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Neighbourhood vitality and physical activity among the elderly: The role of walkable environments on active ageing in Barcelona, Spain

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ABSTRACT

This study investigated whether neighbourhood vitality and walkability were associated with active ageing of the elderly. Immobility, activity engagement and physical activity were explored in relation with age, gender and walkability of the built environment. Number of trips per day and minutes spent on walking by the elderly were extracted from a broad travel survey with more than 12,000 CATI interviews and were compared across vital and non-vital urban environments. Results highlight the importance of vital environments for elderly active mobility as subpopulations residing in highly walkable neighbourhoods undertook more trips and spent more minutes walking than their counterparts. The results also suggest that the built environment has different effects in terms of gender, as elderly men were more susceptible to urban vitality than elderly women.

1. Background

Like many European Countries, Spain faces the challenge of a rapidly ageing population. Having an old age dependency ratio of 26.3, the pace of ageing is much higher in Spain than in other countries, and it is projected that by the year 2050 its old age dependency ratio will be 26% higher than that of the EU28 (EUROSTAT, 2014). Barcelona's Metropolitan Region is no exception to that general dynamic and in 2013 it had 17.4% of its population older than 65 years, with an elder-child ratio of 107 (IDESCAT, 2013). Within the next 15 years, 22% of the population will be above 65 years of age and the elder-child ratio will be 147. The increase of the senior population, not only in Spain but all over Europe, has focused public health policies on the need to promote healthier mobility habits in favour of physical activity (PA) and activity engagement.

PA directly affects several health issues in the general population, all of which become more urgent in the age range of the elderly. The World Health Organization (WHO) identifies the lack of PA as the fourth global risk factor, globally accounting for 6% of deaths (World Health Organization (WHO), 2010). In general terms, more active individuals have lower mortality rates, in comparison with people who remain sedentary (Gregg et al., 2003; Stessman et al., 2009). Other demonstrated effects of the lack of PA are cardiovascular diseases, some types of cancer, arthritis and obesity (Ewing et al., 2014; Jongeneel-Grimen et al., 2014). According to the current recommendations, seniors should perform moderate-intensity PA, for at least 150 min throughout the week, which can be the result of adding shorter PA bouts (WHO, 2010). Over the past few years, there has been a great increase of studies linking PA with general health status (Ewing et al., 2014, 2008; Jongeneel-Grimen et al., 2014), and specifically with elderly mobility (Moniruzzaman et al., 2013; Páez et al., 2007; Hildebrand, 2003).

In terms of transportation, walking has been seen as the key for resolving most elderly problems related with PA. Walking for transport is a major source of physical activity, especially for people over 65 years of age who perceive the options for using other types of transport as being reduced (Balboa-Castillo et al., 2011). Walking is seen as a convenient, safe and adequate activity for seniors as it places the right amount of stress on joints in the human body (Moniruzzaman et al., 2013). The recognition of walking as a means of transport and as a source of moderate PA has led urban planners to focus on creating walkable environments that make active mobility more appealing (Clarke and Nieuwenhuijsen, 2009; Handy and Boarnet, 2002; Lamíquiz and López-Domínguez, 2015; Talavera-Garcia and Soria-Lara, 2015).

Furthermore, urban settings not only determine PA but also psychological wellbeing and mental health (Fujiwara and Kawachi,

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2008; Clark et al., 2007). Studies have demonstrated how mental health depends heavily on social capital (Bowling and Stafford, 2007) and resources that individuals can access through their networks (Fujiwara and Kawachi, 2008). For individuals above the age of 65 years, living in a vital and thriving urban environment may mean undertaking more trips, engaging in more activities (Hildebrand, 2003) and interacting with more people in their everyday life (Kuo et al., 1998; Kweon et al., 1998). All of the aforementioned contributes to increasing their social capital status while avoiding social exclusion processes derived from immobility (Hanibuchi et al., 2012; Richard et al., 2009; Leyden, 2003). The relation between built environment attributes and mental health condition is thus recognised through the number of activities which the elderly can perform within a walking distance.

Currently, there is enough empirical evidence to corroborate that the way neighbourhoods are designed influences walking behaviour (Villanueva et al., 2014). At an age where adults experience a reduction in functional capacities, the settings of the built environment become even more important, as they have the potential to either compensate the deficits in mobility capacity or to exacerbate mobility problems (Dujardin et al., 2014).

There are few articles that try to assess both the physical and mental health of the elderly through their use of active mobility. Most of the research is focused either on PA of seniors (Kerr et al., 2012; Lockett et al., 2005; Michael et al., 2014, 2006, 2010) or on the social capital status of seniors (Bowling and Stafford, 2007; Fujiwara and Kawachi, 2008; Hanibuchi et al., 2012; Leyden, 2003; Richard et al., 2009), without always realising that neighbourhood settings have the potential to determine both the modal choice of the trip (and thus the PA) and the number of trips that the elderly undertake, which relates with activity engagement. Furthermore, and as Sugiyama et al. (2014) suggest, limited variation in environmental attributes may be causing most non-significant or weak associations between neighbourhood environmental attributes with physical activity.

Hence, we believe that the analysis of how the built environment determines the health of seniors, through promoting active mobility, is far from being closed. Our study aims to understand how living in vital or non-vital urban areas can change the travel behaviour of the elderly along with the amount of PA that they are gaining from walking for transport.

Our view of urban vitality takes the seminal works of the American city activist, Jane Jacobs (1961), who measured the vitality of an urban area by using the walking activity on the streets as a reference. For Jacobs, the vitality of the streets was a product of the diversity of the built environment, and the presence of pedestrians served as an indicator of the city liveliness (Sung et al., 2013). We thus understand urban vitality as a synonym of vibrant environments and we measure this vitality, not from a set of morphological indicators (Aditjandra et al., 2012) nor as a personal well-being indicator (Guite et al., 2006; Richard et al., 2009), but through the observation of mobility patterns. Those areas where a large part of daily mobility is performed through short walking trips are labelled as vital areas. The presence of short walking trips characterises not only areas with a high intensity of pedestrians, but also by their proximity to services, amenities, and land use mix (Marquet and Miralles-Guasch, 2015; Morency et al., 2011), forming a particularly suitable urban environment for ageing populations (Marquet and Miralles-Guasch, 2014) and shaping what American urban planner Kevin Lynch understood was a place that supported the biological requirements and capabilities of human beings (Lynch, 1981, p. 118). Having pedestrians on the street increases the appeal of walking (Gehl, 2010) and the potential enjoyment of the trip (Gehl, 2011, p. 68), also making walking more attractive for the elderly. In contrast, areas where short walking trips are scarce often represent low-density built environments that offer neither proximate facilities nor vibrant street life for elderly walkers.

Comparing the health outputs of the elderly populations living in vital or non-vital areas can provide an idea of how much healthy mobility habits can be improved by investing in vital built environments.

2. Sources and methodology

In order to understand the determinants of physical activity and activity engagement for the ageing population, we need information sources where all types of daily trips are treated in the same way. Daily travel surveys, such as the one used for the present study are useful because of their homogeneous treatment, including all types of means of transport, trip purposes and journey durations. In this methodological section we intend to address both data sources and the reasons for choosing our population and territorial variables along with the methods of analysis.

2.1. Data sources and measures

The study took place in Barcelona's Metropolitan Region (RMB), a 3200 km^2 metropolitan area located north-east of Spain, made up of 164 municipalities that gather a total of 4,635,5421 inhabitants. The region is strongly centralised within the Barcelona environment, but it gets polycentric, discontinuous and disperse as one moves away from the core of Barcelona (Muñiz and Galindo, 2005).

The main data source is a broad travel survey, Everyday Mobility Inquiry (ATM and GC 2006), that was performed in 2006 (hereafter, EMQ06) by the regional authorities in Catalonia (Spain). It aims to describe the mobility of the resident population of Catalonia with 106,091 Computer Assisted Telephone Interviews (CATI), out of which 45,184 were located in our area of study, Barcelona Metropolitan Region (RMB). The interviews were used to gather data regarding trips taken in a working day and also included some socioeconomic input about the interviewee.

Mobility data and variables, such as number of trips, modal choice, travel duration or physical activity related to transport per person were extracted from the EMQ06. However, other sources were needed to gather socioeconomic variables at the neighbourhood level, such as income or motorisation levels, and territorial variables like population density or land use distribution. Socioeconomic data were extracted from the official Statistics Institute of Catalonia (IDESCAT) and the official Statistics Service of Barcelona.

Our focus was set on the health-related aspects of travelling for the elderly population, particularly on the rates of change of healthy mobility habits that can be gained from moving from a non-vital area to a vital area. The study represents the built environment on its most local scale, which is consistent with the analysis of a population with low mobility potential (Prins et al., 2014). Health outcome variables are divided into activity engagement measures and physical activity measures. Firstly, immobility is a dichotomous proxy for activity engagement. In that, following a fairly common definition of immobility (Sikder and Pinjari, 2012), when a person claims not to have left the house the day prior to the interview, we consider it a case of immobility. Secondly, activity engagement is a continuous variable: number of trips made on the day prior to the interview. This variable provides the average number of trips in terms of age, gender and urban vitality. PA measures are expressed through two variables: modal choice and number of minutes spent on walking. All the results were stratified by gender (male/female), age (64–75 and >75 years) and urban vitality (vital or non-vital).