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Adaptation of the Physical Activity Neighborhood Environment Scale in Oman

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Abstract

Objectives: This study aims to adapt the Physical Activity Neighborhoods Environment Scale (PANES), a 17-item tool to assess environmental factors relevant for walking and bicycling in the community, to the Omani context. **Methods:** The adaptation process was conducted in 3 steps: (1) revision by local experts, (2) Arabic translation and cognitive testing, and (3) test-re-test reliability testing with a sample of Omani women and men. **Results:** Four of the 17 items of the PANES were modified, and one was removed resulting in a 16-item PANES, Oman (PANES-O) questionnaire. The test-retest reliability scores ranged from 0.436 to 1.000; scores for more than half were almost perfect (0.8 – 1.0), demonstrating a good level of consistency and good psychometric performance similar to other studies. **Conclusion:** The PANES-O demonstrated good test-retest reliability and appears promising for assessing environmental perceptions related to physical activity in Oman. Confirming construct validity is recommended before wider use.

Keywords: Physical activity, Built environment, Oman.

Introduction

Physical inactivity is one of the ten leading risk factors for mortality, causing 3.2 million

deaths each year globally.¹ The built environment is associated with the physical activity levels of a population. Increased street connectivity, residential density, and accessibility to mixed destinations are some of the environmental attributes that are supportive to being physically active.²⁻⁵ Research on the built environment's influence on physical activity in Oman and neighboring countries is needed to guide public health policy.⁶ Reliable and valid measures of the built environment are available for conducting such research, however, they have not been tested for cities in the Arab world, including in countries of the Arabian Peninsula.⁷⁻⁹

The Physical Activity Neighborhoods Environment Scale (PANES) developed by the International Physical Activity Prevalence Study (IPS) group is a comprehensive yet brief measure about the perceived environment. This 17-item tool assesses adults' perceptions of the built environment relevant to walking and bicycling such as land use mix, residential density, pedestrian infrastructure, aesthetic qualities, and safety from traffic and crime.¹⁰ Studies using this tool have demonstrated associations of the built environment with physical activity in lower, middle and high income countries on all five continents.^{9, 11} This study, the first in a two-part series, aims to describe the adaptation of the PANES to the Omani context and to assess the test-retest reliability of the Omani version.

Methods

The adaptation process followed a similar methodology carried out in Nigeria.¹¹ It was conducted in 3 phases between September 2016 and August 2017: (1) revision by local experts, (2) Arabic translation and cognitive testing, and (3) test-retest reliability testing with a sample of Omani women and men.

Revision by Experts

The 17 items of the PANES tool measures perceived attributes of the neighborhood environment including residential density (1 item), access to destinations (3 items), pedestrian and bicycling facilities (4 items), recreational facilities (1 item), visual qualities (1 item), social environment (1 item), street connectivity (1 item), traffic safety (2 items), crime safety (2 items), and household motor vehicles (1 item). Perceptions are measured using a 4-point scale ranging from strongly disagree to strongly agree, except for 2 items. Response options for the residential density item ranges from single-family detached homes to apartments. The question on number of vehicles is open ended.¹⁰

The tool was reviewed by seven experienced experts from a variety of backgrounds (Table 1). Working independently, the experts were requested to propose replacements of items that were not relevant to the Omani environment with culturally appropriate equivalents and suggest additional items to be included if not already reflected. Feedback was provided to the research team on a separate form. The PANES questionnaire was revised based on the suggestions made by the experts.

Cognitive Testing

The revised English version, PANES Oman (PANES-O), was translated into the Arabic language by an Omani English language teacher and reviewed by the research team. Six public health experts were invited to a meeting to review the Arabic PANES-O. During the meeting, participants were briefed about the background of the PANES including its development in Australia and USA,⁹⁻¹⁰ and its adaption in Nigeria¹¹ and Oman. The research team then facilitated a discussion about the clarity and relevance of each item including ensuring appropriate wording in the local Arabic dialect. Their suggestions for improvement were welcomed and items rephrased, as needed.

Test-retest Reliability

The test-retest reliability testing was carried out with a purposive sample (n=33) of women and men from different neighborhoods and different socioeconomic status (educational level and employment status) in Nizwa, a city 130 km from the capital area. Participants were approached directly to take part in the study from their home, college or place of work. Eligibility criteria included being 18-60 years old, not having any disability and being willing to complete the survey in Arabic. Participants completed the questionnaire in the presence of a researcher twice, with a 7-day interval. Sociodemographic characteristics (age, gender, education and marital status) were included in the initial data collection. All participants provided informed consent.

Statistical Analysis

Test-retest reliability was assessed using a one-way model single-measure intraclass correlation coefficient (ICC) to ascertain consistency across multiple observers along with 95% confidence interval (CI). Test retest reliability of each of the environmental variables was also conducted. Agreement ratings followed Landis and Koch proposal used in the

Nigerian adaptation:¹¹ poor (0.0 – 0.2), fair (0.2 – 0.4), moderate (0.4 – 0.6), substantial (0.6 – 0.8) and almost perfect (0.8 – 1.0). SPSS 16 (SPSS Inc, Chicago, Illinois) was used for statistical analysis.

Results

Revision by Experts

Inputs from the local experts were analyzed using simple descriptive analysis (Table 2). Four of the 17 items of the PANES were modified, and one was removed. The responses to item 1 (What is the main type of housing in your neighborhood?) were changed. Item 7 (The crime rate in my neighborhood makes it unsafe to go on walks at night) was changed to (Walking at night is unsafe in my neighborhood); Item 12 (There are many four-way intersections in my neighborhood) was modified to (There are many cross-junctions in my neighborhood); and item 16 (The crime rate in my neighborhood makes it unsafe to go on walks during the day) was changed to (walking during the day is safe in my neighborhood). Item 17 (How many motor vehicles in working orders e.g., cars, trucks, and motorcycles are there at your household?) was deleted because of broad car ownership in the country.

Cognitive Testing

During the meeting with experts on the Arabic translation of PANES-O, the participants confirmed the clarity of the questions and their relevance to the country except for item 1. For item 1 (what is the main type of housing?) housing options were changed. Although participants were concerned about the applicability of items about neighborhood infrastructure (such as sidewalks and bicycle pathways), they agreed to retain these items.

Test-Retest Reliability

Thirty-three participants, mean age 35.9 ± 10.2 years, completed the test-retest reliability survey. A majority were married (78.8%), two-thirds of them were women (66.7%) and the same percentage had at least a high school education.

The results of the test-retest reliability was good overall with ICC scores ranging from 0.436 to 1.000 (Table 3). Nine of the 16 items had almost perfect agreement (ICC=0.80 – 1.00) with one item on neighborhood infrastructure having a perfect score (ICC=1.00) (“There are facilities to bicycle in or near my neighborhood, such as special lanes, separate paths, shared use paths for cycles and pedestrians.”). Of the remaining seven items, five scored substantial

agreement (ICC=0.60 – 0.80) and two, related to the neighborhood social environment and aesthetics scored moderate agreement (ICC=0.40 – 0.60). A substantial portion (25 to 50%) reported that they did not know (DK) and/or the item was not applicable (NA) for four items; three were related to the neighborhood infrastructure and one was related to the neighborhood social environment.

Discussion

The adaptation of the PANES instrument to the Omani context shows promise for assessing perceptions about the built environment in Oman. A high portion of non-responses to items related to the neighborhood infrastructure and social environment possibly reflect the development patterns and cultural context of Oman and Nizwa city in particular.

Oman has developed rapidly in the past fifty years following a Western planning model of functional spatial segregation and dispersal of low density settlements.¹²⁻¹³ Newer communities are not designed to be supportive of walking and cycling.¹⁴ Although older parts of Nizwa follow traditional designs that may be more supportive for active travel, as in Muscat, the challenges respondents had in completing some items may reflect experience in the newer neighborhoods. In addition, cultural perceptions has altered people's attitude about walking and bicycling,¹²⁻¹⁵ especially among the younger population.¹⁶

The test-retest reliability scores ranged from 0.436 to 1.000, with scores for more than half of the items almost perfect (0.8 – 1.0), demonstrating a good level of consistency and good psychometric performance similar to other studies.¹⁰⁻¹¹ All items assessing residential density, access to destinations, neighborhood safety and street connectivity had higher reliability coefficients (>0.650) compared to items for social environment and aesthetics. Neighborhood social environment, the item with the lowest score, was also the item with the largest number of participants who did not respond; this may reflect both the negative socio-cultural perceptions towards active travel as well as an unsupportive built environment.^{6, 13-15} More research is needed to confirm retention and possible re-woring of items scored poorly or with limited response.

The main strength of this study was the systematic adaptation of this internationally validated tool. However, the modest non-representative sample size from one city limits its generalizability despite the demographic diversity of the sample in terms of age, gender and

educational level. Selecting samples from a variety of neighborhood environments would better measure the variability in perceptions about the built environment¹⁰ and confirm the utility of this tool for the Omani context.

Conclusion

In conclusion, this study supports PANES as a promising measure of perceptions of the built environment related to physical activity. The second of this two-part series will examine the construct validity of this tool. Further research to confirm these findings using objective measures as well as respondents from a variety of neighborhoods is needed before wider use.

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Conflict of Interest

The authors declare no conflicts of interest.

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Table 1: Characteristics of the local experts in Oman who reviewed the PANES questionnaire

No	Sex	Work place	Position at work	Education	Years of Work Experience
1	Male	College Of Education, Sultan Qaboos University	Head of physical Education	PhD	≥ 20
2	Male	College of Applied Science, Rustaq	Assistant professor on physical activity	PhD	≥ 20
3	Male	Ministry of Housing	Geographic	Master Degree	15
4	Male	Ministry of Environment	Director of Environmental Affairs	Bachelor Degree	≥20
5	Male	Capital Market Authority	Expert on Oman Centre for Governance and Sustainability	Master Degree	≥20
6	Female	Sultan Qaboos University- College Of Agriculture	Assistant professor	PhD	≥20

7	Female	PDO	Dietician	Master Degree	15
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Table 2: Adaptation of the PANES questionnaire

Original PANES Questions	Local expert's comments			Changes made by experts	PANES-O items
	Relevant	Modify	Not relevant		
Residential Density					
1. What is the main type of housing in your neighborhood?	66.6%	33.3%	0.0%	Option rephrased	What is the main type of housing in your neighborhood? a. One floor villa b. More than one floor villa c. Apartment d. Detached single family housing
Access to Destinations					

2. Many shops, stores, markets or other places to buy things I need are within easy walking distance of my home.	100%	0.0%	0.0%	Item same	Many shops, stores, markets or other places to buy things I need are within easy walking distance of my home.
3. There are many places to go within easy walking distance of my home	85.7%	14.2%	0.0%	Add example	There are many places to go within easy walking distance of my home such as mosques, schools, health institutions, work places, markets, parks, etc.
4. It is within a 10-15 minutes' walk to a transit stop (such as bus, taxi, train, trolley, or tram) from my home.	14.2%	57.1%	28.5%	Item rephrased	It is within easy walking distance from my home to access the public transport and taxi in the main road of my neighborhood.
Neighborhood Infrastructure					

5. There are sidewalks on most of the streets in my neighborhood.	100%	0.0%	0.0%	Item same	There are sidewalks on most of the streets in my neighborhood.
6. There are facilities to bicycle in or near my neighborhood, such as special lanes, separate paths or trails, shared use paths for cycles and pedestrians.	57.1%	14.2%	28.5%	Item same	There are facilities to bicycle in or near my neighborhood, such as special lanes, separate paths, shared use paths for cycles and pedestrians.
7. Places for bicycling (such as bike paths) in and around my neighborhood are well maintained and not obstructed	71.4%	28.5%	0.0%	Item same	Places for bicycling (such as bike paths) in and around my neighborhood are well maintained and not obstructed.

8. My neighborhood has several free or low cost recreation facilities , such as parks , walking trails , bike paths , recreation centers , playground , public swimming pools ,etc.	57.1%	42.9%	0.0%	Item rephrased	My neighborhood has several places such as open fields, parks, sea, clubs, and gymnasium to exercise and play football and other sports.
9. The sidewalks in my neighborhood are well maintained (paved, with few cracks) and not obstructed	100%	0.0%	0.0%	Item same	The sidewalks in my neighborhood are well maintained (paved, with few cracks) and not obstructed
Neighborhood safety					
10. The crime rate in my neighborhood makes it unsafe to go on walks during the day	28.5%	57.1%	14.2%	Item rephrased	Walking during the day is safe in my neighborhood.

11. The crime rate in my neighborhood makes it unsafe to go on walks at night	28.5%	57.1%	14.2%	Item rephrased	Walking at night is unsafe in my neighborhood.
12. There is so much traffic on the streets that it makes it difficult or unpleasant to walk in my neighborhood.	85.7%	14.2%	0.0%	Options rephrased	There is so much traffic on the streets that it makes it difficult or unpleasant to walk in my neighborhoods.
13. There are so much traffic on the streets that it makes it difficult or unpleasant to ride a bicycle in my neighborhood.	71.4%	28.5%	0.0%	Item same	There are so much traffic on the streets that it makes it difficult or unpleasant to ride a bicycle in my neighborhood.
Neighborhood social environment					

14. I see many people being physically active in my neighborhood doing things like walking, jogging, cycling, or playing sports and active games	100%	0.0%	0.0%	Item same	I see many people being physically active in my neighborhood doing things like walking, jogging, cycling, or playing sports and active games
Neighborhood aesthetics					
15. There are many interesting things to look at while walking in my neighborhood.	85.7%	14.2%	0.0%	Appropriate examples provided	There are many interesting things to look at while walking in my neighborhoods such as shady trees, building variety, beautiful beach, etc.
Street connectivity					
16. There are many four-way intersections in my neighborhood	57.1%	28.5%	14.2%	Item rephrased	There are many cross-junctions in my neighborhood.
Motor Vehicle					

17. How many motor vehicles in working orders (e.g., cars, trucks, and motorcycles) are there at your household?	100%	0.0%	0.0%	Item same – DELETED	How many motor vehicles in working orders (e.g., cars, trucks, and motorcycles) are there at your household?
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Table 3: Intraclass Correlation Coefficients (ICC) of the Test-Retest Reliability of the Adapted Physical Activity Neighborhood Environment Scale, Oman

Adapted Items	Total (N=33) ICC (95% CI)	Number excluded¹
Residential density		
What is the main type of housing in your neighborhood?	0.868 (0.750 – 0.933)	0
Access to destinations		
Many shops, stores, markets or other places to buy things I need are within easy walking distance of my home.	0.851 (0.720 – 0.924)	0
There are many places to go within easy walking distance of my home such as mosques, schools, health institutes, work places, etc.	0.928 (0.854 – 0.965)	77 - 3
It is within easy walking distance from my home to access the public transport such as bus and taxi in the main road of my neighborhood.	0.954 (0.909 – 0.977)	0
Neighborhood infrastructures		
There are sidewalks on most of the streets in my neighborhood.	0.948 (0.896 – 0.974)	77 - 1
There are facilities to bicycle in or near my neighborhood, such as special lanes, separate paths, shared use paths for cycles and pedestrians.	1.000 (1.000 – 1.000)	77 – 1; 88 – 7
Places for bicycling (such as bike paths) in and around my neighborhood are well maintained and not obstructed.	0.791 (0.446 – 0.931)	77 – 16; 88 - 4
My neighborhood has several places such as open fields, parks, beach, clubs, and gymnasium, etc. to exercise and play football and other sports.	0.802 (0.636 – 0.897)	0

The sidewalks in my neighborhood are well maintained (paved, with few cracks) and not obstructed.	0.611 (0.230 – 0.830)	77 – 2; 88 - 12
Neighbourhood safety		
Walking during the day is safe in my neighborhood.	0.767 (0.574 – 0.879)	77. - 1
Walking at night is safe in my neighborhood.	0.663 (0.418 – 0.818)	0
There is so much traffic on the streets that it makes it difficult or unpleasant to walk in my neighborhoods.	0.855 (0.684 – 0.937)	77 – 2; 88 – 5
There is so much traffic on the streets that it makes it difficult or unpleasant to ride a bicycle in my neighborhood.	0.870 (0.745 – 0.936)	77 - 3
Neighborhood social environment		
I see many people being physically active in my neighborhood doing things like walking, jogging, cycling, or playing sports and active games.	0.436 (0.114 – 0.695)	77 – 11
Neighborhood aesthetics		
There are many interesting things to look at while walking in my neighborhoods such as shades trees, building variety, beautiful beach, etc.	0.598 (0.320 – 0.781)	77 - 1
Street connectivity		
There are many cross- junction in my neighborhood.	0.666 (0.412 – 0.824)	88 - 2

¹ Participants excluded in ICC analysis: 77 – Don't know; 88 – Not applicable for their neighborhood