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Perceived Resources and environmental correlates of Domain-Specific Physical Activity in Rural Midwestern Adults

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Abstract

Background—Rural adults participate in lower levels of physical activity (PA) than urban or suburban adults. Due to known effects of the environment on PA participation, this study examined perceived ecological correlates (social, environmental, and policy) of domain- and intensity-specific PA in rural adults.

Methods—A cross-sectional survey was completed by 143 individuals residing in the rural Midwest. PA was measured using the International Physical Activity Questionnaire; correlates of PA were measured using a modified version of the PA in Communities Questionnaire. Multiple regression analyses were conducted using general linear modeling.

Results—Predictors of PA included: employers providing time for exercise ($P = .0003$); available shopping malls ($P = .0032$); activity-friendly community aspects ($P = .0048$); favorable policy attitudes ($P = .0018$): participation in sports ($P < .0001$); encouragement from friends ($P = .0136$); awareness ($P = .0015$) and use ($P = .0113$) of community resources; and having hills ($P = .0371$).

Conclusions—Correlates of PA in various domains and intensities in rural adults are multi-factorial and occur at different levels of the environment. Findings from this study can be used to tailor PA interventions in rural adults, with respect to specific domains and intensity in which the PA occurs.

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Keywords

physical activity; rural; environment; correlates

Introduction

Physical activity (PA) is associated with positive health outcomes, and is often examined in research studies as an individual-level behavior. However, an individual-level perspective may overlook the broader context in which the PA occurs.[1] Most research has examined PA in urban or suburban communities[2], and there is a need for research specifically examining rural environments.

Ecological frameworks stress that there is a relationship between one's environment and the behaviors individuals choose to engage in.[3] The physical, social, and policy environment, along with personal beliefs, attitudes, and skills, plays an important role in determining whether one will engage in regular PA.[4] In the physical environment, perceived access to PA resources has been associated with being twice as likely to meet PA guidelines.[5] Previous research found that the most relevant physical environment aspects in rural areas that are associated with PA are aesthetics, walkable destinations (including trails and parks), and safety from crime and traffic.[6] However, access to resources may be more limited in rural areas, [7] and there may be fewer destinations within walking or biking distance.

In the social environment, evidence suggests that social support is one important factor for increasing the likelihood of meeting exercise recommendations.[7] Additionally, rural women prefer to exercise in social groups for safety reasons,[8] and having friends that encourage exercise was found to be positively associated with rural adult participation in sport activities.[9]

A study of policy attitudes showed some associations with PA. Greater odds of being physically active was associated with individuals who believe employers should provide time during the day for exercise, support local schools require physical education, and favor the use of government funds for building walking/jogging trails, swimming pools, and biking paths in a national sample of adults.[4] In rural adults, one study showed widespread support for policies that increase PA.[10]

In addition to factors in perceived social, physical, and policy environments, awareness of objectively-identified, local PA resources may potentially influence levels of PA. Few studies have examined awareness of PA resources as a determinant of this behavior in rural adults, and one study showed that over half of rural adults were not aware of walking trails in their community.[11] There is a clear need to examine how awareness is associated with PA behavior.

The purpose of this study was to examine associations between PA and perceived correlates guided by an ecological approach in a sample of Midwestern rural adults. Data were gathered using a survey modified to be culturally relevant to the rural population. It was hypothesized that the social, physical, and policy environmental correlates would be

positively associated with PA in the domains of transportation, occupation, house or yard work, recreation or leisure, and sport, and that barriers to these environmental correlates would be negatively associated with PA.

Methods

Design and Sample

A cross-sectional survey was carried out in 2012 using a self-administered, mailed survey. Adults aged 18 and above who had lived in their community for at least one year were recruited from a rural county in southeast Iowa. Potential survey participants were randomly selected (every 20th listing), stratified by town, from the county-wide public telephone book, which includes approximately 9,000 listings. Adults were screened for eligibility over the phone, and the survey was mailed to eligible adults who agreed to complete it. In addition, recruitment flyers were posted around the sampled towns, and press releases advertising the study were published in local newspapers. Potential participants seeing these were asked to contact the researchers if they were interested in completing a survey. In exchange for completing a survey, participants were mailed a $10 gift card for a local retailer. If the survey was not returned after 2 weeks, a follow-up call was made, and up to two more follow up calls were made every two weeks thereafter. Participants who decided not to participate after being mailed a survey were asked to send back a blank survey. Thirty participants completed the survey a second time in order to determine the test-retest reliability. Study procedures were approved by the Institutional Review Board at the University of Iowa.

Measures

Demographics—Demographic information included standard questions on: age, height/weight, gender, education level, income (eight categories from less than $10,000 to $75,000 or more), employment status, marital status, self-rated health status (five categories from poor to excellent), and residing in town or in the country. Those living in the country were asked to further provide whether they lived on a farm, acreage, or subdivision. Age was stratified into five categories: <30, 30-39, 40-49, 50-59, and ≥60 years because the relationship between age and PA is not linear.[12]

Physical activity—The survey included the International Physical Activity Questionnaire Long Form (IPAQ), which assesses PA behavior over the past seven days across the domains of occupation, transportation, house and yard work, and recreation and leisure. The IPAQ can be self-administered, and was developed for ages 15 to 69, making it appropriate for the present study sample. Test-retest reliability coefficients of the IPAQ range from 0.46 to 0.96, with a majority of the scores being above 0.70.[13] Fair to moderate criterion validity of the IPAQ, using accelerometer data for comparison, has been reported.[13] Physical activity by domain (measured as a continuous variable in MET-minutes per week, or as a categorical variable consisting of low, moderate and high levels of PA) was this study's outcome of interest using the IPAQ. Both continuous and categorical variables were used in analyses.

The Sport Index of the Kaiser Physical Activity Survey was included to provide data on activities that participants engaged in. The Sport Index has shown the highest correlation with PA (r = .73), and the highest criterion validity (r = .73), among all of the domains measured in the survey.[14] This index is a unit-less rank-order value, where 0 indicates no participation in sports during the course of a year, and 5 indicates high participation in sports during the course of a year.

Perceived environment—We used a modified version of a questionnaire developed by Brownson and colleagues to measure perceived social, environmental, and policy correlates of PA.[15] This survey instrument was designed for a national sample of adults, and includes questions on walking and PA behaviors (six questions), neighborhood characteristics and barriers to being active (four questions), social assets for being active (twelve questions), community assets for being active (two questions), and policy attitudes (seven questions). Scoring varied for each question, with the following possible response options: yes or no, a 5-point scale from never to very often, a 4-point scale from not at all true to very true, and a 4-point scale from strongly disagree to strongly agree.

Modifications were made to this survey instrument for the purposes of this study. A few items were deleted because they were very similar to other measures used. Other changes include revising the scoring responses for questions related to policy attitudes towards PA from “yes” or “no” to a 4-item Likert-type scale ranging from strongly disagree to strongly agree. Modifications were also made to response choices to better fit the rural context for being active. For example, some questions were modified to include the option of exercising at home as an answer choice; question #15 was modified to include farm equipment on the roads and hunting or conservation areas as answer choices, and gravel, muddy, and/or dusty roads were added as answer choices for questions #14 and #16; and additional barriers for question #16 included no sidewalks available, unsure of how to use exercise equipment, and having to pay to use facilities.

Based on results from previously conducted focus groups among rural adults in the same communities targeted in this study,[16] three items were included in the modified instrument asking about the perceptions of whether schools and other community buildings should be open to the public to allow community members to engage in exercise or be more active. Finally, research has shown that rural adults may lack awareness of community PA resources, [11] and a new question was developed to measure awareness. A list of county-wide PA resources was created and sent to multiple community stakeholders for review and additional suggestions, and 35 resources and facilities in the county were included in the final survey.

Pre-Testing

Five personal interviews with community members were conducted to examine the survey instrument and ensure that it was comprehensible. No structural changes were suggested and all questions were answered easily and without confusion. The average administration time for the entire survey was about 30 minutes.

Data Analyses

Test-retest scores were analyzed using Pearson's correlation coefficients and kappa statistics, as appropriate, to examine variability within participants. Spearman correlations were also examined for data that were skewed.

Distributions, frequency counts and the presence and patterns of missing data were examined. Physical activity scores were cleaned and truncated following IPAQ guidelines to ensure realistic levels of PA. Data were then analyzed using multiple regression with continuous and categorical measures of PA. Factors examined as covariates included BMI, age, gender, income, education, employment status, health status, and living “in town” or the country. Chi-square analyses and correlation matrices were examined among all variables to determine which ones to include in the model selection analyses. Variables were considered if they were univariately significant at an alpha level of 0.05. Then, model selection was conducted using stepwise selection. This two-step model selection process was conducted due to the large number of variables included in the survey. The regression residuals were examined, and goodness of fit tests conducted on the final models with no evidence of assumptions being violated and no lack of fit. None of the variables were dropped due to high correlations; however, some variables were collapsed into fewer categories for use in the analyses.

A p-value of 0.05 was used for tests of significance. All analyses were conducted using SAS, version 9.3 (SAS Institute, Cary, North Carolina).

Results

Response Rate

Overall, 215 individuals were reached by phone during recruitment. Of those, 143 consented to complete the survey and 72 refused. For the 143 who agreed, 130 participants sent back a completed survey and 13 did not return the survey, giving a response rate of 60% of those reached by phone. In addition, 13 other participants contacted the researchers to participate after either hearing about the study by word of mouth, seeing flyers posted around town, or reading a published press release. Only three participants sent back a blank survey declining to participate; substitutes were randomly chosen from the same town of the individual returning the survey using the criteria described above. The total number of completed surveys was 143.

Reliability

Thirty participants completed a retest survey within 7 to 30 days of completing the initial survey. Retests averaged 13 days between the completions, with a range of 7 to 29 days. Correlation coefficients ranged from -0.06 to 1.0, with the majority (75%) of values falling above 0.58. Kappa coefficients ranged from -0.052 to 1.0, with the majority (75%) falling above 0.46. Correlation and kappa coefficients for the modified questions ranged from 0.27 to 0.82, with the majority (75%) falling above 0.45, indicating moderate reliability.[17]

Sample

Characteristics of the study population are shown in Table 1. The sample was 63% female, 97% white, 83% married, and the mean age was 51 years. In comparison, the state of Iowa is 94% white and 50.4% female.[16] Approximately 56 % were classified as overweight or obese according to their BMI (> 25), which is lower than the state average of 63 %.[18]

Descriptive analyses—Using the IPAQ coding guidelines, [19] over half (55%) of the participants reported high levels of PA, and only 12% reported low levels. There were 72 participants who reported no PA in the domains of work or through transportation. Median scores (in MET-minutes per week) for PA in home and yard work, leisure time, and total activity were 1418 minutes, 233 minutes, and 4017 minutes, respectively. The median MET-minutes per week for moderate PA were 2205; for vigorous PA were 1119; and for walking were 594. Walking was the most common sport or exercise reported by participants, followed by gardening and bicycling. The mean Kaiser Sport Index score was 2.9, with a median of 3.5 and a range of 0 to 5.

The majority (84%) reported having access to both indoor and outdoor places to exercise. Neighborhood streets or sidewalks and using space or equipment at home were the most common reported place participants often exercised. The mean number of PA resources that participants reported being aware of in their county was 19 (SD 8.6, median 19), and the mean number of PA resources that participants reported using was 2.9 (SD 3.3, median 2). Greater awareness of PA resources was significantly correlated with greater use of those resources (Pearson's $r = 0.414$; $P = .000$).

The mean number of barriers reported was 7.34 (SD 3.7, median 7.0). The most common barriers reported were not having time (75% indicated this was a barrier), being too tired (72%), not having motivation (68%) or energy (63%) to exercise, and bad weather (62%). The most common social and environmental barriers reported were having no one to exercise with (39%) and gravel/unpaved/muddy/dusty roads (35%).

Most participants reported feeling safe while exercising, with 83% reporting they felt “quite safe” or “extremely safe” and 94% felt their neighborhood was safe from crime. The majority of participants reported exercising alone (61%), and the most frequently reported response for those exercising with others was spouse/partner (24%), followed by friends (16%) and children (14%). Participants reported getting most of their information about exercise from computer websites and friends, and greater than half reported receiving social support from their family and friends.

Over half of the participants agreed that employers should provide time during the work day for employees to exercise, even though only 27% of participants reported their workplace provided support or incentives for employees to exercise. Overall policy attitudes towards using government funds for building and maintaining PA facilities, zoning regulations that include walking and biking paths, and the use of community buildings for PA were positive, with at least 60% of the participants reporting agreement for each variable.

Regression analyses—A description of the results of the multiple regression analyses are discussed for each domain of PA below. The results are also shown in Table 2.

Work—Since slightly over half of the sample (51%) did not report any PA done at work, this variable was re-coded into a dichotomous categorical variable of either no PA or some PA. Multivariate regression analyses with total PA in MET-minutes per week done in the domain of work showed that those who reported that their employers should provide support or incentives for exercise were more likely to be active at work ($P = .0003$). Also, those who were self-employed were more likely to engage in PA during work ($P < .0001$).

Active transportation—Similar to the domain of work, slightly over half of the sample (51%) reported no active transportation, and this variable was re-coded into dichotomous categories for use in multivariate analyses. Having a higher number of items in one's community that might be associated with PA was associated with more active transportation ($P = .0066$); this included shopping malls ($P = .0032$), sidewalks ($P = .0048$) and hunting/conservation areas ($P = .0213$).

House/yard work—Physical activity in house or yard work was associated with the policy attitude of agreeing that local government funds should be used to build swimming pools ($P = .0018$) and greater use of PA resources and facilities ($P = .0005$). Individuals who were employed full-time, part-time, or self-employed were less likely to engage in PA in house or yard work than someone who was not employed ($P = .0095$). Women were more likely to engage in PA in house or yard work than men ($P = .0389$).

Leisure time—In leisure time, being male ($P = .0413$) and married ($P = .0401$) was associated with PA. Married males were most active, and single females were least active. In addition, having a higher KSI score was associated with PA in leisure time ($P < .0001$).

Total PA—Total PA, as measured by summing the activity scores from the previous four domains, was positively associated with a greater number of positive community aspects ($P = 0.0156$), especially having street lights ($P = .0044$). Additionally, having friends that encourage exercise was positively associated with total PA ($P = .0136$).

A description of the results of the multiple regression analyses for each intensity of PA are discussed below. The results are also shown in table 3.

Vigorous PA—The total vigorous activity, as measured by summing vigorous intensity activity across all domains, was positively associated with greater awareness ($P = .0015$) and use ($P = .0113$) of PA resources. In addition, vigorous PA was negatively associated with having street lights ($P = .0027$).

Moderate PA—The total moderate activity, as measured by summing moderate PA across all domains, was positively associated with greater use of PA resources ($P = .0147$), and hills ($P = .0371$). In addition, moderate PA was negatively associated with more positive policy attitudes towards PA ($P = .0221$) as well as having street lights ($P = .0210$).

Walking—The total activity done through walking in all domains was positively associated with greater use ($P = .0147$) and awareness ($P = .0328$) of PA resources. Increasing walking corresponds to increases in use and awareness of community resources and facilities.

Kaiser Sports Index—The Kaiser Sports Index was positively associated with greater use of PA resources ($P = .0005$), and negatively associated with barriers to exercise ($P < .0001$).

Discussion

Physical Activity

The variability explained by the regression model for total PA was lower than the variability in domain-specific models, indicating that correlates of PA are specific to the domain being measured. There have not been any published studies examining correlates of domain-specific PA using multiple domains in rural adults for comparison.

Findings that warrant attention for their relevance to the rural environment include unpaved/gravel/dusty roads as a barrier to exercise. Prior focus groups with rural adults revealed that unpaved/gravel/dusty roads were common in this area, making it difficult to ride bicycles on them.[16] In addition, these roads did not contain shoulders, [16] which may have contributed to perceived feelings of the roads being unsafe for PA use. Participants in this study identified PA resources they were aware of and used in their county, and while awareness of the resources was high, use of the resources was not. Future studies could examine awareness within just one community or neighborhood since some resources may not be available for all residents in one county. The finding that the presence of street lights was inversely associated with PA confirms other findings.[6] This finding might be due to street lights being placed near areas where there is more traffic; thus potentially creating the feeling of unsafe circumstances that may deter PA. More in-depth research is needed to further investigate these relationships.

Neighborhood and Community Aspects

Community resources, especially sidewalks, shopping malls, and hunting, conservation, and park areas were all positively associated with PA in these rural adults, which supports other findings.[6] This study found that walking was positively associated with greater use and awareness of PA resources in the community, as was PA in different domains and at different intensities. Increasing awareness of environmental supports and opportunities for PA may be an effective strategy for community-based interventions for increasing this behavior.[20] There was a moderate but significant correlation between awareness and use of resources, which offers support for increasing awareness of PA resources. Moreover, promoting any existing resources would save time and money spent on developing new resources for being active.

Barriers

The most common barriers to PA reported in this study (no time, too tired, no motivation, and no energy) are also the most common barriers reported in a national sample of Americans[4] and other rural adults.[21] Although the focus of this study was on environmental

correlates of PA, these barriers indicate that personal-level interventions combined with environmental supports are needed to help reduce impediments to PA in order to increase activity levels in rural adults.

Social Determinants

High levels of safety and low fear of crime were reported by participants, supporting existing studies.[11] The participants here reported getting most of their information about exercise from websites and their friends, which contrasts previous findings that rural adults get this information from magazines and newspapers.[21] Most participants here reported exercising alone, but almost two out of five indicated that having no one to exercise with was a barrier to being active. Since friends may be important for informational support, they could be targeted in interventions to increase PA in rural adults. The use of websites for information on exercise may represent a change in the use of technology for informing health behaviors, and future interventions could examine the use of the internet for promoting PA. Short and colleagues recently found that living in a rural area was associated with a preference for a web-based intervention over face-to-face intervention, providing some impetus for planning online interventions that promote PA in rural communities.[22]

Policy Attitudes and Workplace Assets

Support for policies aimed at increasing PA was overall positive in this study, which supports other findings[10], and indicates that policy interventions may be an effective method for increasing PA in rural adults. However, fewer participants agreed that employers should provide time during the workday for employees to exercise than what has previously been reported.[10] This could indicate changing attitudes towards workplace productivity, or that rural adults value their job duties more than being active at work. It should be noted that these policy attitudes may be independent of available resources for implementing any policy changes to increase PA.

Rural adults who were self-employed were more likely to be active at work, which is likely due to the nature of their employment. Although specific occupations were not measured here, self-employed rural adults might engage in farming or agricultural practices, which could require more activity than more urbanized occupations. Physical activity done at work was associated with employers providing support or incentives to exercise, an area that has not been studied extensively.

Limitations

The generalizability of this study is limited to adults aged 18 and over living in the rural Midwest. Also, the sample was predominantly white, female, and most of the participants were married. Using the public telephone book for recruitment may limit the representativeness of some sub-groups of the population (for example, younger adults may be more likely to use mobile phones than landlines). Recruitment occurred from August through October to account for possible seasonal changes in PA levels; however, PA levels may be higher in the warmer months, and this may have influenced the total and domain-specific amounts of PA reported. Additionally, the variability explained by the regression model for PA in the domains of walking and active transportation was low indicating that

there may be other variables that may explain whether one is active in those domains. Finally, the survey was self-administered, which may introduce self-report bias, especially regarding height and weight data and reporting of PA levels.

Conclusions

Through new and existing measures, this study captured correlates unique to the rural population that should help inform future interventions. This study, which focused mainly on environmental factors associated with PA, found that ecological frameworks are useful for examining factors associated with PA due to their multi-level nature. The modified survey here was shown to be reliable over multiple measurements, and moderate to substantial agreement was found for the majority of the questions indicating support for using this instrument when measuring PA and determinants of this behavior in rural adults.

In addition, multiple factors at different levels of influence of an ecological model were found to be related to domain-specific levels of PA in this study. This provides support for targeting multiple levels of influence when attempting to increase PA. Specifically, this study provides support for increasing social support for PA, increasing awareness of existing community resources, and developing policy-level approaches to increasing PA.

Future research should examine how to increase male participation by rural adults, whether living in town or the country impacts PA levels and ways to increase awareness of existing resources, especially resources that could be considered destinations for walking.

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References

1. Li F, Fisher KJ, Bauman A, et al. Neighborhood influences on physical activity in middle-aged and older adults: A multilevel perspective. J Aging and Phys Activity. 2005; 13:87–114.
2. Yousefian A, Ziller E, Swartz J, Hartley D. Active living for rural youth: Addressing physical inactivity in rural communities. J Public Health Management and Prac. 2009; 15(3):223–231.
3. Sallis, JF.; Owen, N.; Fisher, EB. Ecological models of health behavior. In: Glanz, K.; Rimer, BK.; Viswanath, K., editors. Health behavior and health education: Theory, researchand practice. 4th. San Francisco: Jossey-Bass; p. 2008p. 465-485.
4. Loprinzi PD, Cardinal BJ. Association between biologic outcomes and objectively measured physical activity accumulated in >= 10-minute bouts and <10-minute bouts. Am J Health Promot. 2013; 27(3):143–151. [PubMed: 23286590]
5. Brownson RC, Baker EA, Housemann RA, Brennan LK, Bacak SJ. Environmental and policy determinants of physical activity in the United States. Am J Pub Health. 2001; 91(12):1995–2003. [PubMed: 11726382]
6. Frost SS, Goins RT, Hunter RH, et al. Effects of the built environment on physical activity of adults living in rural settings. Am J Health Promot. 2010; 24(4):267–283. [PubMed: 20232609]

7. Parks SE, Housemann RA, Brownson RC. Differential correlates of physical activity in urban and rural adults of various socioeconomic backgrounds in the United States. J Epi and Community Health. 2003; 57(1):29–35.

8. Gangeness JE. Adaptations to achieve physical activity in rural communities. Western J Nursing Res. 200910.1177/0193945909353767

9. Chrisman M, Nothwehr F, Yang J, Oleson J. Perceived correlates of domain-specific physical activity in rural adults in the Midwest. J Rural Health. 201410.1111/jrh.12065

10. Brownson RC, Schmid TL, King AC, et al. Support for policy interventions to increase physical activity in rural Missouri. Am J Health Promot. 1998; 12(4):263–266. [PubMed: 10178620]

11. Whaley DE, Haley PP. Creating community, assessing need: preparing for a community physical activity intervention. Res Quar for Ex and Sport. 2008; 79(2):245–256.

12. Patterson PD, Moore CG, Probst JC, et al. Obesity and physical inactivity in rural America. J Rural Health. 2004; 20(2):151–159. [PubMed: 15085629]

13. Craig C, Marshall A, Sjostrom M, et al. International physical activity questionnaire: 12-country reliability and validity. Med and Sci Sports & Exercise. 2003; 35:1381–1395.

14. Ainsworth BE, Sternfeld B, Richardson MT, Jackson K. Evaluation of the Kaiser Physical Activity survey in women. Med and Sci Sports & Exercise. 2000; 32(7):1327–1338.

15. Brownson RC, Chang JJ, Eyler AA, et al. Measuring the environment for friendliness toward physical activity: A comparison of the reliability of 3 questionnaires. Am J Pub Health. 2004; 94(3):473–483. [PubMed: 14998817]

16. Chrisman M, Nothwehr F, Yang J, Oleson J. Environmental influences on physical activity in rural Midwestern adults: A Qualitative Approach. Health Promot Prac. Forthcoming.

17. Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics. 1977; 33:159–174. [PubMed: 843571]

18. U.S. Census Bureau. [Accessed August 17, 2011] Iowa quick facts at the US Census Bureau. http://quickfacts.census.gov/qfd/states/19000.html

19. [Accessed January 7, 2013] Guidelines for data processing and analysis of the international physical activity questionnaire (IPAQ)- short and long forms. 2005. http://www.ipaq.ki.se/scoring.pdf

20. Addy CL, Wilson DK, Kirtland KA, et al. Associations of perceived social and physical environmental supports with physical activity and walking behavior. Am J Pub Health. 2004; 94(3):440–443. [PubMed: 14998810]

21. Chrisman, M.; Nothwehr, F.; Schulz, U. Gender differences in the perceived social, environmental, and policy determinants of PA in rural Midwestern adults; Poster session presented at the 2011 annual meeting of the American Public Health Association; Washington, D.C.

22. Short CE, Vanelanotte C, Duncan MJ. Individual characteristics associated with physical activity intervention delivery mode preferences among adults. Int J Behav Nutr Phys Act. 2014; 11(25)

Table 1

Demographics of study participants

Variable	Number (%)
Gender	
Women	88 (63%)
Men	51 (37%)
Age	
20-39	33 (23%)
40-49	35 (25%)
50-59	30 (20%)
60-69	25 (18%)
70 and above	14 (10%)
BMI	
Overweight or obese (25 or greater)	80 (56%)
Normal or underweight (24.9 or less)	55 (39%)
Marital Status	
Married	117 (83%)
Not married	24 (17%)
Education	
High school diploma or less	39 (27%)
Some college	29 (21%)
Associate's or Bachelor's degree	50 (36%)
Post-graduate degree	22 (16%)
PA category	
Low	17 (12%)
Medium	47 (33%)
High	78 (55%)

Table 2
Domain-specific correlates of physical activity of rural adults

Domain	Variable	F-value	p-value	Adj. r-square
Work (n=131)	Employers provide time/support for exercise	8.86	0.0003	0.2517
	Work status	8.11	<0.0001	
Active Transportation (n=137)	Exercising at shopping malls	6.07	0.0032	0.1615
	# of positive community aspects	7.69	0.0066	
	Sidewalks	8.22	0.0048	
	Hunting/Conservation areas	5.43	0.0213	
House and yard work (n=124)	Favorable attitude towards using government funds to build pools	3.19	0.0018	0.2224
	Total use of PA resources	3.57	0.0005	
	Work status	2.64	0.0095	
	Gender	2.09	0.0389	
Leisure time (n=132)	Kaiser Sport index	28.24	<0.0001	0.2366
	Gender	4.25	0.0413	
	Marital status	4.30	0.0401	
Summary of all domains (n=133)	Street lights	8.41	0.0044	0.1357
	# of positive community aspects	6.01	0.0156	
	Friends encourage exercise	3.70	0.0136	

Table 3
Intensity-specific correlates of physical activity in rural adults

Intensity	Variable	F-value	p-value	Adj. r-square
Vigorous (n=127)	Awareness of resources	10.50	0.0015	0.1771
	Use of resources	6.62	0.0113	
	Street lights	9.36	0.0027	
Moderate (n=123)	Use of resources	6.13	0.0147	0.1537
	Total policy attitude	5.38	0.0221	
	Hills	4.44	0.0371	
	Street lights	5.48	0.0210	
Walking (n=131)	Use of resources	6.11	0.0147	0.0776
	Awareness of resources	4.66	0.0328	
KSI (n=124)	Total barriers	23.42	<0.0001	0.2296
	Use of resources	12.63	0.0005	