

Cognability: An ecological model of cognitive function and neighborhood design

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Abstract

Background: Neighborhood environments are linked to multiple established risk factors for cognitive decline and dementia including physical inactivity, depression, obesity, hypertension, and diabetes. As an upstream influence on modifiable risk factors, neighborhood environments may help delay or prevent the onset of cognitive impairment. They may promote physical activity, social engagement, intellectual stimulation, and healthy eating; reduce exposure to air pollution; and limit stress levels related to environmental factors such as traffic and noise. Ecological theoretical models of cognitive health are needed to systematically investigate the environments in which people develop and navigate cognitive decline. This paper builds evidence for a new concept of 'cognability': an innovative theoretical approach to indicate how supportive a neighborhood is to cognitive health through community resources and neighborhood amenities that support socially, physically, and intellectually active aging in place.

Method: We conducted analyses in the *Reasons for Geographic and Racial Differences in Stroke* study, a national sample of aging Black and white Americans (n=21,151, mean age at assessment 67 years). We used a confirmatory factor analysis of five cognitive tests measuring verbal learning, memory, and executive function (Root Mean Square Error of Approximation=0.013; Comparative Fit Index=0.999), and output standardized scores for each participant. Contextual measures were created for urban-dwelling participants using a kernel density method to capture proximity and availability of neighborhood amenities. Multilevel generalized additive models estimated associations between global cognitive function and access to neighborhood places for physical activity, socialization, and intellectual stimulation.

Result: Analyses identified statistically significant positive associations between cognitive function and access to civic and social organizations (p-value=<0.001), senior centers (p-value=0.004), coffee shops and fast-food restaurants (p-value=<0.001), parks (p-value=<0.001), recreation amenities (p-value=0.023), walkable destinations (p-value=<0.001), and arts/cultural sites (p-value=<0.001).

Conclusion: Living in neighborhoods with more opportunities for social interaction, physical activity, and intellectual stimulation may support cognitive function among older adults aging in place. Promoting 'cognability' via neighborhood intervention and urban planning may complement and enhance biomedical and individual lifestyle approaches.