Journal of Housing and the Built Environment (2020) 35:1037–1054
https://doi.org/10.1007/s10901-020-09737-5

ARTICLE

Older adults' mental maps of their spatial environment: Exploring differences in attachment to the environment between participants in adult day care centers in rural and urban environments

Adi Vitman-Schorr[1] · **Liat Ayalon**[2]

Received: 27 June 2019 / Accepted: 15 February 2020 / Published online: 25 February 2020

Abstract
Familiarity with the environment, attachment to the environment and social ties are highly correlated with the ability to construct mental representations of the environment (mental maps). These are thought to influence older adults' lives in a variety of ways including: quality of life, health, well-being, social integration, accessibility, use of services, and the ability to age in place. The objectives of the current research were to examine what mental maps (defined as the integration of the objective features of the environment with our subjective representations) older adults attending adult day care centers (ADCC) draw and how attachment to their specific urban or rural environment is reflected in the maps. The method included researchers interviewed older adults attending urban and rural ADCCs. The interview included a demographic questionnaire and the drawing of a mental map of the ADCC, after being asked to "Please draw the surroundings of the ADCC and mark all the important places." Level of attachment was analyzed by measuring the number of map items reflecting the variables of familiarity and social participation and ties. Our results show that older adults from the rural ADCC drew more social items and more detailed maps compared to urban older adults. This suggests that their attachment to the living environment is stronger. The research conclusion is that Mental maps can be an effective tool for measuring the level of attachment to different environments. Moreover, mental maps can give professionals essential information related to specific items in the environment that are important and meaningful to older adults. These aspects of attachment may not be determined from standard questionnaires.

Keywords Mental maps · Environmental connection · Settlement type · Aging in place

✉ Adi Vitman-Schorr
adivitman@gmail.com

Liat Ayalon
liat.ayalon@biu.ac.il

[1] Shamir Research Institute, Haifa University, 1290000 Kazrin, Israel

[2] School of Social Work, Faculty of Social Science, Bar Ilan University, 5290002 Ramat Gan, Israel

The living environment (in which older adults spend most of their time) and the perceptions older adults have of that environment influence older adults' lives in a variety of ways (Krause 2006; Lawton 1999), among them: quality of life, health, well-being (Iwarsson et al. 2007), social integration, social involvement (Vitman-Schorr et al. 2013), accessibility and use of services (Vitman-Schorr et al. 2017), and the ability to age in place (Iecovich 2014). Familiarity with one's living environment is essential for independent living and is particularly important for maintaining personal autonomy and quality of life (Hinton 2011; Rowles 1983) but is not sufficient. Attachment to one's living environment, feeling part of the environment and a strong "sense of place" are also very important to maintaining a high level of well-being and social participation and, as a result, a high quality of life (Vitman-Schorr et al. 2017). Familiarity with and attachment to the living environment are also highly correlated with the ability to construct mental representations of the environment (mental maps) (Boschmann and Cubbon 2014). Familiarity with the environment makes it easier to recognize items and monuments in the environment and therefore to easily create more detailed and elaborated mental maps (Lachini et al. 2009). Familiarity with the environment is part of the intimate recognition with it, and awareness of its details. Therefore, part of being connected to a place is familiarity with the physical environment (Rowles 1983). The current research examines whether there are differences regarding attachment to the environment, as reflected in mental maps, between older adults living in rural and urban settlements.

1 Mental maps

Comprehending one's environment is a cognitive process and the psychological transformation processes by which individuals gather, retrieve, arrange, store, encode, and interpret information related to characteristics of their environment are called "mental mapping" (Boschmann and Cubbon 2014; Downs and Stea 1973; Somdahl-Sands 2015). The creation of a mental map varies from group to group and from person to person, and is determined by personal experiences, personal characteristics, individual differences (Hirtle and Hudson 1991; Kozlowski and Bryant 1977; Montello et al. 1999) and feelings toward particular places (Curtis 2016; Downs and Stea 1973; Gieseking 2013). Differences in mental maps are also due to the fact that people interpret things differently, even those that seem to be objective.

The creation of mental maps is also associated with spatial memory. The spatial memory becomes more accurate and detailed as the time spent by the individual in the environment is longer and the acquaintance with the environment is deeper (Bryant 1982; Siegel and White 1975). However, sometimes, the environment is too complex and for that reason, the mental map lacks the expected details and accuracy, even after spending a long time in the same environment (Lindberg and Gärling 1982; McDonald and Pellegrino 1993; Moeser 1988).

Therefore, the perception of one's environment is actually a personal-individual interpretation helped by the individual's senses; the mental map expresses the maker's understanding of the spatial environment (Campbell et al. 2009; Coulton et al. 2013). Mental maps are texts that contain many types of symbols (Duncan and Ley 1994; Matteucci and Önder 2018; Soini 2001). These symbolic values are the semiotic resources of the landscape and vary a great deal between individuals. In this respect, landscapes are reflections of cultural identities rather than of the natural environment. The physical environment is

transformed into landscapes in our minds, and cultural groups transform these landscapes through the use of different symbols—symbols that confer different meanings to the same physical objects (Gillespie 2010).

In every person's mind there exists a pool of mental maps of places visited, which represent expressions of the environment in his or her eyes. Every activity involving interaction with the environment, such as driving to work, walking to school, and walking to a clinic or an adult day care center, adds another layer to the mental map. Mental maps are not only organized and designed according to the individual's pool of experiences, they have a great significance for one's overall functioning and development. Mental maps enable the individual to navigate, to relate to events, to understand phenomena, and to make decisions about the environment (Cops 2013).

The expression of mental mapping of certain spaces may be different in different population groups according to their age, culture, socio-economic status, and activity level in the environment (Campos-Delgado 2018; Didelon-Loiseau et al. 2018; Teo Siew 1994). For example, a child's perception of the environment is different from that of an adult and an adult's perception is different from that of an older adult (Kirasic 2000). Children describe their living environment in great detail because they experience it as a very specific space where they interact intensively with its elements. These spaces include school, where they meet friends, engage in hobbies and activities, shop and more. Most of the time, the elements in that specific space are perceived as larger than elements in far away and strange spaces (Gillespie 2010; Haynes 1981; Rowntree 1997; Teo Siew 1994).

In general, studies of mental maps can explain how diverse groups comprehend the same space and utilize that information to improve planning, transportation, and social integration (Bar-Gal 2003; Gillespie 2010; Hannes et al. 2012). An interesting study conducted in the United States reported differences in the perceptions of Whites living in the suburbs and African-Americans living in the city center under inferior conditions. The White participants had mental maps with the main commerce areas, shopping centers, and main roads that connected important elements. The African-American participants drew mental maps of their nearby surroundings because they did not often leave their neighborhood (Haynes 1981). These findings support the notion that the environmental image and level of knowledge of the details constructing the environment are correlated with the level of individual activity in the described space (den Besten 2010; Pearsall et al. 2015; Teo Siew 1994; Wridt 2010).

2 Attachment to the environment

There are many different definitions concerning place attachment. In the early 1960s, the emphasis was on affective bonds between persons and places (Korpela 2012). Currently, the definition of the concept can be summarized into a three-dimensional framework: person–psychological process–place (Scannell and Gifford 2010). The person and the most researched dimension (Lewicka 2011; Hummon 1992) of place attachment refers to its social meanings of attachment. The psychological process dimension includes the affective, cognitive, and behavioral components of attachment. The place dimension emphasizes the place characteristics of attachment, including the spatial level (what is the spatial magnitude an individual feels attached to—only the house, the whole neighborhood, the city, etc.) (Hidalgo and Hernandez 2001), and the prominence of social or physical elements of

the environment. These aspects of place attachment can be seen and analyzed in mental maps (Hidalgo and Hernandez 2001; Hummon 1992; Scannell and Gifford 2010).

Mental maps do not only express one's physical environment but also the relationship between the individual and the environment (Boschmann and Cubbon 2014; Catney et al. 2018; Lloyd 1999; Pearsall et al. 2015). Attachment to and familiarity with the environment are associated with high quality of life, level of activity in everyday life (Michael et al. 2006; Richard et al. 2008; Vitman-Schorr et al. 2017), ability to age in place (Davies and James 2011; Wiles et al. 2017), and maintaining social participation in one's living environment (Morita et al. 2010).

The mental maps drawn by older adults are thought to reveal their familiarity with their environment, their connection, and even their activity level, given the correlation between familiarity and activity (Catney et al. 2018; Madriaga 2010; Rowntree 1997; Teo Siew 1994). Accordingly, the drawing of mental maps is a means of "externalizing" a complex aggregate of ideas, attitudes, connection, and information that individuals and groups of individuals possess about their living environment (Soini 2001).

Attachment to the environment is not only expressed by familiarity with one's physical environment, but also by strong feelings of belonging to a place and being part of its social and cultural fabric for many years (De Donder et al. 2012; Wiles et al. 2012). These feelings develop, in most cases, after many years of residence (Shamai 1991). According to Rowles's theory of insideness (1983, 1993), there are three dimensions of attachment to place: physical insideness, social insideness, and autobiographical insideness.

Physical insideness refers to intimate recognition and familiarity with the environment and awareness of its details, hence, part of being connected to a place is familiarity with the physical environment (Rowles 1983). That kind of intimate familiarity with spaces comes from years of navigating in the same place and walking the same paths. It is more likely to occur in rural places (Husband 2001) but also has been reported in urban environments (Vitman-Schorr et al. 2015).

A sense of place is also measured by social insideness, measured by the extent of relationships with friends and family and level of participation in social activities in the environment (Cavalli et al. 2007; Toepoel 2011). According to Rowles (1986), rural environments provide a supportive context for older adults, due in part to the availability of "indigenous social support networks and a sense of identification as an 'insider' and as 'being known' that stems from residence in a low-density environment (Rowles 1986, p.516). The stronger community bonds in rural settings can also stimulate volunteering and civic participation" (Rowles 1986, p. 516).

Recent studies using mental maps have addressed the ability to draw memories (e.g., autobiographical insideness) (Brown 2012), the ability to indicate place location, differences in orientation between older and younger adults, and the level of familiarity with one's living space (Meneghetti et al. 2013). However, there is little research using older adults' mental maps to understand familiarity and attachment to their environment or research comparing mental maps drawn by older adults living in different settlement types.

3 Settlement types

The living environment and the settlement type influence the attachment of older adults to their environment (Vitman-Schorr et al. 2015, 2017). Small rural areas are characterized by feelings of safety, high walkability, less traffic, and green open spaces that

promote social interaction and walking activity of older adults (Michael et al. 2006). Moreover, rural settlements are characterized by strong social integration and social support, facilitating a greater degree of interaction with friends and neighbors (Burholt 2006).

A study comparing familiarity and social support of city and rural kibbutz (communal settlement) residents reported that in the much larger and more highly populated city, people were less familiar with their fellow inhabitants and mutual responsibility existed mainly between family members or close neighbors (Vitman-Schorr et al. 2015). City distances are also much greater and people commonly travel by bus, car or bicycle. The kibbutz, on the other hand, is characterized by collective and communal life with high mutual responsibility. The community is very small, the people live in a well-defined space, the residents know the place well, and generally get around by foot, bicycle or electric mobility scooters (Vitman-Schorr et al. 2015). Older adults in rural settlements maintain more social relations than those who live in large urban environments; hence, they have a greater sense of belonging than urban older adults (Vitman-Schorr et al. 2017). Differences between rural and urban older adults with regard to familiarity with and attachment to the environment and social support and connection should, therefore, influence their mental map drawings.

In light of a gap in information regarding older adults' mental maps and in order to increase understanding of the differences between mental maps drawn by older adults from different settlement types, the current research aims to examine the ways older adults draw mental maps, how their attachment to the environment is reflected in the maps, and through this explore the special characteristics of rural and urban groups of older adults. The importance of the study is inherent in the significance of the environment to older adults' well-being and quality of life.

3.1 Current study

The present research examined the mental maps of attendees of Israeli adult day care centers (ADCCs) for differences in attachment to the environment between urban and rural older adults. ADCCs are a care alternative for older adults who suffer from functional impairments (Baumgarten et al. 2002). This care alternative is currently funded in Israel by the Long-Term Care Insurance Law, adopted in the late 1980s with the goal of enabling older adults to age in place (Campbell 2015). ADCCs in Israel are open five or six days per week and provide services for six to seven hours per day. Services include recreational and social activities, transportation, nutritious meals, and health services including physical and occupational therapy, nursing care, and dietary supervision. Additional care and beauty services such as showering, shaving, and pedicure can be purchased for extra fees (Iecovich and Biderman 2012).

ADCCs are formal (paid) attempts to reduce the sense of loneliness among older adults by providing them with a variety of opportunities for social interaction (Iecovich and Biderman 2012). ADCCs are segregated by age and geography, so that only people over a certain age are eligible to participate, and the place, itself, is defined spatially (Campbell 2015). Because connection to the environment seems to be very important in order to age in place (Davies and James 2011; Wiles et al. 2017) and maintain social participation in the living environment or main active environment (Morita et al. 2010), the present study examines whether there are differences regarding the attachment to the environment between rural and urban ADCC participants, as reflected in their mental maps.

3.1.1 Research hypotheses

1. The mental maps drawn by the participants depict their attachment to the environment because mental maps reflect, through drawing, many of the feelings a person has toward the place drawn (Curtis 2012, 2016; Gieseking 2013). According to the literature review, the mental map is more than drawing one's surroundings, people choose to draw the most important and meaningful items in their environment, because these are the items that have the greatest influence on them. The level of attachment to the environment can be inferred based on the items chosen, their amount and their belonging to a specific category (Boschmann and Cubbon 2014; Catney et al. 2018; Curtis 2016; Lloyd 1999; Madriaga 2010; Pearsall et al. 2015).
2. Elements drawn in the mental maps of rural participants will be different from elements drawn in the mental maps of urban participants. Because the mental maps reflect the surrounding environment, and are impacted by its complexity (Lindberg and Gärling 1982; McDonald and Pellegrino 1993; Moeser 1988), it is expected that rural participants, who live in a simpler environment will be able to draw more detailed maps, with more elements in it, and urban participants, who live in more complex environments will draw less detailed maps. The elements in the maps are expected to differ as well, because the rural environment is different from the urban environment (Bar-Gal 2003).
3. Attachment to the environment, as depicted by the mental maps, will be greater for older adults in the rural ADCC than for older adults in urban ADCCs, and this difference can be attributed to the characteristics of rural settlements [smaller communities, less traffic, more green spaces, and greater feelings of safety (Burholt 2006; Michael et al. 2006)]. The literature concerning attachment to the environment indicates that rural older adults feel more connected to their living environment compared to their urban counterparts (Rowles 1983; Mookherjee 1998; Vitman-Schorr et al. 2015, 2017). It is expected that these differences will be shown in the mental maps.

4 Method

4.1 Sample

The study was supported by a grant from the Israel Science Foundation 537/16. For the purpose of this study, which represents an added sub-aim of the overall project, all users of three ADCCs were approached for potential participation. Study participants were older adults regularly attending ADCCs in the Israeli cities of Ramat Gan and Tel Aviv and in one rural settlement, a Kibbutz in the dessert of Israel. Ramat Gan and Tel Aviv are located in Israel's coastal plain and the Kibbutz is located in the south of the country. At the time of the study, the population of Ramat Gan was 153,674 (with 17% older adults, aged 65 and over) and the population of Tel-Aviv was 438,818 (with 14.2% older adults, aged 65 and over). The Kibbutz's population consisted of 866 people (with 8.3% older adults, aged 65 and over; Central Bureau of Statistics 2018).

Background information concerning the settings was provided by the social worker of each setting and s/he directed us not to approach older adults with dementia or major health issues. This indication, in addition to not speaking Hebrew or English constituted the exclusion criteria. BM, one of the two urban ADCCs, is a 130-person setting, with

relatively homogenous participants in terms of functional level and geographical residence. The average age of participants was 85 (SD = 6.2), 65% of them were women. The average number of years of education was 9.2 (SD = 4.0) and level of impairment in activities of daily living (ADL; range 0–4) was 1.0 (SD = 1.3).

In contrast, KS, the second urban ADCC, is a 71-person setting, which offers services to two different populations: those impaired in ADL and independent older adults who attend a club in the same facility. In the present study, only the older adults with functional impairments, who attended the ADCC were interviewed. The average age in this ADCC was 80.6 years (SD = 14.4), 73.2% of the participants were women. The average number of years of education was 7.1 (SD = 5.6) and the average ADL score was 1.4 (SD = 1.6).

BG, the rural ADCC located in a kibbutz includes 74 older adults from different rural settlements in the area. BG participants ranged in functional level from physically dependent to completely independent older adults who viewed themselves as volunteers in the arts and crafts workshop. The average age of participants was 82.0 years (SD = 7.7), 61.0% of them were women, with an average level of education of 10.7 years (SD = 3.6) and average ADL of 0.4 (SD = 1.1).

All participants in the respective settings, who met the eligibility criteria detailed above were invited to participate in the study. Response rate to the mental map task was low and ranged between 12% and 28% in each of the settings. The number of participants in each setting was as follow: 20 participants in BM, 20 in KS, and 9 in BG.

4.2 Procedure

The study was approved by the ethics committee of the PI's university. All participants signed an informed consent. Potential participants at each ADCC received written and oral explanations about the study. Participation was voluntary and respondents could opt out of the study at any time. Trained research assistants administered questionnaires (included age, gender, years of education) during face-to-face interviews with the participants in a phase that lasted from November, 2016 to October, 2017; in each of the settings, interviews were conducted for about three to 4 months. After completing the questionnaire, participants were asked to draw a mental map. They were handed an A4 sheet of paper and told: "Please draw the surroundings of the ADCC and mark all the important places. You can add names of streets/buildings and elements which seem important to you."

4.3 Data analysis

In the first stage, univariate analyses were performed to describe the socio-demographic characteristics of respondents and to examine the distribution of the study variables, using independent *t* test analyses for continuous variables (e.g., age and education years) and Chi square analyses for categorical variables (e.g., gender). In the second stage, an analysis of the mental maps was conducted according to the seminal research on spatial behavior by Lynch (1960), Blaut and Stea (1971), Saarinen (1973) and Appleyard (1969), who used sketch-mapping (drawn maps) as a form of graphic, unstructured recall mapping to understand how people make sense of their environments. This study used sketch mapping analysis to identify characteristics reflecting attachment to the environment for each of the settlement types.

Attachment to the environment is based on familiarity with the environment and social participation and ties. Familiarity with the environment was measured by the average

number of items drawn by the participants, the average number of transportation items, and level of the maps' detail. The aspect of social participation and ties was measured by the average number of social items drawn by the participants and by the similarity level of the maps (how many older adults from the same setting drew the same items/streets/buildings).

The maps were analyzed thematically (Elo and Kyngäs 2008; Miles et al. 2013) and subsequently quantitative descriptive analysis was conducted to explore differences across sites. We approached the maps using open-coding of the smallest units of meaning in the map: a dining room, a garden, a bench, a name of a street, etc. Initially, each map was analyzed separately. Subsequently, codes were collapsed into larger categories of meaning while comparing and contrasting within and across maps. At this stage, each map was reviewed again. Comparisons and contrasts were conducted within and between maps to collapse the smaller units of meaning into larger categories (see Fig. 1 as an example of the analysis procedure). The large categories of meaning were (1) Transportation: highways, railroads, sidewalks, roads, and others; (2) Social: the ADCC building, a synagogue, a garden, trees, benches, a museum, a theater, and others; and (3) Functional: a reception area, a supermarket, a bank, a health clinic, a school, and others.

Two researchers coded the maps. The reliability was high for the analyzed topics. ICC (Landers 2011) was used to compute inter-rated reliability. The ICC was 0.89 for transportation items, 0.92 for social items, and 0.84 for functional items.

The analysis of the mental maps consisted of measuring the average items per setting, average items for the categories of transportation, social, and function, the overall level of detail of the map of the surroundings or of the inside of the ADCC, and the level of map similarity. These are detailed below.

Fig. 1 A map from BG (rural ADCC). This figure is given here as an example of the coding methods. The map is in Hebrew and the smallest units are the drawn rooms (carpentry, sewing, Dafna (name of person), paint)

4.3.1 Level of detail of the map

Determined by the number of items (from all categories) drawn in each individual map. The overall number of items was represented as a score, which ranged between one and four for each individual map. This was done in the following manner:

Score 1 = The participant drew the ADCC with two items or less (e.g., with no detail at all, with only general words such as "I love living here," or with up to two items from either the outside, inside, or one of each).
Score 2 = The participant drew three to four items or details about the function of two to three rooms/areas in the ADCC
Score 3 = The participant drew five to six items or details about the function of four rooms/areas in the ADCC
Score 4 = The participant drew at least seven items or details about the function of five rooms/areas in the ADCC.

After obtaining scores for all maps of a particular setting, the average score was calculated for the setting, representing the setting's overall level of detail.

4.3.2 Maps' point-of-view

The score for point-of-view was calculated based on whether the drawing depicted the surroundings of the ADCC or the inside of the ADCC: 1 = surroundings; 2 = inside; 3 = surroundings and inside; 0 = only words (e.g., "I love being here," "the company is nice") or painting of flowers/hearts/other objects that cannot be translated into a meaningful unit.

4.3.3 Level of ADCC similarity

Level of ADCC similarity measured how many older adults from the same setting drew the same items/streets/buildings. The level of similarity analysis measured the ADCC as a whole. It consisted of counting the number of maps with the same items from the same ADCC. After counting the repeated items, we calculated the average number of repeated items per map. The higher the average repeated items, the higher the ADCC similarity.

After analyzing the mental maps, the quantitative analysis consisted of independent *t* test (for continuous variables) and Chi square analyses (for categorical variables), in order to compare the two settings on the properties indicated above.

5 Results

The majority of the participants in all settings were women. In BM (urban), the age, measured in years, ranged between 71.8 and 94.9 ($M = 85.28$, SD = 5.51); in KS (urban), the age ranged between 66.91 and 87.36 ($M = 76.51$, SD = 5.91); in BG (rural), the age ranged between 79.8 and 91.71 ($M = 86.01$, SD = 4.2). For the total sample, the age ranged between 66.91 and 94.88 ($M = 81.76$, SD = 7.0). There were significant

Table 1 Descriptive statistics of study variables in total sample and by settlement type using independent *t* test and Chi square analyses ($N=49$)

Background characteristics		Total sample	Settlement type				
			Urban $N=40$			Rural BG $N=9$	F/χ^2 p value
			BM	KS	total		
Gender—*N* (%)	Men	18 (36.7%)	8 (40%)	6 (30%)	14 (35%)	4 (44.4%)	0.23 $p=0.45$
	Women	30 (61.2%)	11 (55%)	14 (70%)	25 (62.5%)	5 (55.6%)	
	Missing value	1 (2.1%)	1 (5%)		1 (2.5%)		
Education years—M (S.D)		9.63 (4.85)	9.3 (4.1)	9.7 (6.0)	9.5 (5.0)	10.33 (3.14)	1.15 $p=0.29$
Age—*M* (*S.D*)		81.76 (7.0) Range 66.9–94.9	85.28 (5.51)	76.51 (5.91)	80.78 (7.18)	86.01 (4.2)	4.21* $p=0.04$

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

differences in age based on settlement type: urban participants were younger, $M = 80.78$, $SD = 7.18$ and rural participants were older, $M = 86.01$, $SD = 4.2$. There were no significant differences in level of education based on settlement type (Table 1).

The mental map analysis of the three ADCCs (Table 2) revealed the following results, as detailed bellow:

BG Older adults from the rural kibbutz ADCC drew no transportation items at all, and drew more social items (average of 2.8 per map) than urban older adults. The items drawn by the rural participants were: the ADCC itself, carpentry, sewing workshop, dining room, and the ceramic workshop. The older adults from the rural ADCC also drew more detailed maps (average score of 2.2 per map), the maps' point of view of the rural participants was from the inside, and the level of similarity was higher: Out of the nine maps, the carpentry repeated in five, the sewing room repeated in four, the office repeated in three, and the garden repeated in two maps (Table 2).

BM Older adults from that first urban ADCC drew an average of 0.8 transportation items per map. They drew fewer social items than their rural counterparts, with an average of 1.7 per map. The items were: a garden, the ADCC, a synagogue, parks, a bench, and a dining room. Older adults from the BM urban ADCC also drew less detailed maps compared to rural older adults (average score of 1.8 per map), the maps' point of view of the BM participants was from the outside and the level of similarity was lower than that of the rural ADCC with one item, the garden, repeating in seven out of 20 maps, two other items, a bench and a school, repeating in four out of 20 maps. Almost all the maps drawn by the urban BM ADCC participants were drawn from the outside (Table 2).

KS Older adults from the second urban ADCC drew an average of 1.5 transportation items per map. They also drew fewer social items, with an average of 1.9 per map. The items were: a garden, the ADCC, a synagogue, parks, a dining room, a senior club, and the community center. The older adults from the KS urban ADCC also drew more detailed maps compared with the rural and other urban ADCC (BM) older adults (average score of 2.5 per map) the maps' point of view of nearly all the KS participants was from the outside and the level of similarity was lower than the rural ADCC with one item, the supermarket, repeating in seven out of 20 maps and two items, the garden and a bank, repeating in three out of 20 maps (Table 2).

After analyzing the mental maps of each setting separately, we combined the results for the urban settings given their resemblance (there were no significant differences between the maps of BM and KS, apart for the detailed level of the map, see Table 2). The resemblance concerned the features drawn in the maps, but also the ADCCs' urban surroundings. After combining the results of the two urban ADCCs, it was possible to compare the urban and rural mental maps (Table 2). Differences were found for the average number of transportation items (0 in the rural maps and 0.95 per map in the urban), average number of social items (3.22 per map in the rural maps and 1.6 per map in the urban), average level of details of the maps (2.22 in the rural maps and 1.95 in the urban), the maps' point-of-view (the rural maps were all drawn from the inside and 31 of 40 urban maps were drawn from the outside) and level of similarity which was higher in the rural ADCC compared to the urban ones (0.92 in the rural maps and 0.19 in the urban).

Table 2 Mental maps drawn in the different living arrangements and different settlements using independent *t* test and Chi square analyses ($N=49$)

Analyzed aspects	Urban ($N=40$)				Rural ($N=9$)		
	BM	KS	Total	F/χ^2 *p* value (between BM and KS)	BG	F/χ^2 *p* value (between urban and rural settings)	Effect Hedges' *g*/Phi
Items in the maps	Total items in the settlement type/ADCC (M, SD)						
Transportation	16 ($M=0.8$; SD = 1.4)	30 ($M=1.5$; SD = 1.7)	38 ($M=0.95$; SD = 1.36)	1.37 $p=0.25$	None	10.70** $p=0.00$	n/a
Social	32 ($M=1.7$; SD = 1.3)	37 ($M=1.9$; SD = 1.2)	64 ($M=1.6$; SD = 1.28)	0.11 $p=0.74$	29 ($M=3.22$; SD = 2.64)	15.52*** $p=0.00$	1.01
Functional	18 ($M=0.9$; SD = 1.1)	25 ($M=1.3$; SD = 1.1)	43 ($M=1.08$; SD = 1.42)	0.001 $p=0.97$	6 ($M=0.67$; SD = 1.66)	0.03 $p=0.87$	0.28
Total characteristics of the map	Total items in the settlement type/ADCC (M, SD)						
Total items	66 ($M=3.3$; SD = 2.7)	92 ($M=4.6$; SD = 2.6)	146 ($M=3.65$; SD = 3.02)	0.37 $p=0.55$	35 ($M=3.89$; SD = 3.98)	0.78 $p=0.38$	0.07
Average detailed level of the map	1.8 (SD = 1.1)	2.5 (SD = 1.2)	1.95 (SD = 1.13)	5.35 $p=0.03$	2.22 (SD = 1.48)	3.90* $p=0.05$	0.22
Maps' point-of-view	Inside—1 (5%) Outside—13 (65%) Both—5 (25%) Only words—1 (5%)	Inside—2 (10%) Outside—17 (85%) Only words—1 (5%)	Inside—3 (7.5%) Outside—30 (75%) Both—5 (12.5%) Only words—2 (5%)	1.33 $p=0.51$	Inside—8 (89%) Both—1 (11%)	34.0*** $p=0.00$	0.88
Mean level of ADCCs' similarity	0.20 (SD = 0.14)	20.17 (SD = 0.15)	0.19 (SD = 0.14)	0.92 $p=0.35$	0.51 (SD = 0.06)	6.34** $p=0.02$	2.46

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

6 Discussion

The goal of the current research was to gain a deeper understanding of what is reflected in the mental maps of older adults and to examine differences in attachment to the environment between older adults living in rural and in urban communities using mental maps drawn by the study participants. Determining attachment to one's environment (physical and social) is important as higher attachment is correlated with the ability to age in place, the well-being of older adults, their quality of life, and their ability to be socially involved (Iecovich 2014; Vitman-Schorr et al. 2013). The research findings reveal that older adults who live in different settlement types have different mental maps. Their varying points of interest and emphasis indicate a different attachment to their environment. Rural ADCC participants drew the inside of the ADCC and included more detail and social elements in their maps. In contrast, urban ADCC participants drew the outside of the ADCC and included more transportation items. The level of similarity of the ADCC maps was also higher for rural ADCC participants.

These results possibly indicate a different level of attachment to rural and urban environments, which is consistent with other studies of the way different groups map their surroundings. Mental maps are influenced not only by their creators, but also by the structure of their settlement types (Haynes 1981; Lynch 1960). Moreover, the expression of mental mapping of certain spaces may be different for different population groups according to age, culture, socio-economic status, and activity levels in the environment (den Besten 2010; Catney et al. 2018; Haynes 1981; Rowntree 1997; Teo Siew 1994).

Both urban and rural groups drew unique maps characterizing their lifestyle in the particular settlement type. Level of attachment to the environment is indicated in the mental maps of both groups by examining the two aspects of attachment, familiarity and social participation and ties. In comparison to the maps drawn by older adults living in rural settlements, those drawn by urban older adults indicate lower attachment to their environment, validating the research hypothesis. With regard to familiarity with the environment, the urban older adults drew many more transportation items, but the maps were less detailed. With regard to social participation and ties, they drew fewer items in the social rubric and the level of similarity was low. The maps of the older adults attending the rural ADCC reflect greater connection to the environment. With regard to familiarity with the environment, the rural kibbutz ADCC participants did not draw transportation items at all; however, their maps were more detailed. With regard to social participation and ties, they drew more items in the social rubric and the level of similarity was high.

The analysis of attachment to the environment indicates that concerning familiarity with the environment there was no clear difference between the rural and urban older adults. However, the rural ADCC participants scored higher for the aspect of social participation and ties. These results can be explained by the different point-of-view for each settlement type, the urban participants drew their maps from the outside of the ADCC, and the rural participants drew their maps from the inside of the ADCC. This difference can indicate the place to which the participants feel connected: The older adults from the urban ADCCs expressed greater connection to the city and the outside environment, whereas the rural participants expressed greater connection to the ADCC building itself. This difference is most likely due to the fact that older adults attending the urban ADCCs used the city for other personal needs and hence felt connection to the city, whereas the older adults attending the rural ADCC who came from other area settlements used only that facility in that particular kibbutz (the kibbutz ADCC gather few rural settlements under one roof)

and hence did not express connection to the kibbutz outside of the ADCC. This may also explain the rural older adults' greater expression of social participation and ties, because attending the ADCC is the main activity these older adults do in that specific kibbutz.

As internal representations of the outside world, mental maps contain memories and feelings about the environment and society, capturing impressions of the environment, one's relationship to it, and relationships with the people in it. By looking at the drawn items, we can identify the most important items in the environment and their pattern of use. Moreover, examining and comparing maps of different groups of people can be an effective tool for advanced analysis, providing information about relationships between people and their connections to the environment. A group of older adults who separately draw quite similar maps indicates that the places they draw have important social meanings for them and that they perceive them in a similar way—they all chose to draw the same items and they included many social items. The analysis indicates that these older adults were connected to the place where they spent considerable time and probably had social relations with the other residents (Gillespie 2010). Drawing maps with a high level of detail of the outside surroundings suggests that the urban older adults who drew the maps were active in the environment, because the environmental image and knowledge of the details constructing the environment are connected to the level of the individual's activity in the described space (Teo Siew 1994). Older adults who are active in the environment, use services, go to friends, and use entertainment facilities, know their environment better and are more connected to it (Vitman-Schorr et al. 2017). Additionally, the mental maps enable us to see which items in the environment are the most important and where they are located.

6.1 Limitations

The study's limitations include its non-representative sample and the non-random division into two settlement types. Second, the researchers interpreted the maps without in-depth interviews with the older adults. Third, only a small number of individuals completed the maps in each of the settings; however, the number of respondents is similar or higher than that reported in other studies on mental mapping (Gillespie 2010; Jung 2014; Raanan and Shoval 2013; Singer and Bickel 2015). Forth, the samples are not homogeneous concerning a variety of demographic characteristics that differentiate the groups. For instance, some ADCC groups are older than others and this potentially results in a poorer spatial memory. Moreover, the very small sample size did not allow to control for a variety of demographic variables that differentiate between the samples and we did not adjust the analysis for multiple comparisons. It is important to note, however, that similar samples and analyses have been used in other studies on mental mapping (Catney et al. 2018; Singer and Bickel 2015). Moreover, there are some general disadvantages to mental mapping, among which are the difficulties of portraying a three-dimensional landscape in two dimensions (Lilley 2000). In addition to the possible drawing difficulties of the respondents, a further disadvantage of mental mapping lies in the recall of the person drawing the map.

6.2 Practice and policy implications

The study has substantial positive implications. The research supports the use of mental maps as a tool for measuring the level of attachment to the environment (physically and socially) and how this attachment is characterized in the different types of settlements. The study compared the difference in attachment to the environment between older adults

attending ADCCs in rural and urban residential settlements, as indicated by their mental maps. According to the findings, each settlement type confers a distinct benefit concerning one of the two aspects of attachment to the environment: the urban setting bestows more familiarity, whereas the rural setting fosters social participation and ties. In order to bring the benefits of the urban ADCCs to the rural ADCCs and vice versa, policy stakeholders should make every attempt to create the urban ADCCs as a defined, unified community with high social cohesion. In addition, efforts should be invested in making the surrounding environment of rural ADCCs more familiar to older adults. In that way, older adults will feel connected to the place and the people they meet there, addressing an important need associated with quality of and satisfaction with life in later life (Costa-Font 2013; Lawton 1991; O'Brien 2014).

References

Appleyard, D. (1969). Why buildings are known: A predictive tool for architects and planners. *Environment and Behavior, 1*(2), 131–156.

Bar-Gal, B. (2003). The mental map as visual and verbal medium. *Consideration and Research in Teachers Training, 9,* 117–151. **(In Hebrew)**.

Baumgarten, M., Lebel, P., Laprise, H., Leclerc, C., & Quinn, C. (2002). Adult day care for the frail elderly: Outcomes, satisfaction, and cost. *Journal of Aging and Health, 14*(2), 237–259.

Blaut, J., & Stea, D. (1971). Studies of geographic learning. *Annals of the Association of American Geographers, 61*(2), 387–393.

Boschmann, E. E., & Cubbon, E. (2014). Sketch maps and qualitative GIS: Using cartographies of individual spatial narratives in geographic research. *The Professional Geographer, 66*(2), 236–248.

Brown, C. H. J. (2012). In living memory: Mapping the landscape of Greenham and Crookham commons. *Memory Studies, 5*(4), 425–444.

Bryant, K. J. (1982). Personality correlates of sense of direction and geographic orientation. *Journal of Personality and Social Psychology, 43*(6), 1318–1324.

Burholt, V. (2006). 'Adref': Theoretical contexts of attachment to place for mature and older people in rural North Wales. *Environment and Planning A, 38,* 1095–1114. https://doi.org/10.1068/a3767.

Campbell, N. (2015). Designing for social needs to support aging in place within continuing care retirement communities. *Journal of Housing and the Built Environment, 30*(4), 645–665.

Campbell, E., Henly, J. A., Elliott, D. S., & Irwin, K. (2009). Subjective constructions of neighborhood boundaries: Lessons from a qualitative study of four neighborhoods. *Journal of Urban Affairs, 31*(4), 461–490.

Campos-Delgado, A. (2018). Counter-mapping migration: Irregular migrants' stories through cognitive mapping. *Mobilities, 13,* 488–504. https://doi.org/10.1080/17450101.2017.1421022.

Catney, G., Frost, D., & Vaughn, L. (2018). Residents' perspectives on defining neighborhood: Mental mapping as a tool for participatory neighborhood research. *Qualitative Research*, *19*(6), 735–752.

Cavalli, S., & Bickel, J. F. (2007). Exclusion in very old age: The impact of three critical life events. *International Journal of Ageing and Later Life, 2,* 9–31. https://doi.org/10.3384/ijal.1652-8670.07219.

Central Bureau of Statistics. (2018). Population survey. Retrieved June 10, 2018, from http://www.cbs.gov.il/census/census/main_mifkad08_e.html.

Cops, D. (2013). The role of autonomous mobility in public space on fear of crime among adolescents. *Journal of Youth Studies, 16,* 1105–1122. https://doi.org/10.1080/13676261.2013.793790.

Costa-Font, J. (2013). Housing-related well-being in older people: The impact of environmental and financial influences. *Urban Studies, 50,* 657–673. https://doi.org/10.1177/004209801245624.

Coulton, C. J., Jennings, M. Z., & Chan, T. (2013). How big is my neighborhood? Individual and contextual effects on perceptions of neighborhood scale. *American Journal of Community Psychology, 51,* 140–150. https://doi.org/10.1007/s10464-012-9550-6.

Curtis, J. W. (2012). Integrating sketch maps with GIS to explore fear of crime in the urban environment: A review of the past and prospects for the future. *Cartography and Geographic Information Science, 39,* 175–186.

Curtis, J. W. (2016). Transcribing from the mind to the map: Tracing the evolution of a concept. *Geographical Review, 106,* 338–359. https://doi.org/10.1111/j.1931-0846.2016.12193.x.

Davies, A., & James, A. (2011). *Geographies of ageing: Social processes and the spatial unevenness of population ageing*. Surrey: Ashgate.

De Donder, L., De Witte, N., Buffel, T., Dury, S., & Verté, D. (2012). Social capital and feelings of unsafety in later life: A study on the influence of social networks, place attachment, and civic participation on perceived safety in Belgium. *Research on Ageing, 34,* 425–448. https://doi.org/10.1177/0164027511433879.

den Besten, O. (2010). Local belonging and 'geographies of emotions': Immigrant children's experience of their neighborhoods in Paris and Berlin. *Childhood, 17,* 181–195.

Didelon-Loiseau, C., de Ruffray, S., & Lambert, N. (2018). Mental maps of global regions: Identifying and characterizing "hard" and "soft" regions. *Journal of Cultural Geography, 35,* 210–229. https://doi.org/10.1080/08873631.2018.1426950.

Downs, R. M., & Stea, D. (1973). Cognitive maps and spatial behavior. In R. M. Downs & D. Stea (Eds.), *Image and environment* (pp. 248–288). London: Aldine Publishing Company.

Duncan, J., & Ley, D. (1994). Introduction: Representing the place of culture. In J. Duncan & D. Ley (Eds.), *Place/Culture/Representation* (2nd ed., pp. 1–21). London: Routledge.

Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing, 62*(1), 107–115. https://doi.org/10.1111/j.1365-2648.2007.04569.x.

Gieseking, J. J. (2013). Where we go from here: The mental sketch mapping method and its analytic components. *Qualitative Inquiry, 19*(9), 712–724.

Gillespie, C. A. (2010). How culture constructs our sense of neighborhood: Mental maps and children's perceptions of place. *Journal of Geography, 109,* 18–29.

Hannes, E., Kusumastuti, D., Espinosa, M. L., Janssens, D., Vanhoof, K., & Wets, G. (2012). Mental maps and spatial behavior: Meanings and models. *Journal of Geographic Systems, 14,* 143–165. https://doi.org/10.1007/s10109-010-0144-2.

Haynes, R. M. (1981). *Geographical image and mental maps*. New York: Macmillan Education.

Hidalgo, M. C., & Hernandez, B. (2001). Place attachment: Conceptual and empirical question. *Journal of Environmental Psychology, 21*(3), 273–281.

Hinton, D. (2011). Wales is my home: Higher education aspirations and student mobilities in Wales. *Children's Geographies, 9,* 23–34.

Hirtle, S. C., & Hudson, J. (1991). Acquisition of spatial knowledge for ruts. *Journal of Environmental Psychology, 11*(4), 335–345.

Hummon, D. M. (1992). Community attachment. In I. Altman & S. M. Low (Eds.), *Place attachment. Human behavior and environment (advances in theory and research)* (Vol. 12). Boston, MA: Springer.

Husband, L. (2001). *Place attachment among older adults living in northern remote communities in Canada*. (Unpublished master's thesis). Simon Fraser University, Canada.

Iecovich, E. (2014). Aging in place: From theory to practice. *Anthropological Notebooks, 20*(1), 21–33.

Iecovich, E., & Biderman, A. (2012). Use of adult day care centers: Do they offset utilization of health care services? *The Gerontologist, 53*(1), 123–132.

Iwarsson, S., Wahl, H. W., Nygren, C., Oswald, F., Sixsmith, A., Sixsmith, J., et al. (2007). Importance of the home environment for healthy aging: Conceptual and methodological background of the European ENABLE-AGE Project. *Gerontologist, 47*(1), 78–84. **PMID: 17327543**.

Jung, H. (2014). Let their voices be seen: Exploring mental mapping as a feminist visual methodology for the study of migrant women. *International Journal of Urban and Regional Research, 38*(3), 985–1002. https://doi.org/10.1111/1468-2427.12004.

Kirasic, K. C. (2000). Age differences in adults' spatial abilities, learning environmental layout, and wayfinding behavior. *Spatial Cognition and Computation, 2,* 117–134.

Korpela, K. M. (2012). Place attachment. In S. D. Clayton (Ed.), *The Oxford handbook of environmental and conservation psychology* (Vol. 9). New York: Oxford Library of Psychology.

Kozlowski, L. T., & Bryant, K. J. (1977). Sense of direction, spatial orientation, and cognitive maps. *Journal of Experimental Psychology: Human Perception and Performance, 3*(4), 590–598.

Krause, N. (2006). Neighborhood deterioration, social skills and social relationships in late life. *International Journal of Aging and Human Development, 62*(3), 185–207.

Lachini, T., Ruotolo, F., & Ruggiero, G. (2009). The effects of familiarity and gender on spatial representation. *Journal of Environmental Psychology, 29,* 227–234.

Landers, R. N. (2011). Computing interclass correlations (ICC) as estimates of interrater reliability in SPSS. *NeoAcademic*. Retrieved June 11, 2018, from http://neoacademic.com/2011/11/16/computing-intraclass-correlations-icc-as-estimates-of-interrater-reliability-in-spss/.

Lawton, M. P. (1991). A multidimensional view of quality of life in frail elders. In J. Birren, J. Lubben, J. Rowe, & D. Detchman (Eds.), *The concept and measurement of quality of life in the frail elderly* (pp. 3–27). San Diego, CA: Academic Press.

Lawton, M. P. (1999). Environmental taxonomy: Generalizations from research with older adults. In S. L. Friedman & T. D. Wachs (Eds.), *Measuring environment across the life span: Emerging methods and concepts* (pp. 91–124). Washington, DC: American Psychological Association. https://doi.org/10.1037/10317-004.

Lewicka, M. (2011). Place attachment: How far have we come in the last 40 years? *Journal of Environmental Psychology, 31,* 207–230.

Lilley, K. (2000). Landscape mapping and symbolic form: Drawing as a creative medium in cultural geography. In I. Cook (Ed.), *Cultural turns, geographical turns: Perspectives on cultural geography* (pp. 370–438). Englewood Cliffs, NJ: Prentice-Hall.

Lindberg, E., & Gärling, T. (1982). Acquisition of locational information about reference points during locomotion: The roll of central information processing. *Scandinavian Journal of Psychology, 23*(1), 207–218.

Lloyd, R. (1999). *Spatial cognition. Geographic environments*. London: Kluwer Academic Publishers.

Lynch, K. (1960). *The image of the city*. Cambridge: MIT Press.

Madriaga, M. (2010). I avoid pubs and the student union like the plague: Students with Asperger syndrome and their negotiation of university spaces. *Children's Geographies, 8,* 39–50.

Matteucci, X., & Önder, I. (2018). Using drawings to explore images of Vienna. *Tourism Analysis, 23,* 517–531.

McDonald, T. P., & Pellegrino, J. W. (1993). Chapter 3 psychological perspectives on spatial cognition thomas. *Advances in Psychology, 96,* 47–82.

Meneghetti, C., Borella, E., Fiiore, F., & De Beni, R. (2013). The ability to point to well-known places in young and older adults. *Aging Clinical and Experimental Research, 25,* 203–209.

Michael, Y. L., Green, M. K., & Farquhar, S. A. (2006). Neighborhood design and active aging. *Health and Place, 12,* 734–740. https://doi.org/10.1016/j.healthplace.2005.08.002.

Miles, M. B., Huberman, A. M., & Saldana, J. (2013). *Qualitative data analysis*. Thousand Oaks, CA: Sage.

Moeser, S. D. (1988). Cognitive mapping in a complex building. *Environment and Behavior, 20*(1), 21–49.

Montello, D. R., Lovelace, K. L., Golledge, R. G., & Self, C. M. (1999). Sex related differences and simmilarities in geographic and environmental spatial abilities. *Annals of the Association of American Geographers, 89*(3), 515–534.

Mookherjee, H. N. (1998). Perceptions of well-being among the older metropolitan and nonmetropolitan populations in the united states. *The Journal of Social Psychology, 138*(1), 72–82.

Morita, A., Takano, T., Nakamura, K., Kizuki, M., & Seino, K. (2010). Contribution of interaction with family, friends and neighbors, and sense of neighborhood attachment to survival in senior citizens: 5-year follow-up study. *Social Science Medicine, 70,* 543–549.

O'Brien, E. (2014). Planning for population ageing: Ensuring enabling and supportive physical-social environments–local infrastructure challenges. *Planning Theory and Practice, 15,* 220–234. https://doi.org/10.1080/14649357.2014.902986.

Pearsall, H., Hawthorne, T., Block, D., Louise, B., Walker, E., & Masucci, M. (2015). Exploring youth socio-spatial perceptions of higher education landscapes through sketch maps. *Journal of Geography in Higher Education, 39,* 111–130. https://doi.org/10.1080/03098265.2014.1002079.

Raanan, M. G., & Shoval, N. (2013). Mental maps compared to actual spatial behavior using GPS data: A new method for investigating segregation in cities. *Cities, 36,* 28–40. https://doi.org/10.1016/j.cities.2013.09.003.

Richard, L., Gauvin, L., Gosselin, C., & Laforest, S. (2008). Staying connected: Neighborhood correlates of social participation among older adults living in an urban environment in Montre´al, Que´bec. *Health Promotion International, 24*(1), 46–57. https://doi.org/10.1093/heapro/dan039.

Rowles, G. D. (1983). Place and personal identity in old age: Observations from Appalachia. *Journal of Environmental Psychology, 3,* 299–313. https://doi.org/10.1016/S0272-4944(83)80033-4.

Rowles, G. D. (1986). The geography of ageing and the aged: Toward an integrated perspective. *Progress in Human Geography, 10*(4), 111–129. https://doi.org/10.1177/030913258601000403.

Rowles, G. D. (1993). Evolving images of place in aging and 'aging in place'. *Generations*, *17*, 65–70.

Rowntree, B. (1997). Mental maps, a geographic tool for knowledge: The case of Angers. *Norois, 176,* 508–603.

Saarinen, T. (1973). Student views of the world. In R. M. Downs & D. Stea (Eds.), *Image and environment: Cognitive mapping and spatial behavior* (pp. 148–161). Chicago: Aldine.

Scannell, I., & Gifford, R. (2010). Defining place attachment: A tripartite organizing framework. *Journal of Environmental Psychology, 30*(1), 1–10.

Shamai, S. (1991). Sense of place: An empirical measurement. *Geoforum, 22,* 347–358. https://doi.org/10.1016/0016-7185(91)90017-K.

Siegel, A. W., & White, S. H. (1975). The development of spatial representation of large-scale environments. *Advances in Child Development Behavior, 10,* 9–55.

Singer, R., & Bickel, R. (2015). Which way to go? Women's walking decisions and Ultra-Orthodox enclaves in Jerusalem. *Gender, Place and Culture, 22*(7), 987–1006. https://doi.org/10.1080/0966369X.2014.939153.

Soini, K. (2001). Exploring human dimensions of multifunctional landscapes through mapping and map-making. *Landscape and Urban Planning, 57*(3–4), 225–239.

Somdahl-Sands, K. (2015). Combating the Orientalist mental map of students, one geographic imagination at a time. *Journal of Geography, 114*(1), 26–36. https://doi.org/10.1080/00221341.2014.882966.

Teo Siew, E. (1994). Mental maps and residential desirability: A Singapore study. *Singapore Journal of Tropical Geography, 15*(2), 171–187.

Toepoel, V. (2011). Cultural participation of older adults: Investigating the contribution of lowbrow and highbrow activities to social integration and satisfaction with life. *International Journal of Disability and Human Development, 10,* 123–129. https://doi.org/10.1515/ijdhd.2011.027.

Vitman-Schorr, A., Iecovich, E., & Alfasi, N. (2013). Ageism and social integration of older adults in their neighborhoods in Israel. *The Gerontologist, 54*(2), 177–189. https://doi.org/10.1093/geront/gnt008.

Vitman-Schorr, A., Iecovich, E., Alfasi, N., & Shamai, S. (2015). Socio-spatial integration of older adults in four types of residential environments in Israel. *Journal of Applied Gerontology, 36*(10), 1243–1271. https://doi.org/10.1177/0733464815614917.

Vitman-Schorr, A., Ayalon, A., Khalaila, R. (2017). Perceived accessibility to services and sites among Israeli older adults. *Journal of Applied Gerontology, 38*(1), 112–136. https://doi.org/10.1177/0733464817721112.

Wiles, J. L., Leibing, A., Guberman, N., Reeve, J., & Allen, R. E. S. (2012). The meaning of "aging in place" to older people. *The Gerontologist*, *50*(3), 357–366.

Wiles, J., Rolleston, A., Pillai, A., Broad, J., Teh, R., Gott, M., et al. (2017). Attachment to place in advanced age: A study of the LiLACS NZ cohort. *Social Science and Medicine, 185,* 27–37. https://doi.org/10.1016/j.socscimed.2017.05.006.

Wridt, P. (2010). A qualitative GIS approach to mapping urban neighborhoods with children to promote physical activity and child-friendly community planning. *Environment and Planning B, 37,* 129–147.