



Cognitive functioning among Dutch older adults: Do neighborhood socioeconomic status and urbanity matter?



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ABSTRACT

Positive associations of neighborhood socioeconomic characteristics and older adults' cognitive functioning have been demonstrated in previous studies, but overall results have been mixed and evidence from European countries and particularly the Netherlands is scarce. We investigated the effects of socioeconomic status (SES) and urbanity of neighborhoods on four domains of cognitive functioning in a sample of 985 Dutch older adults aged 65–88 years from the Longitudinal Aging Study Amsterdam. Besides cross-sectional level differences in general cognitive functioning, processing speed, problem solving and memory, we examined cognitive decline over a period of six years. Growth models in a multilevel framework were used to simultaneously assess levels and decline of cognitive functioning. In models not adjusting for individual SES, we found some evidence of higher levels of cognitive functioning in neighborhoods with a higher SES. In the same models, urbanity generally showed positive or inversely U-shaped associations with levels of cognitive functioning. Overall, effects of neighborhood urbanity remained significant when adjusting for individual SES. In contrast, level differences by neighborhood SES were largely explained by the respondents' individual SES. This suggests that neighborhood SES does not influence levels of cognitive functioning beyond the fact that individuals with a similar SES tend to self-select into neighborhoods with a corresponding SES. No evidence of systematically faster decline in neighborhoods with lower SES or lower degrees of urbanity was found. The findings suggest that neighborhood SES has no independent effect on older adults cognitive functioning in the Netherlands. Furthermore, the study reveals that neighborhood urbanity should be considered a determinant of cognitive functioning. This finding is in line with theoretical approaches that assume beneficial effects of exposure to complex environments on cognitive functioning. We encourage further investigations into the effect of urbanity in other contexts before drawing firm conclusions.

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1. Introduction

Recent years have seen a strong interest in the effects of neighborhood environments – typically understood as relatively small areas surrounding a person's place of residence as defined by administrative, geographical or subjective boundaries – on health. A sizeable amount of findings indicating better health (as assessed

in terms of self-rated health, depression, cardiovascular and cardiometabolic risk factors, and mortality) in socioeconomically better off neighborhoods is challenged by many studies reporting null-findings (Julien et al., 2012; Kim, 2008; Leal and Chaix, 2011; Mair et al., 2008; Pickett and Pearl, 2001; Richardson et al., 2015; Riva et al., 2007). Especially for older adults, maintaining cognitive functioning is an important health outcome, influencing their quality of life, and costs of care (Hertzog et al., 2009). It has been argued that the neighborhood context is especially meaningful for older adults because of their higher vulnerability and because they presumably spend more time in their neighborhoods than younger people, especially after retirement (e.g. Robert and Li, 2001).

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A recent review concludes that the majority of studies report that older adults in neighborhoods with a higher socioeconomic status or lower levels of deprivation show better cognitive functioning (Wu et al., 2015). However, while many cross-sectional studies examined effects of neighborhood socioeconomic status (NSES) on the levels of cognitive functioning, very few studies examined cognitive decline over time (but see Boardman et al., 2012; Sheffield and Peek, 2009; Zeki Al Hazzouri et al., 2011). We thus aim to examine effects of NSES not only on levels but also on decline of cognitive functioning. To get a broader and more detailed picture, we investigate four different aspects of cognitive functioning, particularly general cognitive functioning, processing speed, problem solving, and memory, instead of using a general measure only. We expect all four domains of cognitive functioning to be associated with NSES. While the different domains may vary in their susceptibility to neighborhood characteristics, we do not explicitly theorize on domain-specific variations in this study. Instead, we include the different domains in our empirical analysis to facilitate a broader test where findings can be cross-validated across domains. Reliance on multiple outcomes rather than a sole measure seems especially important in light of the rather poor discriminatory power of MMSE in well-functioning individuals.

We further examine the effect of another key neighborhood characteristic, i.e. the effect of neighborhood urbanity, on older adults' cognitive functioning. Like NSES, neighborhood urbanity may affect access to opportunity structures that benefit cognitive functioning. Given the potential contribution of neighborhood urbanity to the understanding of interindividual differences in cognitive functioning, the scarcity of previous research on this issue signifies the need for our study.

We start by outlining theoretical considerations and empirical findings that propose effects of NSES and urbanity on older adults' cognitive functioning. Subsequently, we use growth models in a multilevel framework to examine the effect of both neighborhood characteristics on levels of and decline in cognitive functioning in a sample of 985 older adults from the Longitudinal Aging Study Amsterdam (LASA; Aartsen and Huisman, 2016). At the beginning of our study in 1995/6, the respondents were aged 65–88 years and did not show cognitive impairment. They were followed up for up to six years.

2. Theory and hypotheses

Associations of NSES and neighborhood urbanity with cognitive functioning could base on two different mechanisms. Firstly, the neighborhood context may have a causal influence on the cognitive functioning of its older inhabitants by affecting opportunity structures that influence behaviors associated with cognitive functioning. For example, neighborhoods with a higher (vs. lower) NSES may provide their older inhabitants with more and higher quality resources that encourage engagement in physical activities (e.g. parks, gyms, sidewalks of good quality), social activities (e.g. attractive shopping areas, social clubs, neighborhood organizations), and cognitively stimulating activities (e.g. bookstores, libraries) (Wight et al., 2006; also see Sheffield and Peek, 2009; Wu et al., 2015). This assumption is supported by theoretical approaches like the cognitive-enrichment hypothesis arguing that within age-related biological constraints, “behaviors of an individual (including cognitive activity, social engagement, exercise, and other behaviors) have a meaningful positive impact on the level of effective cognitive functioning in old age” (Hertzog et al., 2009). Other theories state more explicitly that cognitive decline may similarly be affected by cognitive, physical, and social activities (e.g. Use It or Lose It Hypothesis (Hultsch et al., 1999), Environmental Complexity Hypothesis (Schooler, 1984), Revised

Scaffolding Theory of Aging and Cognition (Reuter-Lorenz and Park, 2014)).

Besides differential access to opportunities, neighborhoods may influence their inhabitants' motivation to engage in cognitively enhancing activities: Older adults' neighbors in better off neighborhoods are more likely to be well educated and occupationally successful and might stimulate upward comparison. This may in turn motivate older adults' engagement in activities that enhance cognitive functioning (Sisco and Marsiske, 2012).

In view of neighborhood urbanity, we assume that more urban neighborhoods represent more complex environments, as understood by the higher diversity of stimuli and the requirement to make decisions in which a larger amount of information needs to be considered and processed (see Schooler, 1984). For example, moving in busy traffic, not getting sidetracked by distractions along the way, and choosing from a larger number of options when it comes to shopping and leisure time activities characterize complex urban environments, offering cognitive stimulation (Cassarino and Setti, 2015). In line with this, Crowe et al. (2008) assumed that a greater life-space (i.e. the spatial range within which people move regularly) with its “greater diversity of experiences and greater demands in terms of decision making” represents a component of environmental complexity. They found that older adults who used a greater life-space showed a weaker decline in cognitive functioning over a 4-year period, controlling for baseline cognition and the effect of physical function. Furthermore, urban neighborhoods supposedly offer a high density of mentally stimulating offers like museums and theatres. Also by means of dense public transportation systems, access to a variety of offers should be facilitated for older adults (St. John et al., 2016; also see Wu et al., 2015).

We thus expect higher levels of and slower decline in cognitive functioning for older adults residing in neighborhoods with a higher NSES (hypothesis H1a/H1b) or a higher degree of urbanity (H2a/H2b), respectively.

Secondly, better cognitive functioning in neighborhoods with a higher NSES or higher urbanity can be caused by the selection of individuals based on their individual socioeconomic status (SES) into specific neighborhoods. E.g., individual education and income have been shown to be related to cognitive functioning in cross-sectional studies (Opdebeeck et al., 2016; Zhang et al., 2015) (longitudinal findings have been more mixed though, see Anstey and Christensen, 2000; Valenzuela and Sachdev, 2006). Thus, individuals with higher SES and associated better cognitive functioning more likely live in neighborhoods with a higher (vs. lower) NSES or a higher (vs. lower) degree of urbanity. In such case, cognitive differences are not necessarily caused by the neighborhood context but by the mingling of certain individuals in the respective neighborhoods. We thus test the alternative explanation that statistical effects of NSES and urbanity dissolve once individual socioeconomic status is considered (H3).

3. Previous research

3.1. Findings on neighborhood socioeconomic status

Cross-sectional empirical findings on the effect of NSES in older populations are mixed. On the one hand, studies found NSES (defined here as (proxy-)measures of at least one dimension of socioeconomic status, i.e. education, occupation, and/or income) to be positively associated with the level of cognitive functioning (Clarke et al., 2012; Lang et al., 2008; Lee et al., 2011; Rosso et al., 2016; Shih et al., 2011; Sisco and Marsiske, 2012; Wight et al., 2006; Zeki Al Hazzouri et al., 2011) or negatively associated with cognitive impairment (Basta et al., 2008; Wee et al., 2012). Partly, studies found that the effect of NSES on cognitive functioning

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