Associations of Physical Activity-Related Social Norms and Frequency of Outdoor Walking with Perceived Walkability Among Rural Oregon Adults

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ABSTRACT

Context: Individuals who walk regularly are more likely to meet recommended physical activity guidelines than non-walkers; however, rural US adults walk less than urban adults. The built and social environment, perceived walkability and walking are bidirectionally related with each other.

Objective: This study's purpose was to assess the associations of physical activity-related social norms and frequency of walking in the neighborhood with perceived walkability among rural adults.

Study Design & Main Outcomes: The data for this cross-sectional analysis comes from a randomized trial with 18 rural Oregon libraries. As part of baseline assessment, participants completed surveys on physical activity-related social norms, perceived walkability, frequency of walking in the neighborhood, and demographic items. We assessed bivariate correlations and ran linear regression models with perceived walkability as the outcome and social norms (social environment) and frequency of walking in the neighborhood (built environment experience) as predictors with covariates of age, gender and income.

Setting and Participants: Adult residents of 18 rural communities in Oregon.

Results: Of the 313 participants who completed the survey, 60% were 65 and older, 92% white and 86% women; 17% reported walking in the neighborhood less than once a month and 5% reported walking 5 or more days/week. We found positive correlations between perceived walkability and frequency of walking in the neighborhood ($r = .23$, $p < .01$), and social norms ($r = .47$, $p < .01$). The linear regression model explained 28% of the variance in perceived walkability (adj r-squared = 0.26). Social norms (unstandardized coefficient = 0.37, 95% CI: 0.28,0.46) and frequency of walking in the neighborhood, (unstandardized coefficient = 0.06, 95% CI: 0.02, 0.10) were positively associated with perceived walkability.

Conclusions: Among a group of rural adults social norms had a greater influence on perceived walkability than frequency of walking in the neighborhood. Intervening in the social environment could impact perceived walkability and ultimately walking among rural adults.

KEY WORDS: built environment, rural, social environment, social norms, walkability, walking

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Introduction

Many rural residents experience disparities in physical activity-related chronic illness, such as cardiovascular disease and certain cancers[1,2]; yet, less than 20% of rural adults meet US physical activity guidelines.[3] Walking is the most common form of physical activity[4-6] and people who walk are more likely to meet physical activity guidelines compared to non-walkers.[4] However, rural residents report walking less than urban residents.[7]

Social Cognitive Theory posits that there are dynamic and reciprocal interactions between individual health behavior (eg, walking), individual cognition (eg, perceptions), and both social and built

environment, with each factor influencing and being influenced by the others, known as reciprocal determinism.[8] Thus, the factors of perceived walkability, the built environment, the social environment, and frequency of walking can influence and be influenced by each other. For example, older adults who participated in a group walking program reported improved physical activity-related perceptions of their community after their participation in the program and aspects of the built environment enhanced their adherence to the group walking program.[9]

Built environment features, such as parks, paths, streetlights, and sidewalks, are associated with both rural and urban walking.[10,11] Built environment features associated with leisure (walking for health, fitness or recreation) and transportation walking (walking to get to a destination) differ among rural and urban adults.[12] In rural settings, specific built environment features, such as sidewalks, paths and trails and destinations, such as movie theaters, libraries and churches are associated with both leisure and transportation walking among rural residents and the greater the number of these features and destinations the greater the amount of reported walking.[7] However, rural compared with urban communities are more geographically dispersed, have fewer of these pedestrian-friendly features, and fewer walkable destinations.[13]

Walkability, defined as how the built environment impacts walking for leisure or transportation,[14] is associated with physical activity more broadly[15] and walking more specifically.[7] Perceived and objective walkability, however, do not always correlate; studies have found that some individuals living in objectively low walkable neighborhoods can perceive them as highly walkable and vice versa.[16,17] In some studies, older age is associated with lower perceived walkability[16,17] and in others there is no significant difference by age.[18,19] Older urban adults have reported in focus groups that safety (eg, traffic volume, street crossings) and attractiveness of places to walk was more important than distances to destinations.[20] In urban areas, the effect of gender on perceived walkability is mixed. Some studies found no significant difference in rating of walkability by gender[16,17] and in others, women reported lower levels of perceived walkability compared to men.[19,21]

The relationship between walkability and the social environment (eg, social norms, social capital, social interactions, social cohesion, sense of community/belonging)[22] is mixed. One study with older urban adults found no association between objective walkability and social norms, social trust, and social networks.[23] Another study with urban adults, found no associations between objective walkability and social cohesion, informal social control, and social interaction, but objective walkability was positively associated with sense of community.[24] In another study, there was a positive association between perceived walkability and social interaction and sense of community but there was not a significant association between objective walkability and social interaction and a negative association of objective walkability with sense of community.[25] A more recent study found that objective walkability was positively associated with social interaction and a sense of community.[26]

There is limited knowledge on what factors might impact perceived walkability among rural residents. This analysis considers how frequency of walking in the neighborhood (direct experience with the built environment), and physical activity related social norms (the social environment) relate to perceived walkability in rural adults. Considering the dynamic and reciprocal interactions among these variables, we focused on the perceived walkability as the main outcome because of its influence on the frequency of walking and the limited understanding of the factors that impact perceived walkability in rural adults.

Methods

Program description and setting

The data for this cross-sectional analysis comes from a randomized trial (the parent study) comparing the impact of two interventions on physical activity and fitness in rural adults: a group walking program called Step It Up, and Step It Up plus a civic engagement program called Change Club.[27] Eighteen rural Oregon libraries were randomized to implement either Step It Up or Step It Up plus Change Club for two years (spring 2023–spring 2025). Libraries were classified as serving rural and small towns per the US Institute of Museum and Library Science.[28] Prior to the start of the programs in spring 2023, participants completed an online survey using a tablet that we provided as part of a larger in-person data collection event. Complete study details can be found in Perry et al.[27] Oregon Health & Science University Institutional Review Board approved this study, and all participants completed an informed consent process prior to participation.

Measures and variables

Frequency of neighborhood walking. We adapted two questions from a survey developed by Brownson and colleagues[29] and asked, "Where do you usually walk most of the time?" and "How often do you use this location for walking?" We used these two questions as a measure of the frequency of walking

outdoors in the neighborhood. We combined the responses from these two questions to indicate whether a participant walked at indoor or outdoor locations and if at outdoor locations, the frequency of walking at those locations. We coded all participant responses of "indoor gym or fitness center track," "treadmill (home or gym)," "school track," "super store and shopping mall," and "other," as a 1, regardless of how often, to indicate that these are indoor locations. Since the specific location was not recorded by the respondent for the "other" category, we coded this response as indoor to be conservative on what was included as outdoor. Participants who responded "walking/jogging trail," "neighborhood streets," or "park," which were considered outdoor locations we coded based on response to the frequency that they walked at these locations with 2 = less than one a month, 3 = 1 to 3 times per month, 4 = once per week, 5 = 2 to 4 days per week and 6 = 5 to 7 days per week.

Social norms for physical activity. We used a scale developed by Ball and colleagues to assess social norms.[30] Participants responded using a 5-point Likert scale (1 = strongly agree, 2 = agree, 3 = neither agree or disagree, 4 = disagree and 5 = strongly disagree) to the following 5 statements: (1) I often see other people walking in my neighborhood, (2) I often see other people exercising (eg, jogging, bicycling, playing sports) in my neighborhood, (3) Lots of people I know walk or cycle, (4) Lots of people I know do other forms of exercise or play sports, (5) Lots of people I know don't do much physical activity. A summary score was calculated by reverse coding for each statement except for statement 5, and then the scores were averaged. Scores range from 1 to 5 with higher score indicating stronger social norms.

Perceived walkability. We used the Perceived Walking Environment Scale to assess perceived walkability.[31] Participants responded on a 5-point Likert scale (1 = strongly agree, 2 = agree, 3 = neither agree or disagree, 4 = disagree, 5 = strongly disagree) to the following 6 statements: (1) my community offers many opportunities to be physically active, (2) facilities (eg, community centers) in my community offer many opportunities to get exercise, (3) it is pleasant to walk in my community, (4) the trees in my community provide enough shade, (5) in my community it is easy to walk places, and (6) I often walk to places near my home. Summary scores were calculated by reverse coding and the scores were averaged; scores range from 1 to 5 with higher score indicating greater perceived walkability.

Demographics. We also asked participants about age, race, ethnicity, gender, and household income.

Statistical analyses

We describe the sample using means and standard deviations for continuous variables and proportions for categorical variables, and report reliability (Cronbach's alpha) for all self-report scales. Relations between scale scores were examined with scatterplots and bivariate correlation coefficients (r). To address the primary aim of the study, linear regression was used to predict perceived walkability with social norms, frequency of walking in the neighborhood, controlling for age, gender and income. We included demographic covariates of age, gender and income in our analysis because of their demonstrated association with perceived walkability. In addition to unstandardized regression estimates, we also report standardized estimates for continuous predictors which allow comparison of the magnitude of the effects between different predictors. Prior to modeling, we recategorized gender as a binary variable (man and woman), and income was recategorized into low income (less than $25 000), middle income ($25 000–$49 999), upper middle income ($50 000–$149 999) and high income ($150 000 or greater). Model diagnostic plots (eg, residual x predicted values) were examined to assess statistical assumptions. All analyses were conducted with R 4.1.2.

Results

A total of 313 participants completed the survey. The majority of participants were 65 years or older (60%), married or partnered (63%), white (92%) and women (86%). There was little missing data (highest proportion was 3.2%) and regression models were fit using listwise deletion. Population demographics are further detailed in Table 1. Seventeen percent reported walking in the neighborhood less than once a month and 5% reported walking 5 or more days/week (Table 2). Both social norms and perceived walkability summary scores were found to be symmetrically distributed. Cronbach's Alpha for social norms survey was 0.77 and perceived walking environment survey was 0.70 indicating moderate to excellent internal reliability.

Table 3 shows the unstandardized (w/ 95% CIs) and standardized linear regression estimates of the association between perceived walkability and social norms, and perceived walkability and frequency of walking in the neighborhood, controlling for age, gender, and income. We found a positive correlation (r = 0.23, p < .001) between perceived walkability and frequency of walking in the neighborhood and a stronger positive correlation (r = 0.47, p < .001) between perceived walkability and social norms. The linear regression model

TABLE 1
Sample Demographics, N = 313

Characteristics	
Age	
Mean (SD)	64.6 (12.8)
Median [min, max]	67.0 [23.0, 90.0]
Missing	3 (1.0%)
Relationship Status	
Married	185 (59.1%)
Member of an unmarried couple	12 (3.8%)
Divorced	49 (15.7%)
Widowed	37 (11.8%)
Separated	2 (0.6%)
Never been married	23 (7.3%)
Missing	5 (1.6%)
Ethnicity	
Hispanic or Latino	16 (5.1%)
Not Hispanic or Latino	292 (93.3%)
Missing	5 (1.6%)
Race	
American Indian or Alaska Native	5 (1.6%)
Asian	6 (1.9%)
Black or African American	1 (0.3%)
More than one race	3 (1.0%)
Unknown or not reported	11 (3.5%)
White	287 (91.7%)
Employment	
Employed for wages	63 (20.1%)
Self-employed	19 (6.1%)
Out of work for more than 1 year	4 (1.3%)
Out of work for less than 1 year	3 (1.0%)
A homemaker	17 (5.4%)
A student	1 (0.3%)
Retired	198 (63.3%)
Unable to work	8 (2.6%)
Income	
Low ($0–$24 999)	48 (15.3%)
Middle ($25 000–$49 999)	78 (24.9%)
Upper ($50 000–$149 999)	156 (49.8%)
High ($150 000 and greater)	21 (6.7%)
Missing	10 (3.2%)
Grade Completed	
Eighth grade or less	6 (1.9%)
Some high school	1 (0.3%)
High school or GED certificate	36 (11.5%)
Technical or vocational school	24 (7.7%)
Some college	92 (29.4%)
College graduate	83 (26.5%)
Post-grad or professional degree	69 (22.0%)
Missing	2 (0.6%)
Gender	
Man	42 (13.4%)
Woman	268 (85.6%)
Missing	3 (3.2%)

(continues)

explains approximately 28% of the variation in perceived walkability (adj *R*-squared = 0.26), suggesting moderate explanatory power. Model diagnostic plots suggested good model fit. Social norms and frequency of walking in the neighborhood showed significant positive associations with perceived walkability with social norms showing the largest effect (standardized estimate = 0.28). Income showed a significant association, with lower income groups perceiving worse walkability as compared to the highest income group. Gender and age were not significantly associated with perceived walkability.

Discussion and conclusion

We found that both social norms and frequency of walking in the neighborhood were positively associated with perceived walkability among adults living in rural Oregon communities. Social norms had a greater influence on perceived walkability compared to frequency of walking in the neighborhood. Income was also associated with perceived walkability with

TABLE 2
Perceived Walkability, Social Norms and Frequency of Walking in the Neighborhood by Age and Gender

	Overall (N = 313)
Perceived Walkability	
Mean (SD)	3.34 (0.627)
Median (Min, Max)	3.33 (1.83, 5.00)
Social Norms	
Mean (SD)	3.25 (0.759)
Median (Min, Max)	3.40 (1.00, 4.80)
Frequency Walking in Neighborhood N (%)	
Walking Indoors	77 (24.6%)
Less than once a month	53 (16.9%)
1 to 3 times per month	67 (21.4%)
Once per week	38 (12.1%)
2 to 4 days per week	48 (15.3%)
5to 7 days per week	16 (5.1%)

TABLE 3
Unstandardized and Standardized Associations with Perceived Walking Environment in Rural Communities

Covariate	Unstandardized (95% CI)	Standardized
Social Norms	0.37 (0.28, 0.46)	0.28
Frequency Walking in Neighborhood	0.06 (0.02, 0.11)	0.10
Age	0.01 (–0.01, 0.01)	0.06
Male[a]	0.10 (–0.09, 0.29)	-
Low Income[b]	–0.42 (–0.71, –0.13)	-
Middle Income[b]	–0.32 (–0.59, –0.05)	-
Upper Middle Income[b]	–0.28 (–0.53, –0.03)	-

[a]*Referent – Female.*
[b]*Referent – High income.*
Note: Standardized coefficients reported for continuous predictors only.

individuals of lower income having worse perceived walkability. Gender and age were not significantly associated with perceived walkability.

Our data suggest the social environment (via social norms) was more influential than direct experience with the built environment (via frequency of walking in the neighborhood) on how rural individuals perceive the built environment's walkability friendliness in these rural settings. In a recent study with rural adults, a sense of community belonging and social cohesion were associated with perceptions of fewer barriers to walking.[32] Taken together with findings from our study, this suggests that the social environment is an important contextual consideration for improving perceived walkability in rural communities. We hypothesize that this may be true due to the high levels of social cohesion, sense of belonging, and social relationships found in rural community life[33] combined with the dearth of built environment features supportive of walking in many rural locations.[13] One way to enhance the social environment, including social norms, is through participating in a group walking program. These programs address social influences to enhance participation in the walking program[34-36] and as our data suggest also would improve perceived walkability. Considering the dynamic and reciprocal relationships between social environment, perceived walkability, and frequency of walking, the Social Cognitive Theory suggests that these three factors would influence and be influenced by each other. As a result, we would expect that improving the social environment would enhance both perceived walkability and the frequency of walking in rural neighborhoods.

Frequency of walking, a direct experience of the built environment, was positively associated with perceived walkability. This is consistent with a study among rural older adults who after participating in a walking program had better physical activity-related perceptions of their community.[9] In accordance with the Social Cognitive Theory, we would expect a bi-directional dynamic interaction between frequency of walking and perceived walkability.

In our study, we did not ask whether the walking in the neighborhood was done for leisure or transportation, although the three outdoor locations (walking/jogging trails, parks, neighborhood streets) suggest the walking was predominantly for leisure. In another study, rural adults who lived outside the town center described walking in their neighborhoods as mostly recreational rather than transportational walking to a destination, such as a store,[37] suggesting that for these adults, recreational walking might be more salient. Recreational walking may involve social interaction, which might be more prevalent in rural tight-knit communities. Thus, promoting walking for recreation through group walking programs has the potential to build upon the importance of social relationships in rural communities.

Income was the only demographic variable that had a significant association with perceived walkability. In our study those with lower income had worse perceived walkability. Similarly, a study with adults found that adults with lower income had worse perceived walkability[21] and another study found that a greater number of adults with lower income living in an area with high objective walkability, perceived it as low walkability.[17] Age did not have a significant effect on perceived walkability. The relationship between age and perceived walkability has been mixed; one previous study similarly found that age did not have a significant effect on perceived walkability among adults.[19] In two previous studies, among adults residing in an objective high walkable

Implications for Policy & Practice

- Social norms may influence the perception of walkability with rural adults.
- Implementing interventions that are directed toward enhancing the social environment such as group walking programs could improve perceived walkability and in turn frequency of walking in rural adults.

neighborhood, older adults compared with younger adults reported worse perceived walkability[16,17] and one study found older adults compared with younger adults reported better perceived walkability.[21] Gender did not affect perceived walkability in our study, likely due to the sample consisting mostly of women. Two previous studies found gender did not impact perceived walkiblity,[16,17] while two studies found women reported worse perceived walkability.[19,21] It should be noted that all the previous studies cited here took place in urban environments, while our study was conducted in rural communities. This highlights the limited research with rural populations and the need for more research with rural populations to understand how these demographic variables effect perceived walkability with rural adults.

Our study has several limitations. It was conducted in rural areas of Oregon and might not be generalizable to other areas in the United States. An inclusion criterion for the parent study required eligible participants be active three or less days per week; thus, our sample consisted of predominantly inactive residents. Data on walking in the neighborhood were self-reported and may be affected by recall bias. Our sample was mostly older, white and women and thus might not be generalizable to other demographic groups. However, our study included 18 rural communities that were geographically spread around the state and were diverse in population size and median household income.

In our study with rural adults, social norms, an aspect of the social environment, had a greater influence on perceived walkability than frequency of walking in the neighborhood, which is a direct experience of the built environment. This suggests that the social environment plays an important role in perceived walkability and that intervening in the social environment by implementing group walking programs could impact perceived walkability and in turn frequency of walking in rural adults. Further investigation with rural populations into the nature of the dynamic interactions among the perceptions of the built environment, the social environment and walking, including prospective studies, is warranted to inform the development of interventions designed to increase walking among rural adults.

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