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Development of the Rural Active Living Perceived Environmental Support Scale (RALPESS)

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Background: Evidence supports the role of physical and social environments in active living, including perception of environment. However, measurement of perceived environments in rural settings is lacking. This study describes the development of the Rural Active Living Perceived Environmental Support Scale (RALPESS). ***Methods:*** Premised on social ecological and cognitive perspectives, 85 initial items were generated through a literature review and a mixed-methods investigation of "activity-friendly" environments. Items were organized by resource areas—town center, indoor and outdoor physical activity areas, schools, churches, and areas around the home/neighborhood—and submitted for expert panel review. In 2009, a revised questionnaire was disseminated to adolescents, parents, public school staff, and older adults in 2 rural southeastern United States counties. Principal component analysis with varimax rotation was used to explore factor structure (n = 542). ***Results:*** The final analysis yielded 33 items with 7 factors: 1) church facilities, 2) town center connectivity, 3) indoor areas, 4) around the home/neighborhood, 5) town center physical activity resources, 6) school grounds, and 7) outdoor areas. ***Conclusions:*** The RALPESS is a valid, internally consistent, and practically useful instrument to measure perceptions of rural environments in the context of physical activity across the lifespan. Confirmatory factor analysis is recommended to validate factor structure.

Keywords: survey, environment, physical activity

United States rural areas have disproportionately greater rates of chronic disease, obesity, and physical inactivity, where physical inactivity is consistently related with greater incidence of morbidity and mortality. Evidence supports the role of physical and social environments in physical activity engagement, including perception of one's environment. However, while perceived environmental factors have been examined in urban areas, they have not in rural areas. During a collaborative effort to define "activity-friendly" rural environments, our research team concluded that modified "urban-based" instruments were not effective for measuring objective and perceived physical activity environments in rural areas. This led to the development of the Rural Active Living Audit Tools (RALA),[1] and the Rural Active Living Perceived Environmental Support Scale (RALPESS), which is described here. Research suggests that objective measurement only conveys partial contextual understanding of factors influencing physical activity[2] and that perceptions could mediate relationships between objective measurement and health outcomes.[3] Thus, the purpose of this study was to design a valid tool to measure perception of the rural environment for physical activity.

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Methods

Study Design

Institutional review board (IRB) approval was obtained before study commencement. Four phases were used to develop the RALPESS during 2009. Phase I, an item pool (n = 201) was generated based on qualitative and quantitative findings from 3 projects with data collection sites in 6 states (AL, CA, KY, ME, MS, and SC) aimed to define activity-friendly rural environments conducted

from 2007–2008 (Active Living Research, Round 6). These projects used conceptual models based on rural and urban-suburban environmental literature to understand factors related to physical activity. Conceptual models were designed based on social ecological and cognitive perspectives, physical activity environmental literature, and transportation models.[4,5] Supported physical activity domains were identified and included: leisure, transportation, and domestic/household physical activity.[6] Rural settings where physical activity engagement occurs were identified as: areas around the home/neighborhood, community structures/buildings (schools, churches . . .), community indoor areas, and community outdoor areas. An overview of these conceptual models was published.[1] Items were constructed in a self-report format with response options ranging from strongly disagree to strongly agree on a 4-point Likert scale, indicating how supportive each of these settings are for physical activity engagement in a rural community.

In phase II, an expert panel (n = 6) was recruited to provide feedback and examine face and content validity. Panel members included professionals with expertise in environmental assessment (built and perceived), scale development, and rural public health. The expert panel review included 3 iterative rounds of feedback, in which 85 items were retained.

Phase III, the RALPESS was field-tested with rural high school youth (n = 20) to assess completion time (20–30 minutes). Construct validity was examined in phase IV, where questionnaire packets, including RALPESS items were disseminated to high school students, their parents, public school staff and a group of senior center attendees in 2 rural counties in the southeastern US. Collected data were subjected to a principal component analysis (PCA) to examine construct validity and further refine RALPESS items. Cronbach's alpha was used to examine internal consistency.

Sample

Two counties in the Alabama-Mississippi delta region were selected for participation based on rural designation [rural-urban commuting area codes (RUCAs) of 6 and 10][7] and to ensure diversity within the sample and across the counties. Each of these counties represented diversity commonly seen within US southeastern rurality, where county A was 72.9% White with a population of 43,922 and county B was 67.9% Black with a population of 10,643.[8] County A had substantially more physical activity resources than County B. Institutions of higher learning were located in both counties and provided physical activity resources to the communities (student population: County A > 15,000; County B < 500). Physical activity resources included, but were not limited to, parks, school grounds, and church-based facilities in both counties. Overall quantity and quality of amenities of these physical activity resources were greater in County A than County B.

Upon IRB approval, participants were recruited through public school systems of the 2 rural counties with the assistance of school district superintendents, principals, and teaching staff. Within each county, 100 students were recruited from each grade (9th–12th) of public high schools (A = 1 high school; B = 2 high schools), based on diversity within grades regarding sport participation, gender, and academic achievement (n = 400/school). Upon agreeing to participate, each student was instructed to take a questionnaire packet home, which included informed consent and assent forms, a student survey, and a parent/guardian survey, to be completed by one of the student's parents/guardians. Students were instructed to return the completed packets if they wished to partake in a social "party" as an incentive for participation. Questionnaire packets (n = 300) including an informed consent form and survey were also disseminated to teachers and staff employed in each school district and attendees of local senior centers. Incentives for adult and older adult participation included refreshments.

Statistical Analysis

All data were examined for accurate data entry and missing variables. No participants with greater than 5% missing data were retained in the analyses. No variable had greater than 1.8% missing data. Missing values were estimated in SPSS (PASW, v18) by imputing the mean. PCA using ones as prior communality estimates and varimax rotation was used to examine factor structure and item loadings. Factors with eigenvalues ≥ 1.0, a scree plot, communalities ≥ 0.45, item-to-factor loadings ≥ 0.40, and item-to-factor cross-loadings < 0.30 were examined for logical model fit and to reduce the number of items.[9]

Results

Of the 1500 questionnaire packets distributed, 592 were returned. Participants with greater than 5% missing data were excluded from analyses, thus a sample of 542 was retained. See Table 1 for sample characteristics.

In the original PCA, 14 factors displayed eigenvalues greater than 1.0; however, a scree plot suggested 7 to 8 meaningful factors (see Figure 1 for original and final scree plots). Upon further examination of factor loadings, item-factor cross-loadings, simple structure, and conceptual meaning, 7 factors were retained. All items that cross-loaded on more than 1 factor (≥0.30), had low communalities (<0.45) and/or did not load (<0.40) on 1 of the 7 factors were removed.[9] Additional items were removed to reduce scale length and participant burden. This process entailed removing items with the weakest of the remaining factor loadings, while ensuring that at least 3 items were retained for each factor.[9] Thus, all items with factor loadings < 0.687 were removed (n = 18).

Combined, the 7 factors accounted for 71.623% of the variance. Internal consistency was acceptable for all 7 factors (α = 0.820–0.938) and the overall scale (α =

Table 1 Sample Characteristics

		Total (N = 542)	County B (n = 311)	County A (n = 231)
General sample characteristics				
Race/ethnicity (N = 504)	American Indian/Alaskan Native	1.0%	0.7%	1.5%
	Asian	1.4%	0.0%	3.4%
	Black/African American	72.8%	96.3%	38.5%
	Hispanic or Latino	6.0%	3.1%	9.7%
	Native Hawaiian/Pacific Islander	0.8%	0.0%	2.0%
	White	24.0%	3.0%	54.6%
Gender (N = 528)	Male	25.0%	21.9%	29.2%
	Female	75.0%	78.1%	70.8%
Age (N = 518)	13–19 years	55.4%	48.5%	64.6%
	20–29 years	3.9%	3.7%	4.0%
	30–39 years	16.0%	23.4%	6.3%
	40–49 years	11.2%	14.9%	6.3%
	50–59 years	7.5%	8.1%	6.7%
	60–69 years	3.3%	1.0%	6.3%
	>70 years	2.7%	0.3%	5.8%
Sample characteristics: adults				
Marital status (N = 237)	Married	46.4%	34.1%	74.0%
	Partner/Significant other	3.4%	4.3%	1.4%
	Single	32.1%	43.9%	5.5%
	Divorced/Separated	13.9%	14.6%	12.3%
	Widowed	4.2%	3%	6.8%
Level of education (N = 228)	Kindergarten or less	0.4%	0.6%	0.0%
	Elementary	1.8%	2.6%	0.0%
	Some high school	8.3%	12.3%	0.0%
	High school graduate	24.6%	32.9%	6.8%
	Some college	21.5%	23.9%	16.4%
	College graduate	43.4%	27.7%	76.7%
Income (N = 208)	< $5000	17.3%	25.2%	0.0%
	$5001–$10,000	10.1%	14.7%	0.0%
	$10,001–$15,000	7.2%	10.5%	0.0%
	$15,001–$20,000	9.6%	11.9%	34.6%
	$20,001–$25,000	3.8%	4.9%	1.5%
	$25,001–$30,000	9.6%	9.8%	9.2%
	$30,001–$40,000	5.3%	4.2%	7.7%
	>$40,000	37.0%	18.9%	76.9%
Sample characteristics: adolescents				
Current school grade (N = 284)	9th	52.1%	52.6%	51.7%
	10th	21.1%	16.1%	25.9%
	11th	18.3%	21.9%	15.0%
	12th	8.5%	9.5%	7.5%

Note. Data collection occurred in 2009 in 2 rural counties in the southeastern US.

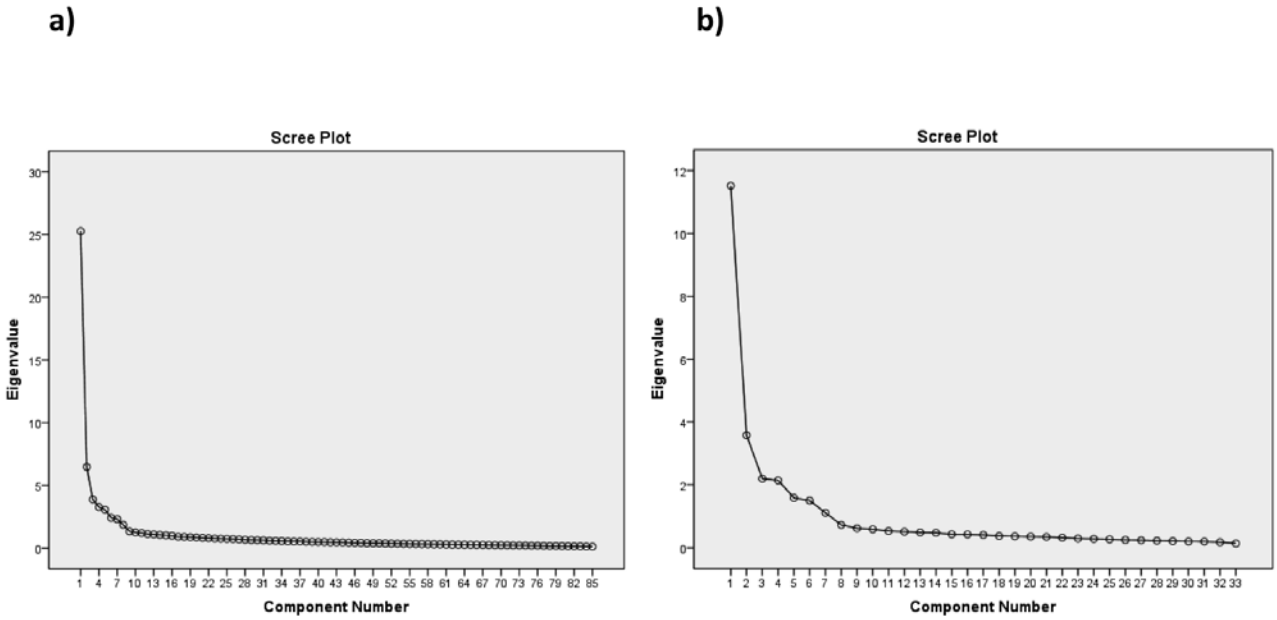

Figure 1 — a) Original scree plot; b) Final scree plot.

0.941). Subscale scores are calculated by summing item scores for each factor. An overall RALPESS score is calculated by summing all 33-item scores. An overall RALPESS score provides insight into the perceived support for physical activity within rural areas, with higher scores indicating greater perceived support for activity. Summed subscale scores can also be used to examine perceived support for activity within specific domains in a community. See Table 2 for factor labels, definitions, characteristics, and final RALPESS items. See Table 3 for factor loadings.

Discussion

The procedure to develop the RALPESS was empirically sound and produced 7 factors through expert panel review and PCA. These factors reflect rural specific factors that are not represented through the modification of urban-based instruments. The RALPESS considers the unique living environments of rural dwelling families, specifically, how church, community, and school facilities may influence physical activity in rural environments. The advantage of using the RALPESS lies in measuring a community's perception of the rural environment, which will identify facilitators and barriers to physical activity engagement. Furthermore, the RALPESS can be used with the RALA tools to identify discrepancies between objectively measured environmental factors and community perception. Once discrepancies are identified within a community, then policy, infrastructure, noninfrastructure, social marketing strategies, and behavioral interventions can be developed to reduce barriers and enhance facilitators to physical activity engagement by targeting environmental factors identified through the RALPESS and RALA tools (perceived and/or physical environment).

This study's strengths include the identification of 7 factors that measure the perception of the environment, with each subscale (factor) having strong psychometric properties. This instrument is the first of its kind to measure the perceptions of the environment in rural settings. The methodology used to develop the instrument was rigorous and went through critical review from well-established experts. We believe that when the instrument is used in conjunction with the RALA tools, researchers and practitioners can identify and clarify perceptions of the environment in contrast to the objective measures of the environment (RALA tools). The diversity of the study participants and counties adds to the strength of the instrument in that a broad spectrum of participants completed the instrument. However, while there are similarities shared by rural communities, there is also considerable diversity across and within rural communities, thus potentially limiting the generalizability of these findings. While this study provides a much needed rural-specific tool, due to its current limited use, a preferred score has not yet been established. Future research should collect RALPESS data from diverse rural communities across the US to determine a preferred score and confirm the factor structure of the RALPESS instrument.

Conclusions

We determined that the RALPESS is a face, content, and construct valid, internally consistent, and practically useful instrument that measures perceptions of the rural environment for physical activity. It provides researchers and practitioners with the community's perspective of

Table 2 RALPESS Factor Definitions, Characteristics, and Items

RALPESS factor definitions and items	Mean (SD)	α	Eigen-value
Factor 1—Church facilities (7 items): areas at the churches in your community that could be used for exercise or PA	14.24 (5.97)	0.938	11.518
1. My town has churches with indoor recreational areas for exercise open to the public.			
2. My town has churches with outdoor recreational areas for exercise open to the public.			
3. I can use the indoor church areas for PA or exercise.			
4. I can use the outdoor church areas for PA or exercise.			
5. Churches in my town offer exercise or PA programming or activities.			
6. Churches in my town have public playgrounds with equipment.			
7. Churches in my town encourage exercise or being physically active.			
Factor 2—Town center connectivity (6 items): infrastructure supportive of PA in the main part of your town, where the library, town hall, town green, post office, courthouse, or the main meeting place in your town	16.54 (4.14)	0.906	3.579
8. There are shopping areas and places to eat in the town center.			
9. There are sidewalks in the town center.			
10. The sidewalks are nice to use in the town center (they are shaded, there are pleasant things to look at, no trash).			
11. The sidewalks are nice to use in the town center (they are well kept and not uneven).			
12. The streets are marked where I should cross in the town center or there are crosswalks.			
13. The area around the town center has working streetlights.			
Factor 3—Indoor areas (6 items): indoor places people use to be active, such as indoor pools, recreation centers, YMCAs, gyms, fitness centers, exercise rooms, sports courts, skate areas, or areas with exercise gear (balls, treadmills, etc) in your town	13.84 (5.22)	0.899	2.200
14. My town has private indoor exercise areas (pay to use).			
15. The indoor exercise areas are nice to use and well kept (there is little or no trash, no broken glass, and equipment works).			
16. The indoor exercise areas in my town are generally safe.			
17. My town offers indoor exercise activities (programs, sports teams, classes, lessons, etc).			
18. There is equipment for PA or exercise at the indoor exercise areas in my town.			
19. There are choices of activities for PA or exercise the indoor exercise areas in my town.			
Factor 4—Around your home/neighborhood (5 items): this includes your home and yard; the streets, parks, and fields around your home; and the homes close to your home	11.13 (3.89)	0.879	2.143
20. There are crosswalks in the area around my home.			
21. The roads around my home have a place to walk or ride a bike next to the road (shoulder, bike lane, built path, etc).			
22. The roads around my home have good lighting.			
23. There are sidewalks on most of the roads in the area around my home.			
24. There are sidewalks in the area I live that connect places so that you can walk from place to place (like connecting a store to the post office).			
Factor 5—Town center PA resources (3 items): places or items in your town center people use to be active	6.29 (2.62)	0.874	1.585
25. There is equipment for PA or exercise in the town center at indoor places.			
26. There is equipment for PA or exercise in the town center at outdoor places.			
27. There are several choices of activities for PA or exercise in the town center.			
Factor 6—School grounds (3 items): areas at the schools in your community that could be used for exercise or PA	7.73 (2.29)	0.822	1.502
28. The school(s) in my town has playground(s) with equipment.			
29. There is equipment for PA or exercise at the school(s).			
30. There are choices of activities for PA or exercise at the school(s).			
Factor 7—Outdoor areas (3 items): outdoor places designed for PA, such as pools, sports fields, sports courts, skate areas, tracks, trails, parks, lakes, rivers, or playgrounds	6.56 (2.55)	0.820	1.108
31. Outdoor exercise areas in my town have available restrooms.			
32. Outdoor exercise areas in my town have water fountains.			
33. There are sufficient police officers or sheriffs patrolling the outdoor areas in my town where people could be physically active or exercise.			

Note. Data collection occurred in 2009 in 2 rural counties in the southeastern US. Physical activity was not abbreviated in the survey.

Abbreviations: RALPESS = Rural Active Living Perceived Environmental Support Scale; PA = physical activity; SD = standard deviation; α = internal consistency (Chronbach's α).

Table 3 RALPESS Factor Loadings

Item #	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
1.	**.804**	.159	.166	.173	.043	.111	.060
2.	**.828**	.098	.102	.229	.118	.100	.081
3.	**.840**	.119	.149	.121	.082	.069	.064
4.	**.836**	.070	.097	.186	.123	.077	.084
5.	**.781**	.092	.128	.189	.127	.131	.131
6.	**.766**	.139	.097	.114	.114	.133	.137
7.	**.749**	.143	.066	.181	.137	.103	.092
8.	.126	**.752**	.210	.026	.052	.142	.084
9.	.114	**.788**	.183	-.022	.086	.085	.039
10.	.156	**.808**	.166	.073	.144	.020	.083
11.	.134	**.776**	.144	.109	.132	.068	.115
12.	.122	**.748**	.199	.172	.103	.059	.143
13.	.073	**.774**	.187	.119	.056	.194	.097
14.	.155	.242	**.727**	.018	-.025	.062	.141
15.	.099	.154	**.823**	.076	.053	.071	.038
16.	.049	.200	**.817**	.043	.094	.027	.046
17.	.119	.181	**.747**	.054	.081	.157	.096
18.	.162	.176	**.749**	.107	.128	.091	.187
19.	.153	.144	**.708**	.128	.195	.055	.242
20.	.178	.025	.117	**.804**	.053	.133	.065
21.	.199	.058	.122	**.821**	.062	.069	.108
22.	.202	.137	.077	**.689**	.106	.104	.090
23.	.225	.124	.008	**.797**	.113	.054	.109
24.	.175	.060	.033	**.743**	.191	.115	.053
25.	.211	.185	.199	.202	**.800**	.077	.131
26.	.209	.139	.098	.184	**.811**	.135	.163
27.	.233	.245	.177	.178	**.730**	.107	.222
28.	.167	.139	.171	.125	.135	**.688**	.153
29.	.141	.174	.073	.166	.059	**.858**	.059
30.	.238	.147	.128	.148	.082	**.824**	.039
31.	.208	.198	.237	.054	.121	.102	**.798**
32.	.207	.123	.263	.175	.154	.096	**.759**
33.	.103	.168	.149	.193	.194	.074	**.714**

Note. Bold factor loadings indicate items retained in that specific factor.

the rural environment's relationship to physical activity. The next step is to collect additional data to confirm the factor structure, determine a preferred score, and assess concurrent validity.

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