-Schorr, Iecovich, & Alfasi, 2013; Vitman-Schorr, Ayalon, & Khalaila, 2019; WHO, 2007).

**Hypotheses.** After controlling for background characteristics, we expect that:

1. Depressive symptoms relate negatively to perceived accessibility of the environment (person-environment fit). High perceived accessibility will produce low depressive symptoms.
2. Depressive symptoms also relate negatively to perceived accessibility (person-environment fit) indirectly via the mediators: satisfaction with social relationships and physical activity. (Fig. 2: multiple mediation model).

Depressive symptoms are also influenced by a variety of personal background variables. For example, depressive symptoms among older adults are higher for women (Mendes de Leon et al., 1998); old-old adults (León-Salas et al., 2015); persons with lower educational levels (Ivey et al., 2015); persons with fewer children (more children can provide greater support to older adults; Okabayashi, Liang, Krause, Akiyama, & Sugisawa, 2004), those without a partner (Ivey et al., 2015) and those suffer from financial barriers (Julien et al., 2012). We controlled for these background variables in our analysis.

## 4. Method

### 4.1. Sample

The study was conducted in the northern periphery of Israel. A

convenience sample of 450 older adults, aged 65 and over was recruited. Inclusion criteria were proficiency in Hebrew or Arabic, living in their present living environment for at least three months, and being mobile. Recruitment of participants was conducted by approaching people in public spaces (e.g., parks, shopping centers, health clinics, and senior citizen clubs). An experienced interviewer approached potential participants, explained the research goals, and asked them to complete a questionnaire after obtaining consent. The current study did not include homebound older adults, because these data are not public. The study underwent an institutional review and was approved by the ethics committee of the university.

### 4.2. Measures

#### 4.2.1. Dependent variable

**Depressive symptoms.** Depressive symptoms were measured by the GDS (Geriatrics Depression Scale) developed by Yesavage and Brink (1983). The purpose of the questionnaire was to check older adults' depressive symptoms by using a simple and reliable tool that does not require the time and skills of a professional interviewer. The tool is composed of 15 items in a yes/no response format (questions 2, 3, 4, 6, 8, 9, 10, 12, 14, 15 equal one point when the answer is **yes** and questions 1, 5, 7, 11, 13 equal one point when the answer is **no**). Scores of 0–4 are considered normal; 5–8 indicate mild depression; 9–11 indicate moderate depression; and 12–15 indicate severe depression (Greenberg, 2012). The internal reliability of the tool (Cronbach's alpha) is high (0.94).

#### 4.2.2. Independent variable

**Perceived accessibility (person-environment fit).** Perceived accessibility was measured by asking respondents the following question: "How satisfied are you with the options you have to go from place to place?" The question was taken and rephrased based on the quality of life questionnaire WHOQOL-BREF (World Health Organization WHO, 2004). Responses were given on a 5-point scale, ranging from (1) not at all satisfied to (5) very satisfied. **The question is very general and basic, yet has two advantages: It summarizes the overall satisfaction or dissatisfaction with the person-environment fit, and provides an overall understanding of the perceived accessibility of the environment without asking multiple questions concerning modes of mobility (e.g., asking separately about public transportation or walking on sidewalks) that may corrupt the results.** For instance, if an older adult has walking problems but the living environment is well-served by public transportation, the person-environment fit might be high and hence satisfaction from the living environment might be high.

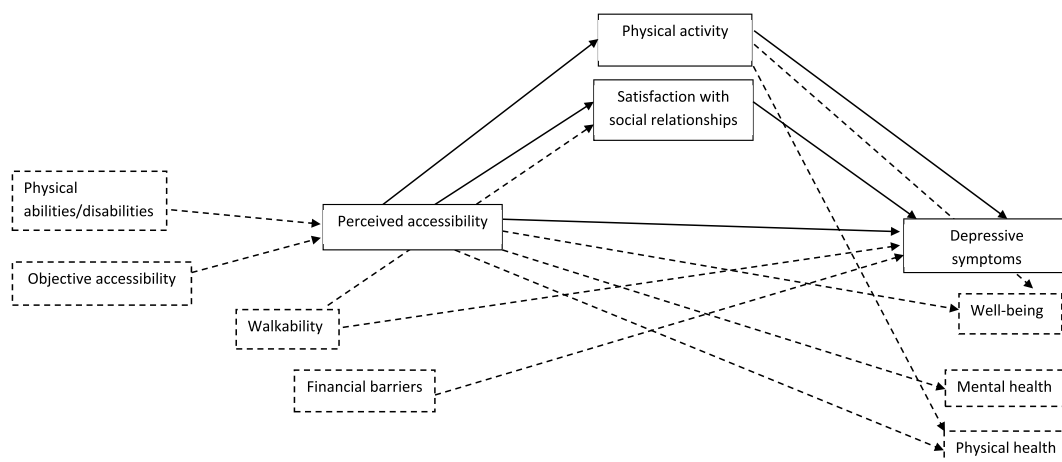


Fig. 1. Conceptual research model. Dotted lines represent hypotheses that were not tested in the present study, but were deemed adequate based on the literature.

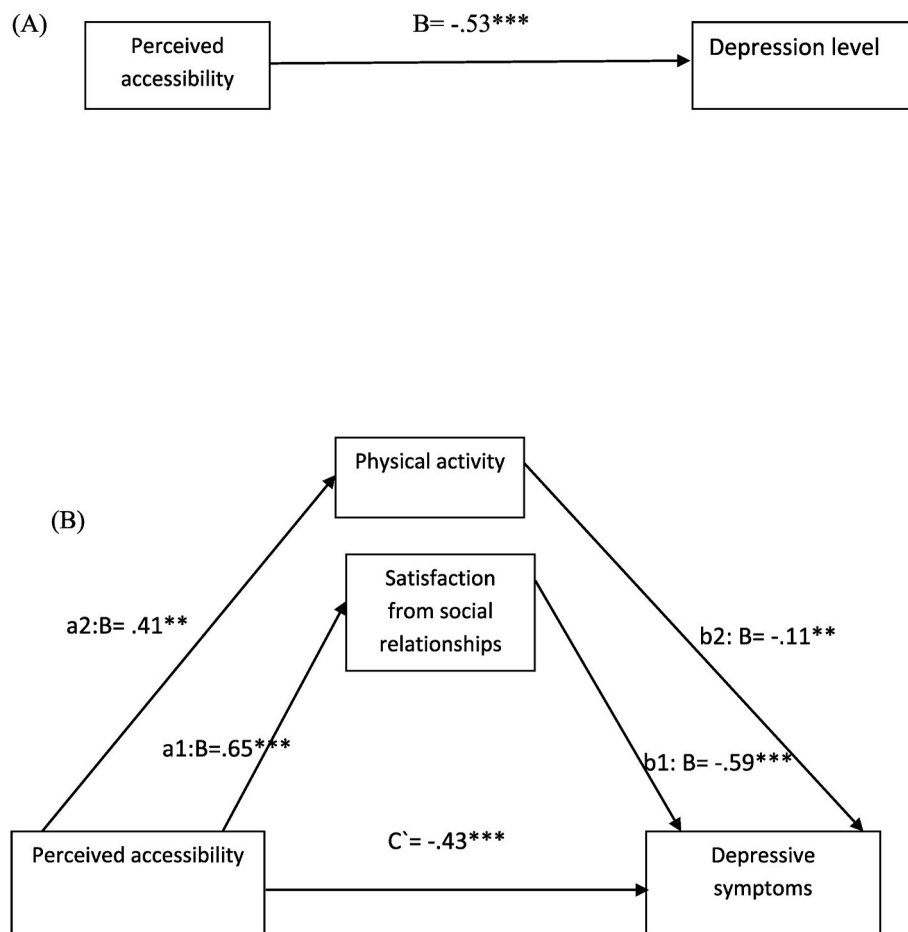


Fig. 2. A mediation model depicting direct and indirect effects of perceived accessibility on depressive symptoms, controlling for background variables. Notes: Graphic A depicts the total effect of perceived accessibility on depressive symptoms. Graphic B depicts the direct effect of perceived accessibility on depressive symptoms after including mediators and controlling for all background variables. Values represent unstandardized regression coefficients.

#### 4.2.3. Mediators

**Satisfaction with social relationships.** Respondents were asked to rate their satisfaction with their social relationships using two questions adapted from WHOQOL-BREF (WHO, 2004): “Are you satisfied with your personal relationships?” and “Are you satisfied with the support you get from your friends?”. Response were given on a 5-point scale, ranging from (1) very dissatisfied to (5) very satisfied. The internal reliability of the tool (Cronbach’s alpha) is moderate (0.70).

**Physical activity.** Respondents indicated the number of hours per week that they devote to physical activity (MABAT questionnaire, Israel Ministry of Health, 2005).

**Background variables.** Gender, age, marital status, years of education, number of children and socioeconomic status were gathered based on self-report. Age and number of children were defined as continuous variables. Sex was coded as a dichotomous variable, 0 = male, 1 = female. Marital status was coded as a dichotomous variable, partnered = 1, unpartnered (single, widowed or divorced) = 0. Years of education was coded by level, 1 = less than primary school, 2 = primary school, 3 = post primary school, 4 = middle school, 5 = high school, 6 = academic B.A., 7 = academic M.A., 8 = academic PhD.

#### 4.3. Data analyses

In the first stage, univariate analyses were performed to describe the sociodemographic characteristics of respondents and to examine the distribution of the study variables. Internal consistencies (Cronbach’s alpha) of the measures were calculated. In the second stage, bivariate analyses were performed to examine connections between depressive

symptoms and the study variables using Pearson correlation tests.

Mediation analyses were computed in which the selected mediators (satisfaction with social relationships, physical activity) were entered, using the bootstrapping method to assess indirect effects (Hayes, 2012; Preacher & Hayes, 2008). The mediation model was examined by testing the significance of the indirect effect of the independent variable (IV; perceived accessibility) on the dependent variable (depressive symptoms) through the selected mediators (satisfaction with social relationships, physical activity). It was then quantified as the product of the effect of the independent variable on the mediators (paths *a*) and the effect of the mediators on the dependent variable. This partialled out the effect of the independent variable (paths *b*) (see Fig. 2), while controlling for background characteristics.

This method is based on regression analysis, calculating the direct effect (weight  $c'$ , with mediators), total effect ( $c$ , without mediators) and indirect effect ( $a \times b$  weights) of an independent variable on a dependent variable. The total and specific indirect effects were calculated through a bootstrapping set at 5000 samples. Confidence intervals were calculated using this method by sorting the lowest to highest of these 5000 samples of the original dataset, yielding a 95th percentile confidence interval (if the number 0 falls within the confidence intervals, the tested effect would be non-significant).

#### 5. Results

The sample consisted of a majority of married or partnered men. The age range was 66–82 ( $M = 72.0$ ,  $SD = 4.39$ ). The average years of education was about 12, the average number of children was 5.23 ( $SD =$

2.58), and the average socioeconomic status was 4.0 ( $SD = 2.0$ ).

The average sample score on the depressive symptoms scale was 4.14. The average score of perceived accessibility of the living environment was 3.78, the average score of satisfaction with social relationships was 7.98, and weekly physical activity was an average of 1.73 h per week (see Table 1).

Table 2 presents the bivariate tests between the study variables with depressive symptoms as the dependent variable. Results revealed that background variables (gender, age, education, number of children, marital status, and socioeconomic status) were significantly related to depressive symptoms. Women and those with no partner had higher depressive symptoms than their counterparts. In addition, higher depressive symptoms were associated with older age, lower educational level, higher number of children, and lower socioeconomic status. Higher depressive symptoms were correlated with low scores of perceived accessibility and satisfaction with social relationships and less physical activity.

5.1. Mediation analyses

Table 3 shows the results of the mediation model (Fig. 2) in which the mediators, satisfaction with social relationships and physical activity, were entered while controlling for the effect of background variables (gender, age, education, marital status, number of children, and socioeconomic status). Results indicated a significant total effect of perceived accessibility on depressive symptoms (*path c*).

The results revealed that higher perceived accessibility was associated with more satisfaction with social relationships (*path a1*). Higher satisfaction with social relationships was negatively associated with depressive symptoms (*path b1*). Higher perceived accessibility was associated with greater physical activity (*path a2*), and physical activity was associated with depressive symptoms. The indirect effect of perceived accessibility on depressive symptoms through satisfaction with social relationships and physical activity was significant.

As for background variables, socioeconomic status was negatively associated with depressive symptoms. No significant associations were found between gender, marital status, age, education, and number of children and depressive symptoms.

**Table 1**  
Descriptive statistics of the study variables ( $N = 451$ ).

Covariates		<i>N</i> (valid %)	Mean ( <i>S. D</i> )	Range
Gender	Female	205 (45.5)		
	Male	246 (54.5)		
Age			72.0 (4.39)	66–82
Education			3.39 (2.0)	1–8
Number of children			5.23 (2.58)	1–16
Marital status	No partner	135 (29.9)		
	Has a partner	316 (70.1)		
Socioeconomic status		451	4.0 (2.00)	1–7
<b>Independent variable</b>				
Perceived accessibility			3.78 (1.05)	1–5
<b>Mediators</b>				
Satisfaction with social relationships			7.98 (1.65)	2–10
Physical activity			1.73 (3.16)	0–22
<b>Dependent variable</b>				
Depressive symptoms			4.14 (3.44)	0–15

**Table 2**

Bivariate tests of covariates and mediators with depressive symptoms ( $N = 451$ ).

Independent Variables	Depressive symptoms
<b>Background characteristics</b>	Test ( <i>p</i> value)
Gender (1 = male; 2 = female)	0.13**
Age	0.13**
Education	−0.45***
Number of children	0.38***
Marital status (1 = with partner, 0 = without partner)	−0.13**
Socioeconomic status	−0.52***
<b>Independent variable</b>	
Perceived accessibility	−0.45***
<b>Mediators</b>	
Satisfaction with social relationships	−0.50***
Physical activity	−0.29***

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

6. Discussion

The purpose of this study was to examine the extent to which perceived accessibility is connected with depressive symptoms of older adults. In other words, we examined if older adults who perceive their living environment as less accessible (usually because of low person-environment fit) have higher levels of depressive symptoms and what potentially accounts for this association. The findings reveal that older adults whose perceived accessibility of their living environment was low (low person-environment fit) suffered from higher depressive symptoms. These results are consistent with prior studies reporting that perceived accessibility is associated with mental well-being (Echeverria et al., 2008; Glass & Balfour, 2003; Ivey et al., 2015; Julien et al., 2012; Koohsari et al., 2019), the ability to age in place, and improved quality of life in later life (Vitman-Schorr, Ayalon, & Khalaila, 2019; Vitman-Schorr & Khalaila, 2018). This implies that the living environment in general, and its perceived accessibility in particular, are connected to older adults' well-being and psychological welfare. One possible explanation for the correlation between perceived accessibility and mental well-being, including depressive symptoms, is that perceived accessibility encompasses not only spatial aspects, but also social aspects (Vitman-Schorr, Ayalon, & Khalaila, 2019; Gregory et al., 2009). These results are consistent with the ecological model of ageing (Lawton & Nahemow, 1973), confirm it and can be explained by it: Perceived accessibility is very much an indicator of the person-environment fit, a compatibility that is connected to many life aspects, including depressive symptoms.

The second research hypothesis, that satisfaction with social relationships and physical activity mediate the association between perceived accessibility of the living environment and depressive symptoms, was supported by the findings. Satisfaction with social relationships is facilitated by spending time outside and perceived accessibility of the living environment increases the actual time older adults spend outside (blinded for review et al., 2017). High perceived accessibility of the living environment may foster a feeling of an ability to venture out of the house (higher person-environment fit) and, as a result, older adults meet more people and become part of social groups and take part in events and activities (Kruger et al., 2007; Vitman-Schorr, Iecovich, Alfasi, & Shamai, 2015). This social engagement provides an opportunity to acquire friends and social support, possibly resulting in lower levels of depressive symptoms (Brown et al., 2009). This analysis is consistent with previous studies demonstrating that a lack of social services in the living environment combined with inaccessibility can result in social isolation and deteriorating health status, which are likely correlated to higher levels of depressive symptoms in older adults (Cacioppo et al., 2006; Dennis et al., 2005; Golden et al., 2009; Kim, 2008).

The current study also found that physical activity mediates the connection between perceived accessibility and depressive symptoms. Engagement in physical activity is connected to perceived accessibility.

**Table 3**  
Summary of mediator analyses to predict depressive symptoms (N = 422).

Background variables	Independent variable	Mediating variable	Dependent variable	Effects of background variables on DV	Effect of IV on Med	Effect of Med on DV	Direct effect	Indirect effect	Total effect	Variance	
	(IV)	(Med)	(DV)	(effects) p value	(Path a) p value	(Path b) p value	(Path C') p value (95%CI)	(a x b) 95%CI	(C) p value (95%CI)	(R <sup>2</sup> ) p value	
Age	Perceived accessibility	Satisfaction with social relationships	Depressive symptoms	(.02) n.s	(.65) .000	(-.59) .000	(-.43) .000	-.38	-.57, -.24	(-.53) .000	(0.42) .000
Education		Physical activity		(-.21) n.s	(.41) 0.008	(-.11) (0.008)	(-.62 to -.28)	-.05	-.09, -.016	(-.1.23- .69)	
Gender				(.32) n.s							
Marital status				(-.55) n.s							
Number of children				(.09) n.s							
Socioeconomic status				(1.58) (0.0005)							

\*p < .05. \*\*p < .01. \*\*\*p < .001.

Notes: Value labels of categorical variables: education (1 = ">12", 0 = "≤ 12"); gender (0 = man, 1 = woman); marital status (1 = with partner, 0 = without partner). n.s. = non significant.

As the ecological model suggests, high perceived accessibility increases the self-confidence of older adults to venture outside and become more physically active. Physical activity is known to reduce depressive symptoms and contribute to overall well-being (Lampinen et al., 2000; Rejeski & Mihalko, 2001; Sakar et al., 2013; Strohle, 2009). The current findings also support data concerning the connection between walkable environments with retail and other shops and low percentage of older adults suffering from depressive symptoms (Berke et al., 2007; Sakar et al., 2013). Walkable and thriving (numerous services and shops) environments invite and encourage older adults to venture outside of their homes and be physically active.

Several ramifications are derived from the study's findings. The study suggests that understanding older adults' depressive symptoms requires a multidisciplinary and comprehensive approach that relates to the characteristics of the individual, physical activity, social relations, and older adults' perception of their living environment. Therefore, greater collaboration and communication within and between experts of different disciplines (geographers, city planners, gerontologists, psychologists, and sociologists) is necessary to understand this complex phenomenon (Andrews, Cutchin, McCracken, Phillips, & Wiles, 2007). Univariable (perceived accessibility/satisfaction with social relationships/physical activity) measurement for purposes of reducing depressive symptoms can provide only a partial picture of this phenomenon. This study opens new venues for further research on the connection between perceived accessibility of the living environment and depressive symptoms of older adults and calls for further investigation of the factors that play a role in this relationship. For example, this study was conducted in cities in the periphery. It might be that in the country center or in rural areas, where the perceived accessibility and social relationships are different (blinded for review, 2019), other factors are responsible for depressive symptoms of older adults.

### 7. Conclusion

The present study stresses the vital role of environmental characteristics (e.g., perceived accessibility and person-environment fit) in determining depressive symptoms of older adults as mediated by improved satisfaction with social relationships and physical activity. The most significant conclusion is that high perceived accessibility is important and correlated with fewer depressive symptoms and, consistent with other studies, with other elements concerning the ability to age in place and improved quality of life in later life (blinded for review et al., 2017; Khalaila & Vitman-Schorr, 2018). The second conclusion concerns the mediation model: Perceived accessibility of the living environment

makes it easier and possible for older adults to venture out of their homes, potentially enhancing their physical activity and social relations, and enabling them to meet friends and family and interact with society. This, in turn, results in lower levels of depressive symptoms.

Another possible understanding of the correlation between the research variables is that perceived accessibility reflects more than the spatial-geographic distances between destinations; it also encompasses social aspects. This may explain why **people who experience a high level of perceived accessibility** are also satisfied with their social relationships and might also be satisfied with the walkability and accessibility of their environment. The natural result of which is the encouragement of greater physical activity.

#### 7.1. Implications

From the perspective of policy and practice, the study sheds light on the factors that can increase or decrease older adults' depressive symptoms, where people live and act. To enable aging in place and active aging and to make living environments more age-friendly, there is a need to address the factors that encourage depressive symptoms at the local level and remove spatial barriers that hinder perceived accessibility and participation of older persons in the living environment (through social relationships and physical activity). This can improve their well-being as well as contribute to community cohesion and intergenerational solidarity and promote the overall quality of life of older adults. Because aging in place is becoming a pivotal policy issue in many aging societies, service providers and policymakers should plan suitable, accessible, and age-friendly services for dependent and independent older adults in their living environment (such as more meetings points, more free outdoor gyms with roofing, benches in parks and along the streets, etc.) and to improve the person-environment fit in order to give older adults opportunities to age in place and enable them to move freely outside their homes (removing obstacles in the streets, constructing roofing against the rain and the sun, constructing rest areas, etc.).

**Perceived accessibility is not actual accessibility, it is based on the individual's assessment of accessibility.** Consequently, policy makers should make living environments more socially familiar and safe, because these are the variables associated with perceived accessibility (blinded for review, 2019). Moreover, older adults in small rural communities often report higher perceived accessibility (Curl, Nelson, & Anable, 2015). Hence, policymakers should make big city neighborhoods more like small settlements with respect to social participation and familiarity with the physical environment, as these aspects increase

perceived accessibility (Fokkema, de Jong, & Nijkamp, 1996).

## 8. Limitations

We should point out the limitations of the current study. One is the cross-sectional study design, which does not allow the prediction of a causal relationship between the variables. A future study should use longitudinal data to examine the relationship between perceived accessibility and depressive symptoms. Two additional limitations might be the sole reliance on subjective rather than objective measures of accessibility. However, previous studies have revealed that in the absence of objective measures, subjective measures of accessibility are robust (Stoeckel & Litwin, 2015). Another limitation concerning the subjective measure of accessibility is that the question asked was very general and basic and did not supply specific details concerning the subjective accessibility of the environment; hence, further research might use a more detailed question. A fourth limitation concerns the physical activity measure which did not categorize types of physical activity, rather addressed only the time spent doing physical activity. The fifth limitation concerns the recruitment of participants. Respondents were recruited from public spaces. This means that the sample consisted of a select, relatively mobile group of people, and that physically weak and immobile older adults were excluded. Future research should find a way to include homebound older adults as well. Finally, the data analysis did not differentiate between Hebrew and Arabic speaking participants.

Despite these limitations, the present study provides initial insights into the mechanisms of the association between perceived accessibility and depressive symptoms which have not been widely studied in this context so far.

## Conflict-of-interest disclosure form

When an author or the institution of the author has a relationship, financial or otherwise, with individuals or organizations that could influence the author's work inappropriately, a conflict of interest may exist. Examples of potential conflicts of interest may include but are not limited to academic, personal, or political relationships; employment; consultancies or honoraria; and financial connections, such as stock ownership and funding. Although an author may not feel that there are conflicts, disclosure of relationships and interests that could be viewed by others as conflicts of interest affords a more transparent and prudent process.

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## Declaration of competing interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jenvp.2020.101527>.

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