Brief Original Report

A retrospective study on changes in residents' physical activities, social interactions, and neighborhood cohesion after moving to a walkable community ☆

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A R T I C L E   I N F O

A B S T R A C T

Objective. This study is to examine changes in residents' physical activities, social interactions, and neighborhood cohesion after they moved to a walkable community in Austin, Texas.

Methods. Retrospective surveys (N = 449) were administered in 2013–2014 to collect pre- and post-move data about the outcome variables and relevant personal, social, and physical environmental factors. Walkability of each resident's pre-move community was measured using the Walk Score. *T* tests were used to examine the pre–post move differences in the outcomes in the whole sample and across sub-groups with different physical activity levels, neighborhood conditions, and neighborhood preferences before the move.

Results. After the move, total physical activity increased significantly in the whole sample and all sub-groups except those who were previously sufficiently active; lived in communities with high walkability, social interactions, or neighborhood cohesion; or had moderate preference for walkable neighborhoods. Walking in the community increased in the whole sample and all subgroups except those who were previously sufficiently active, moved from high-walkability communities, or had little to no preference for walkable neighborhoods. Social interactions and neighborhood cohesion increased significantly after the move in the whole sample and all sub-groups.

Conclusion. This study explored potential health benefits of a walkable community in promoting physically and socially active lifestyles, especially for populations at higher risk of obesity. The initial result is promising, suggesting the need for more work to further examine the relationships between health and community design using pre–post assessments.

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Introduction

Physical and social activities have important health benefits. Regular *physical activities* help prevent obesity and have many other benefits for physical and mental health (Strohle, 2009; U.S. Department of Health and Human Services, 2008). However, in 2014, 48.4% of American adults did not meet the public health guidelines recommending ≥150 min of moderate physical activities per week (Centers for Disease Control and Prevention, 2014). Positive *social interactions* help improve physical and mental health and trust among residents (Berkman et al., 2000; Kawachi and Berkman, 2001; Putnam, 2000). But such social interactions within the neighborhood have declined over the past few decades,

accompanied by a decrease in residents' attachment to the neighborhood (Guest and Wierzbicki, 1999).

The built environment has been identified as an important correlate of residents' physical and social activities. In contrast to automobile-dependent developments, walkable communities typically feature high density, mixed land uses, and sufficient pedestrian, bicycle, and transit facilities. They have been associated with higher levels of physical activities (Dannenberg et al., 2011; Frank et al., 2004; Ding and Gebel, 2012; Saelens and Handy, 2008; Durand et al., 2011; Humpel et al., 2002) and more social interactions (Lund, 2002; Nasar and Julian, 1995; Kim and Kaplan, 2004; Leyden, 2003). However, previous studies are mostly cross-sectional (Saelens and Handy, 2008; Ding and Gebel, 2012; Zhu and Sallis, 2011); only a few studies conducted a pre–post comparison to better isolate the impact of moving into walkable communities (Handy et al., 2008; Tudor-Locke et al., 2008; Wells and Yang, 2008; Giles-Corti et al., 2013).

This study addressed this knowledge gap by using a retrospective "pre–post" comparison to examine (1) if residents increased their

Table 1

Descriptive statistics and *t* test results for pre–post move differences in physical and social activities among the 2013–2014 survey respondents who moved to Mueller in Austin, Texas, U.S.A.

Variables	Descriptive statistics		T test results: mean pre–post differences (post-move–pre-move)					
	All respondents (N = 449)		All respondents (N = 449)	Respondents who moved from Austin (N = 284)	Subgroups by pre-move neighborhood's walkability[b]			
	Pre-move mean (SD[a])	Post-move mean (SD)			High (N = 60)	Medium (N = 99)	Low (N = 81)	Very low (N = 34)
Physical activities								
Days/week with ≥30 min of moderate physical activities	3.6 (2.0)	4.2 (1.8)	0.6***	0.6***	0.1	0.8***	0.7**	0.8*
Bicycling (min/week[e])	12.4 (35.9)	21.8 (54.8)	9.5***	10.9**	9.1	1.4	12.2**	40.5*
Total Walking (min/week)	110.9 (112.5)	142.4 (116.3)	32.1***	31.0***	2.3	39.8***	37.8***	53.3***
Walking in community (min/week)	80.5 (99.9)	118.0 (105.2)	37.8***	41.4***	10.0	49.8***	55.3***	54.1**
Traveling in private car (min/week)	249.5 (207.5)	181.1 (152.3)	−68.4***	−50.8***	24.6	−59.9***	−60.7**	−164.2**
Social interactions (days/month)								
Say hello to neighbors	10.9 (9.8)	17.9 (10.3)	7.0***	8.6***	7.4***	9.3***	8.1***	10.4***
Stop and talk to neighbors	6.2 (7.9)	11.2 (9.5)	4.9***	6.2***	5.2***	6.6***	5.8***	8.8***
Socialize with neighbors	2.7 (5.6)	4.9 (6.9)	2.1***	2.5***	1.7	3.3***	1.5*	4.4**
Seek help from and exchange favor with neighbors	2.2 (4.3)	3.4 (5.1)	1.2***	1.6***	1.4	2.1***	1.2	1.9*
Neighborhood cohesion[f]								
Neighbors can be counted to help in case of need	3.1 (1.4)	4.1 (1.1)	1.0***	1.4***	1.3***	1.3***	1.4***	1.8***
This is a close-knit neighborhood	2.5 (1.4)	3.9 (1.1)	1.4***	1.7***	1.6***	1.7***	1.7***	1.9***

[a] SD: Standard deviation.

[b] High walkability, Walk Score: 89-70; medium walkability, Walk Score: 69-50; low walkability, Walk Score: 49-25; very low walkability, Walk Score: 24-0.

[c] Sufficiently active is defined as obtaining ≥30 min/day of moderate physical activities on ≥5 days/week.

[d] Subgroups for social interactions and neighborhood cohesion were created based on the percentiles of the sum of all corresponding measures (high = 100–67 percentiles; medium = 66–34 percentiles; low = 33–1 percentiles).

[e] The survey collected information about the *number of days per week* (continuous variable) and the *number of minutes per day* (categorical variable with ranges of 1–10, 11–20, 21–30, 31–40, 41–50, 51–60, and 61+) spent on each type of physical activity or in a private car. The *number of minutes per week* was calculated by multiplying the number of days per week with the midpoint value of the time range (or a value of 65 for the "61+" category) for the number of minutes per day.

[f] Neighborhood cohesion variables were measured on a 5-point Likert scale, by asking the respondent how much he/she agreed or disagreed with each statement (1 = strongly disagree; 2 = somewhat disagree; 3 = neither disagree nor agree; 4 = somewhat agree; 5 = strongly agree).

*** $p < 0.001$.

** $0.001 \leq p < 0.01$.

* $0.01 \leq p < 0.05$.

physical activities, social interactions, and neighborhood cohesion after moving to a walkable community and (2) whether such changes varied across sub-groups with different levels of physical activities, community walkability, social interactions, neighborhood cohesion, and neighborhood preferences before the move.

Methods

Study setting

The study setting is the 711-acre Mueller community in Austin, Texas, U.S.A. It will accommodate about 10,000 residents and 10,000 employees upon completion in 2018. About 25% of the housing units in Mueller are affordable homes reserved for households with incomes lower than the area's median. When this study began in May 2013, Mueller had approximately 40% of its construction completed. Mueller's activity-friendly environment features compact and mixed land uses, grid-like street networks, complete sidewalks, and rich green/open spaces. Based on the 2010 Census, its population characteristics are similar to the citywide average. This offers an advantageous opportunity to study the health impacts of moving into a walkable community. More details about Mueller's environment and population characteristics have been reported elsewhere (Zhu et al., 2013).

Variables and data collection

A self-report survey was administered to one adult (≥18 years) from each participating household, who had no physical impairment or disability preventing him/her from engaging in normal physical activities. The survey included post-move and pre-move sections. The recall period for the pre-move section, or the time the respondent had lived in Mueller, ranged from 1 month to 6.4 years, with a mean of 2.9 years. Study variables included the outcomes (physical activities, social interactions, and neighborhood cohesion) and personal, social, and physical environmental factors that might have influenced those outcomes. They were selected based on the social ecological theory (McLeroy et al., 1988) and previous literature (Saelens and Handy, 2008; Ding and Gebel, 2012; Durand et al., 2011). Most survey items were adopted and a few were adapted from existing validated questionnaires, including the International Physical Activity Questionnaire, the Twin Cities Walking Survey, and the Active Where Survey (Forsyth et al., 2009; Durant et al., 2009; Craig et al., 2003). The adaption was made based on the feedback from a focus group with Mueller residents (N = 13) and a pilot test (N = 6), to reflect Mueller's unique characteristics (e.g., adding "front porches" as a choice for physical activity locations).

Online surveys were the main method of data collection, but hard copies, as a more preferred format for older adults, were also mailed to the senior apartment residents. The recruitment process started with an online message posted at the community online forum in May 2013, followed by two online reminders. Between December 2013 and May 2014, mail invitations were sent to those residents who did not respond to the survey and were followed by two reminder mails.

Physical activities were captured by the number of days per week with ≥30 daily min of moderate physical activities and by frequencies (days/week and min/day) of specific activities (Table 1) (Craig et al., 2003). Positive social interactions were measured by the frequency of specific interactions; neighborhood cohesion was measured using a 5-point Likert scale, by asking the respondent how much he/she agreed or disagreed with relevant statements (Table 1) (Forsyth et al., 2009). Residential self-selection (neighborhood preference in relation to walkability) was captured by asking the respondent how important the "ease of walking" was in their relocation to Mueller (Boone-Heinonen et al., 2010; Forsyth et al., 2009). The walkability for each respondent's pre-move neighborhood was measured