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Environmental pressures and elderly people in the Guadalajara metropolitan area:
The performance of the nearby territory

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Abstract: This paper analyses the social, cultural and urban factors influencing the mobility of older adults in Guadalajara, Mexico. Specifically, it addresses the experiences of 18 elderly within their immediate urban environment, identifying the environmental pressures they encounter during their movements. The study maps destinations that satisfy needs shaped by participant's culture and identifies the emotional resources and social capital that support older adults in accessing these destinations. The findings reveal that mobility barriers arise not only from non-universal design but also from a fragile social-institutional framework, primarily reflected in an environment perceived as unsafe.

Keywords: Elderly-friendly design, Guadalajara-Environmental Gerontology, Walkable Space.

1. Introduction

Population aging poses challenges in the inclusive design of cities, which are discussed in WHO's Age-friendly Cities Guide (2014), a program that Guadalajara (GDL) has recently begun to implement. Currently, the municipality registers 14% of people over 65 years of age (INEGI, 2020) and prospects indicate that within a couple of decades the state of Jalisco, of which GDL is the capital, will enter the category of "aging society" (Camacho et alt., 2019). Given such a perspective, it is worth asking whether the public space in GDL is adequate to support an aging population profile.

The central hypothesis of the study is that while urban infrastructure in Guadalajara (GDL) can support older adults' use of the environment by meeting specific needs, significant barriers also exist that could arise both from a non-universal urban design and inadequate urban policies. This study seeks to answer the following questions: What kind of barriers do older adults face during their movements? Which destinations are the most frequent? And what forms of social support do aged people the elderly rely on during their journeys?

To explore the dynamics of the relationship between habitat and the elderly, we considered two primary models: the ecological model (Lawton, 1982, 1989) and the congruence model (Kahana, 1975, 1980). We also adopted social capital theory as a valuable framework for examining the support older adults receive in navigating their immediate environment. In doing so, this research aligns with the recommendations of Wahl and Gerstorf (2018), who coined the term Context

Dynamics in Aging to expand the scope of studies on older adults. Wahl and Gerstorf (2018) argue that it is necessary to merge the perspective of environmental docility studies, rooted in M. P. Lawton's ecological model, with research grounded in the concept of Life Space, as developed by Cantor (1975), which explores the urban environment of ageing.

Lawton's "environmental docility hypothesis" (Lawton & Simon, 1968) suggests that as individuals age and their capacities decline, they are increasingly likely to abandon efforts to overcome barriers, conceptualized as "pressures", a term whose meaning is borrowed from H. A. Murray (1938). Lawton studied the interplay between motor skills, cognitive functions and the characteristics of the environment, focusing on the capacities required for successful adaptation to varying levels of environmental pressure. For our purposes, it provides a framework for understanding various elements of the urban environment as barriers or pressures that not only discourage mobility but also trigger a negative feedback loop, leading to a decline in individual capabilities. Escudero (2005, p. 52) used the ecological terminology in his work, noting that "the reduction of environmental pressure (...) is achieved by enacting accessibility guidelines (...), with architectural resources aimed at minimizing architectural and urban barriers". Such resources can also be conceived as elements that contribute to universal design, which allows a product or space to be used by all people without the need for adaptation (Soydaş and Tosun, 2022).

Latin American cities present numerous deficiencies in universal urban design research but there are interesting studies detailing them. G. Boils (2019) provides a thorough description of the design errors that sidewalks have in Mexico City, which, on occasions are even non-existent or have dangerous, high or very narrow ramps for a wheelchair to circulate. M. Yeannes (2007), in his work on falls among older adults in Mar del Plata, Argentina, reported that 67% of falls were due to environmental factors, such as slippery floors and poor lighting. The remaining falls were linked to personal factors, including walking difficulties and reduced visual perception, as well as behavioural factors, such as choices related to wearing appropriate footwear, maintaining attention while walking or using a cane.

Lawton (1989) to develop a more sophisticated of "personal resources", among which we find affective self-regulation. This idea of personal resources (broader than the previous concept of competence, without clinical connotations) makes it possible to include emotional and motivational elements, as well as the proactive capacity to dominate or take advantage of the environment, thus emphasizing the dialectical relationship between individual resources and environmental resources. Michael et alt. (2005) have shown the benefits of access to nearby stores and services, as well as walkable surface, which encourages seniors to walk and experience healthy activity. This work follows the path emerged since the 1980s, with the "congruence model" (Kahana, 1980), in which well-being does not only depends on a level of adaptation between capacities and environmental pressures but from coherence between what the environment offers and the needs of each older adult. Carp & Carp (1984), by integrating the ecological model and the congruence model, conceived different stages in which the initial variables (competencies, needs, environmental traits) do not have a direct influence on the results (satisfaction, autonomy, stress) but are modulated, in an intermediate stage, by actions, attitudes, perceptions and social support.

In the context of Latin American societies, characterized by a limited welfare state and streets that can often be unsafe, the social climate and the support accessible to older adults are vital. This support can be studied from the social capital perspective. A substantial body of literature identify social capital as a critical source of support for older adults, encompassing promotion of healthy living (Simons et al., 2020; Kawachi et al., 1997; Carrasco & Bilal, 2016) and assistance

with mobility (Gray et al., 2016), particularly at the time when the elderly leave wheeled transport (Isbel and Berry, 2016). Phillips et al. (2010, p. 227) developed a model of interactions between older adults and the city, applying it to residents of Hong Kong. Their study, among a wide range of cultural factors, highlights the influence of filial piety, a core tenet of Confucianism. The authors highlight the need to take into consideration caregivers' competencies and advocate for viewing family support as a form of collective competence. This work serves as an inspiring example for researchers addressing non-European contexts, underscoring the need for analytical models tailored to these unique realities.

Social capital can be understood as a component of a community's social cohesion (a more structural perspective) but other perspective sees it as a resource derived from networks formed by individuals through their proactive engagement in groups and families (Portes, 1998). An intermediate position argues that individuals initiate efforts to establish social ties, but the community's social environment helps them by providing the conditions necessary for fostering enduring relationships. Social capital has been categorized into three types: bonding social capital, which refers to relationships within families or close-knit communities; bridging social capital, involving connections with more distant social groups; and linking social capital, for relationships with groups of significantly different social status. Fu et al. (1980) found a correlation between high levels of bonding and bridging social capital and an increased likelihood of maintaining high levels of physical activity among older people. From an urban perspective, Bronfenbrenner (1979) drew a distinction between proximal and distal contexts, with the latter including interactions with strangers, which may involve both trust and distrust. It is interesting to examine the extent to which the elderly in Guadalajara can benefit from these forms of social capital to make effective use of nearby urban facilities.

2. Methodology

The methodological model chosen for the study was a mixed-methods approach, with the qualitative method serving as the main component. The qualitative approach was appropriate to delve deeply into the users' daily experiences, as constructed by their subjectivity. The quantitative method, adopted as a complementary component (Morse & Niehaus, 2009), involved determining the distances travelled and the number of services available in the environment. The mixed-methods design followed a sequential framework (Creswell & Creswell, 2017), with quantitative data collected based on the destinations mentioned during the previous semi-structured interviews. The tool used for transcription and coding was QDA Atlas.ti Cloud software.

The database was a set of 18 interviews with people between 65 and 90 years old, residents of Guadalajara and the surrounding municipalities of Zapopan, Tlajomulco and San Pedro Tlaquepaque. In a complementary manner, qualitative observation of the environment was used, with images obtained from a photographic survey of the environment and Google Earth (Street View). The urban territory exploration provided data that could be contrasted with the experience of the interviewees. Additional tools included the drawing of route diagrams illustrating the distances travelled in metres. These quantitative data were combined with location maps of services and significant segments from the interviews, all of which were integrated into a single FileMaker file for each participant studied.

The individual interviews considered a script with the following points:

- Usual destinations. Characteristics of the places that satisfy their needs. Distances travelled, mode of travel.
- Travel experience and accessibility to destinations.
- Specific difficulties in urban mobility.
- Family situation and help obtained in the immediate environment.
- Relationship with neighbours or close social group.

The qualitative data collection process adhered to ethical guidelines, ensuring confidentiality and the responsible use of private data. Written informed consent was obtained from participants, explicitly authorizing the use of their data for academic purposes.

3. Results

3.1. Distances

The destinations mentioned in the interviews provide information on the maximum distances users can travel (Fig. 1) in one trip (they don't offer data about the maximum distances people interviewed walk daily). The distances have been calculated in AutoCAD on Google map, looking for the most direct or "natural route" between home and destination.

Table 1. Distances covered by the participants and density of urban facilities.

Case and Person ID	Age	Maximum walked distance (mts)	Mobility support	Presence of urban equipment in the surrounding area
1 Ca1	82	650	Wheelchair	High
2 Mar	65	360	Wheelchair	High
3 Jos	61	900	Wheelchair	High
4 Ade	85	0 *	walking frame	High
5 Vid	90	0 *	Walks	Intermediate
6 Vic	67	2300	Wheelchair	Intermediate
7 Mar	64	1300	Walks	High
8 Be1	66	2100	Walks	Low
9 Ire	74	0 *	Walks with a cane	Low
10 Ire	64	550	Walks	Intermediate
11 Enr	68	700	Walks	Intermediate
12 Be2	62	1000	Walks	Intermediate
13 Ma2	65	1300	Walks	Intermediate
14 Dom	85	120	Walks	Intermediate
15 Ca2	76	1100	Walks with a cane	Low
16 Mar3	65	150	Walks	Intermediate
17 Yol	72	1200	Walks	High
18 Bla	81	400	Walks	Intermediate
Average:	72	802*		

**Cases without routes discarded.*

Table 1 shows three groups of users: those who walk 1000 m. or more, those who are in the 500-1000 m. range, and those who walk less than 500 m. There is no immediate correlation between the distance walked and the density of urban facilities, as occurred in Michael et alt. (2006).

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People living in an environment with an abundant supply of services do not always use them. Four people out of 18 were found to be walking more than 1000 m. where the Gps route shows little presence of facilities.

This can occur for various reasons, such as the use of mobility aids like a wheelchair or walker (as seen in the cases of Man, Ca1, Jos1, and Ade). These instances support the ecological model, which emphasizes the role of physical capacities in determining how individuals interact with their environment. By contrast, Ca2 and Be1, both in good health but residing in areas with low density of services, have a high score in walking performance. Here what triggers a displacement is not the quantity of facilities but the quality of destinations congruent with the preferences of older adults. This supports the congruence model, which emphasizes the importance of alignment between individual requirements and environmental provisions.

The results of the most relevant interviews in terms of our interests are presented below, first presenting those cases in which walking distances are longer and then those in which shorter trips are detected.

3.2. Destinations, barriers and social support

Yol. (72-year-old, lives with her husband, daughter, son-in-law, and 5 grandsons) She attends church and a sport club, where she goes with her husband to work out. Despite her age, she walks extensively (1,200 metres), benefiting from an environment abundant in services. Her routine includes walking to the bank and shops. Yol. warns of the danger of simply not sweeping leaves from trees, ("people can slip"). No one, neither neighbours nor authorities, has taken responsibility for sweeping, so the street creates an environmental risk factor that needs to be known. In this case, the environmental pressure arises from a lack of street maintenance by both local authorities and area residents.

Figure 1. Environment and distances traveled by Case 17 (Yol.).

Ma3 (65, divorced, two daughters) is in poor health (“I can't sweep or mop because the days I do it I can't get up and they have to inject me with medicine"). The cobblestone streets hurt her a

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lot ("I can't walk much because the cobblestones hurt my spine when I walk"). Furthermore, cars irritate her "(...) cars do not respect you, that is, if they see a space on the corner they park and block the way; I feel that the best days to walk are Saturdays and Sundays when there are not so many cars". However, she can walk 1300 m. Going to church by metro is not a problem for her ("the metro moves me and very quietly"); the destination acts as a motivation for a journey that would otherwise be difficult for her.

Ma2, 65 (three children, teaches virtual classes, walks 1100m) lives in a colonia (neighbourhood) close to many favourite destinations. "I have Galerias (a mall) in front of me, I direct my walks there or to the park. He has an active life, with many destinations within walking distance, although he suffers from the problem of the city's pavements; "because in some parts (local authorities) only cover up the holes where cars pass, but they don't care about the pavements, I think almost nobody cares about that". Negligent management of urban maintenance here leads to a loss of hope about the ability of local politicians to care about pedestrians.

Ca2 (a 76-year-old former university teacher from Santa María Tequepexpa) visits nearby restaurants, where she socialises with her friends—a stimulating social activity that was limited during the pandemic. Her immediate social environment is not very rich, as she lives alone, has no children, and only one brother. Consequently, maintaining a broader social network of friends encourages her to lead a more outward-facing daily life, travelling up to 1000m. She goes out to buy small quantities in nearby shops ("I am alone, there is no point in going to the Abastos market to buy a lot, if I buy too much it will go to waste"). Her case validates the importance given by the ecological model to individual resources. Attention to obstacles and the use of a cane are part of the behavioral aspects in which individual agency is expressed, which are linked to personal resources such as

Figure 2. Environment and distances traveled by Case 15 (Ca2).

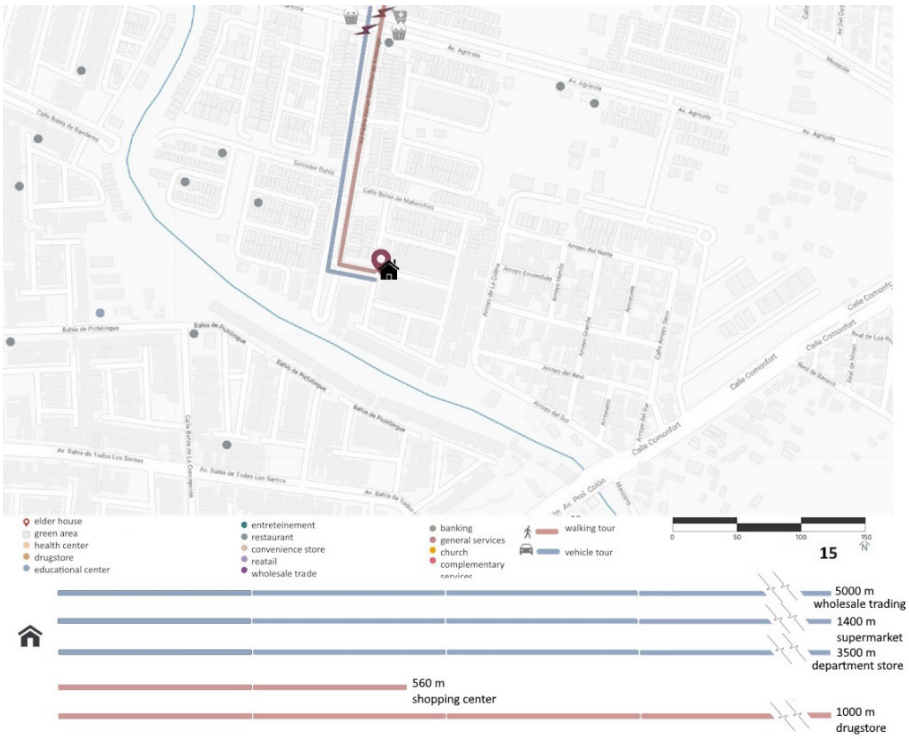

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Figure 3. Environment and distances traveled by Case 12 (Be2).

Thanks to her knowledge of the pavements, she can avoid obstacles and unevenness in the ground ("I already know the pavement"). Another resource is the acceptance of help from strangers who observe her walking with difficulty: "there are always kind people who help me to climb pavements, ramps". Despite her age, she still drives a car, although she walks most of the time with a cane to prevent falls. Her personal competences (optimism, openness) push her to an active life. She confesses that sometimes she would go out of the house aimlessly, perhaps to a store just to look around, with no real need to buy anything; "that's why I tell you when I'm bored, I go out. There are people moving around here. Also, children who shout but it's not like being between four walls". A brother accompanies her to the bank to withdraw money, as it is not safe to do it alone at ATMs. [Before the pandemic] I would go to my brother's house, we would play dominoes [...] there were about five of us. One can guess that, through her brother, Ca2 connects with a wider environment; close people and not so close people appear interconnected here.

Be2 (62, three children, widow) also lives alone and does 1000 m rides. Despite the pains she suffers in her spine (which prevent her from cycling as she used to) she is active in cleaning her house. She is very close to her son who helps her ("my son, I dial him and he is here in 3 minutes; I love family meetings") and she has the courage to move forward in life ("I tell my grandchildren that they should always move forwards"). Her personal psychological resources (she is cheerful even though her daughter who lived with her died last year) and family support compensate for her delicate physical health and low supply of services in her nearby territory.

The following case is noteworthy as it reveals an instance of environmental pressure related to a social environment shaped by insecurity. Ire, a 64-year-old married woman who walks 550 m. explains that neither she nor her husband drive because their car was stolen ("there are criminals on the other side of my house, they are in collusion with the police"). The couple only go to the supermarket, to the shops (Wallmart) and to the doctor.

The case also raises the issue of the presence or absence of social ties. The interviewed have the support of a son and of neighbours they have known for four decades. With neighbours they have

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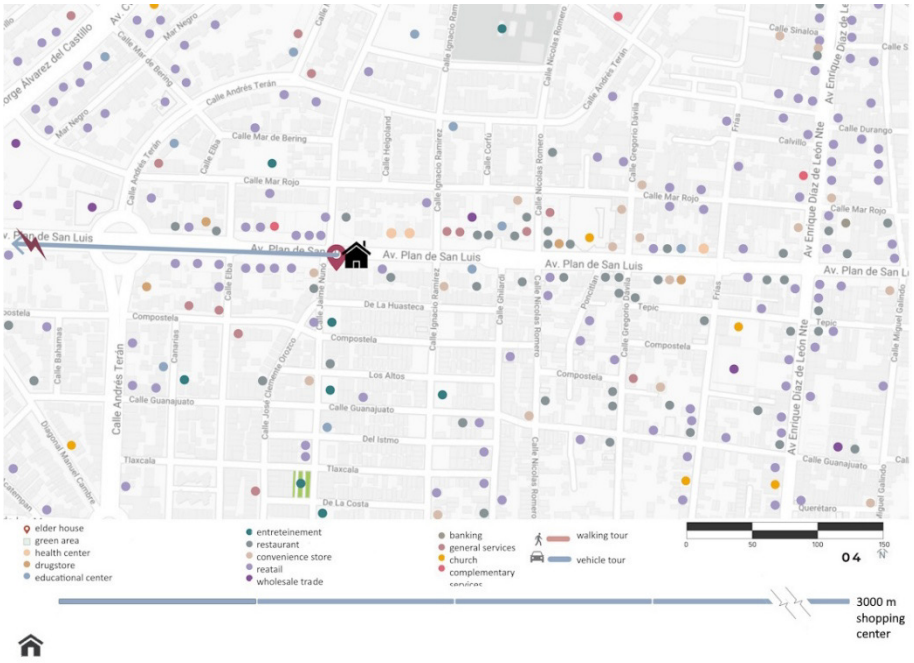
an apparently cold relationship ("we say really just good morning, good afternoon, how have you been and that's it", which points to an intermediate level between bonding and bridging capital. "Only for special reasons, if they want to tell me something or I want to tell them something, then we visit each other".

Ade, an 85-year-old rarely goes outside in spite of a rich urban environment:" I have never gone out alone, I can't do anything, I don't feel able to risk it again (...). If you go out you have to be home early because you can't go out very late at night, (...) maximum until 8 - 9 at night". A. is a widow, lives with an unmarried daughter, has another daughter in Durango and a son in Houston who supports her financially.

"In the afternoon I read or go out to the garage for a while, or I lie down for a while, because the walker makes me very tired. Ad. relies on a walker to get around, says that the condition of the sidewalks is the main inconvenience when leaving the house. Another stressor pointed out is the presence of badly parked cars. For more distant outings she resorts to the help of her children; "they put my chair in their van, and we go to a coffee shop or a mall. They take me in, they take me out, they get me settled, I just tell them to leave me here and you go and do your shopping, I just watch the people go by, that's enough to keep me entertained".

The narration of past events by F. (66, does not appear in the table because his routes were not specified) illustrates the benefits of bridging social capital. F. bought a large van "in order to move friends, to move colleagues, before the pandemic we went to the cinema forum, we went to different places"; it seems that these are past times, because currently, he lives alone, he supports himself with his pension and the support of the parish where there is a community canteen. He has no relationship with his neighbours ("my neighbours are criminals, in other words, they steal"), nor with his children, who, after separating, are linked to his mother. "There have been times when I have also been sick and I have gone to a hospital for help, but I have not been able to get there, I have fainted. Passengers have got out of the truck fainting and sat me down on the pavement and asked for an ambulance". The nearby support is replaced by the support of anonymous people in the street, who help him in case of need.

Figure 4. Environment and distances traveled by Case 12 (Ade 85).



Enr. (68) reads psychology, exercises, rides a motorbike and is about to get married ("for the last time"); his personal spirit and health compensate for a scarce social capital (one of his sons died, and he does not see two sons who left with his former wife, his sister takes care of his mother who has Alzheimer's). He walks 700 metres to the market and the SNDIF (Sistema Nacional para el Desarrollo Integral de la Familia, a social organization addressing family vulnerability) and maintains close relations with his neighbours.

Domi. (85, widower) walks a short distance (15-20 minutes, 120 m) in a park in front of his house, with no problems with the pavements. When he needs to make longer trips, his granddaughter drives him in his car, which he is no longer able to drive himself.

Vic. (67, married) sells sweets and peanuts at traffic lights in the streets, from morning until 6 p.m. His cases show how the congruence between environment and user in GDL takes on nuances not observed in similar studies in other regions. He receives food in the church and has multiple pains in his body; his courage and mental strength allow him to survive. To get to the crossroads where he works, he has to use a wheelchair and get a bus. When the bus arrives, a ramp is lowered for him (he doesn't need help from passengers because "I only get on backwards to support myself with my good foot and my good hand). On the pavements, where there are holes "I have fallen several times, I push the chair backwards and sometimes I don't see that there is a hole”). Like other transcriptions of users' accounts, his narrative reveals a sense of discomfort and risks caused by physical barriers (pavements in poor condition) that do not comply with numerous principles of universal design: fairness and flexibility of use, perceptible information, tolerance of error, low physical effort (criteria listed by The Center for Universal Design, 1997).

4. Conclusions

The use of a qualitative methodology enabled a deep observation of the motivational factors shaping participants' access to the nearby territory. This approach proved suitable in understanding the urban decision-making processes of the participants, particularly the alignment between the availability of services and the fulfilment of their needs. These needs, clearly shaped by social and cultural factors, in our case highlight the significance of specific services such as churches—reflecting Jalisco's status as one of the most religious states in Mexico—and the presence of state social inclusion programs, such as those provided by the SNDIF. In Guadalajara, a substantial portion of the older population views the city as a source of economic opportunities, religious services, and safe spaces for social interaction. As a result, the congruence between the environment and the user takes on unique characteristics not observed in similar studies conducted in other regions of the world. The analysis presents a opportunity to refine the dimensions of environmental congruence at the urban level in cities outside Europe and Asia. To the dimensions proposed by Kahana et al. (1980), we propose adding two additional dimensions: one related to the desire for spiritual protection (fulfilled by sacred spaces) and another associated with physical protection.

In this respect, numerous references to insecurity underline the relevance of this dimension. Mexico is currently experiencing an era marked by the negative presence of drug trafficking. This situation justifies the use of the lawtonian concept of environmental docility, driven in this case by a perception of the environment as hostile. The study conceptualizes crime and crime perception as an environmental pressure, drawing connections between the docility hypothesis and perceptions of insecurity, as also suggested by Köber et al. (2022). However, while Köber and his colleagues identified a weak correlation between crime perception and urban activity in Europe and Australia, the reality in Mexico reveals a significantly stronger relationship. This

disparity highlights the suitability to account for regional socio-cultural and environmental factors when examining environmental congruence and urban dynamics.

Older adults report deficiencies that can be categorized as both institutional and social, arising from factors such as non-compliance with urban regulations (e.g., illegally parked cars), uncivil behaviours, and inefficient management of urban spaces (e.g., poorly maintained or upswept surfaces).Thereupon, it is pertinent to recall Murray's definition of "pressure" as any external influence that affects the satisfaction of an individual's essential needs. As with issues of crime and safety, our findings reaffirm the necessity of rethinking and redefining categories of environmental barriers and pressures within a sociocultural and institutional framework.

The study included questions addressing the resources and support available to older adults in Guadalajara (GDL) to manage the challenges outlined above. Alongside emotional resources such as resilience and optimism, several participants demonstrated a proactive approach to deal with risks, anticipating difficulties (for instance, being aware of pavement conditions or seeking assistance when needed). These findings underscore the relevance of Carp & Carp model (1984) with reference to intermediate factors, which extend beyond behavioural and cognitive dimensions to encompass the disposal of social support.

The responses identified two distinct forms of social support. The first, derived from bonding social capital, refers to assistance provided by individuals closely connected to the participants. The second involves more casual support from those with weaker personal ties, such as infrequently visited neighbours or strangers who occasionally offer help in public spaces. Building on the findings of Fu et al. (2018), we observe that this second group plays a crucial role in responding to falls or unexpected situations. Strong relationships between neighbours are uncommon; however, there is a widespread belief in the importance of neighbourhood support during times of need. This kind of support aligns with the concept of bridging social capital, as studied by sociologists in other contexts and for different population segments, where weak ties have been shown to be pivotal, for example, in facilitating career advancement.

In summary, the study highlights the need to adapt classic models of environmental gerontology to diverse socio-spatial contexts, differing significantly from those that informed the original frameworks, which were predominantly based on residential areas or neighbourhoods in Anglo-Saxon countries. Integrating approaches from environmental gerontology, urban studies, sociology and inclusive design can contribute to future research projects in this field in Latin America, where environmental characteristics differ markedly from those in countries with a greater theoretical tradition on age-friendly cities research.

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