RELIABILITY AND VALIDITY OF THE NEIGHBOURHOOD ENVIRONMENT WALKABILITY SCALE (NEWS) – MALAY VERSION

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ABSTRACT

Background: The Neighbourhood Environment Walkability Scale (NEWS) was originally developed by the researchers of the International Physical Activity and the Environment Network (IPEN) to assess residents' perceptions of the environment characteristics in their neighbourhood. Widely used in several countries, the objective of this paper is to translate and validate the questionnaire and determine its reliability for use among local residents in Malaysia.

Materials and Methods: The questionnaire was translated from English to Malay and another back-translation was conducted. The local research team verified the quality of the translated and back-translated questionnaire and made cross-cultural adaptations to reflect the built environment of Malaysia. The translated instrument was distributed to 66 adults for self-administration, completed on two separate occasions two weeks apart. Confirmatory factor analysis and test-retest reliability indices were used to determine its validity and reliability.

Result: Test-retest reliability was moderate to good with intra-class correlation coefficients (ICC) ranging from 0.56 to 0.91. Items with lower ICCs had high percent agreement indicative of good reliability. Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy value was 0.521, indicating a satisfactory factor analysis. Bartlett's Test of Sphericity was significant ($p<0.001$). Six factors were retained based on original questionnaire and guidelines, and the curve from Scree plot also began to flatten at factor 6.

Conclusion: The NEWS-Malay held adequate levels of factorial validity and reliability to be used for measuring perceived neighbourhood environment walkability among Malaysian adults.

Keywords: Neighbourhood environment walkability scale (NEWS), walkability, physical activity, reliability, validity, Malay language

1.0 Introduction

The Neighbourhood Environment Walkability Scale (NEWS) is currently among the best developed and well-tested questionnaire to assess the local environment (Cerin, Saelens, Sallis, & Frank, 2006; Titze et al., 2010; Sallis et al., 2016). This questionnaire is one of the main research tools in the multi-country studies under the International Physical Activity and the Environment Network (IPEN). Perceived neighbourhood environment attributes variables are useful for environmental surveillance because they revealed substantial variations by country, and the associations with physical activity supported the construct validity of the variables.

Items from the validated NEWS in English assessed perceived built environment characteristics that are theoretically associated with increased physical activity (Saelens et al., 2003a). These items are: (a) residential density; (b) proximity to non-residential land uses such as restaurants and stores (land use mix - diversity); (c) ease of access to non-residential land uses (land use mix - access); (d) street connectivity; (e) infrastructure and safety for walking and cycling; (f) neighbourhood aesthetics; and (g) pedestrian, traffic, and crime safety. Higher scores on all the subscale items indicated a more favourable environment for physical activity. All perceived neighbourhood environment attributes items were rated on a four-point scale (1-4 from strongly disagree to strongly agree), except for the residential density and land use mix - diversity (five-point scales; 1-5) attributes. A neighbourhood was defined as the area within a 10 to 15 minutes' walk from home. Each item in the NEWS assessed an environmental attribute that was shown to be related to physical activity for recreations or transportation in previous studies (Humpel, Owen, & Leslie, 2002; Saelens et al., 2003b).

Component A of NEWS: Types of Residences in your Neighbourhood (Residential Density)

The items under this component include questions about the frequency of various residence types, from single-family detached homes to more than 13-storeys apartments, flats or condominiums, with a response range of "None" (1), "A few" (2), "Some" (3), "Most" (4) and "All" (5).

Component B of NEWS: Proximity to Stores and Facilities (Land Use Mix-Diversity)

For this component, participants were asked to check how long would it take for them to walk from their homes to the nearest stores or facilities. There were originally 23 types of stores and facilities, with responses ranging from 1- to 5-minutes of walking time (coded as 5) to 30-minutes or more walking time (coded as 1).

The 23 original destinations were namely: 1) convenience/small grocery store, 2) supermarket, 3) hardware store, 4) fruit/vegetable market, 5) laundry/dry cleaners, 6) clothing store, 7) post office, 8) library, 9) primary schools, 10) other schools, 11) book store, 12) fast food restaurant, 13) coffee place/café, 14) bank/credit union, 15) non-fast food restaurant, 16) video store, 17) pharmacy, 18) salon/barber shop, 19) your workplace/job or school, 20) bus/transit stop, 21) park, 22) recreation center, and 23) gym or fitness facility. Adaptation to this component will be explained in the next chapter.

Component C of NEWS: Access to Non-residential Land Uses/Services (Land Use Mix-Access)

In this section, participants were asked to response to variables scaled from 1 (strongly disagree) to 4 (strongly agree) regarding the level of difficulty to have access to non-residential land uses and services that are within walking distance in the neighbourhoods. This includes walking to stores for shopping, walking to other places, services, and transit stops (bus/train/other public transportation), access to parking at local shopping areas, and the presence of major barriers that increase the difficulty in walking from place to place.

Component D of NEWS: Neighbourhood Street Connectivity (Street Connectivity)

Neighbourhood street connectivity section intends to investigate participants' view on the distance between intersections in their neighbourhood, the number of four-way intersections, presence of other alternative routes for getting from place to place in the neighbourhood, and presence of dead-end streets which limit walking routes around the neighbourhood. Responses to these items were scaled from 1 (strongly disagree) to 4 (strongly agree).

Component E of NEWS: Places for walking and cycling (Infrastructure and Safety for Walking and Cycling)

Responses for this component were scaled from 1 (strongly disagree) to 4 (strongly agree). Participants were asked to respond to the presence and condition of sidewalks in their neighbourhood, presence of bicycle or pedestrian trails, and other facilities related to walking and cycling in the neighbourhoods.

Component F of NEWS: Neighbourhood Surroundings (Aesthetics)

Participants were asked to rate the aesthetics value of their neighbourhood from a scale of 1 (strongly disagree) to 4 (strongly agree). Among the questions were the presence of trees and trees as natural shade for sidewalks, attractive buildings and homes, the interesting thing to look at, as well as natural sights, and if the neighbourhood is free from litter.

Component G of NEWS: Neighbourhood Safety (Pedestrian/Traffic/Other Safety Hazards)

This component of the questionnaire includes a variety of questions on neighbourhood safety, including traffic, crime and other safety hazards. The questions were also rated at a 4-point scale, ranging from 1 for strongly disagree to 4 for strongly agree. Among the questions were the presence of busy traffic that made walking more difficult, traffic speed and speed limits, exhaust fumes, well-lit streets (at night), the safety of the neighbourhood from crime and crime rates. The questions would be grouped according to their respective NEWS subscales (perceived neighbourhood environment attributes) for further analysis (Cerin, Conway, Saelens, Frank, & Sallis, 2009).

2.0 Methodology

The critical principle of adaptation of the IPEN study is to retain the core items, and then new items are added as needed to reflect the local environment or culture. Core items were to be retained even if they do not exist in the country. This is to enable comparisons of pooled data, and absence of an attribute in a country is an important data point for international comparisons. This condition was fulfilled so that the results of the study could be used for the intended cross-country comparison.

2.1 Translation and back-translation

Translation from English to the Malay Language was conducted by a bilingual native Malay Language speaker and fluent in writing, reading and spoken English. The quality of the translation was then reviewed and verified by the research team. Subsequently, the back-translation of all the survey items from the Malay Language to English was conducted by an independent person who is not a member of the research team. The back-translator was bilingual and fluent in writing, reading and spoken English and Malay Language, with no knowledge of the original questionnaire.

2.2 Adaptations

Several destinations frequented by Malaysians were added to Component B upon the suggestions of research group members, such as, places of worship (mosques, temples and churches), night markets, wet markets, beaches (popular family recreation destination), hospitals, and government owned health clinics/private clinics. This subscale reflects an average perceived walking proximity from home to 29 destinations after modifications. Modifications were also made to numerous terms in the questionnaire to reflect the local culture in the country.

2.3 Reliability and Validity Test

The translated questionnaire was tested twice on 66 free-living Malaysian adults aged 18 years old and above who can read and communicate verbally in the Malay Language. The questionnaires were self-administered, with guidance from the research staff if needed. The interval between the pre- and post-test ranged between 14 to 21 days. Test-retest reliability of the items in the NEWS was established by computing the intra-class correlation coefficients (ICC), which is a measure of the reliability or measurements or ratings. The single measure ICC is used as an index for the reliability of ratings for one, typical, single rater. Based on classifications systems, ICC values below 0.50 were classified as poor, 0.50 to 0.75 as moderate, and above 0.75 were regarded as high levels of reliability (Portney & Watkins, 2015).

The percentage agreement was also computed as an additional measure of test-retest reliability to assess the percentage of individuals who gave the same response on an item on both assessments. Percent agreement was also computed for subscales with restricted variability (SD < 0.5), as low levels of variability may result in very low ICC values even though the actual agreement between the assessments is high. Items with moderate and low ICC values, restricted variability (SD < 0.5), but percent agreement greater than 75% were

considered highly reliable (Cerin et al., 2010). Items and scales with low ICC but percent agreement exceeding 60% were considered moderately reliable (Saelens et al., 2006).

Meanwhile, the confirmatory factor analysis was used to determine the validity of the NEWS items involving Likert scales. The Varimax with Kaiser Normalization component analysis rotation method was used.

3.0 Result

3.1 Adaptations (Additions and Modifications)

The quality of the back-translated questionnaire was verified by the research team, and minor modifications were made before the questionnaire was used for the validity and reliability study. The research team consisted of a multi-disciplinary panel of experts from the fields of public health and nutrition (*n=2*), physical activity and sports science (*n=1*) and built environment (*n=2*).

New measures were added to the land use mix - diversity attribute by the team to reflect the local environment of the study setting and target population, such as the local health clinics, night markets, place of worship (examples are mosques, temples, and churches) and beaches (Table 1.0). These establishments are usually frequented by locals in the country. Component B of NEWS now consists of 29 items. Several terms such as "elementary school" and "coffee place" were modified to portray these destinations in the local context. The usage of "miles" were also converted to "kilometres" because the metric systems is more relevant to Malaysians.

3.2 Reliability and Validity of the NEWS

Results of the ICC and percentage agreement are shown in Table 2.0. Most of the items were found to have moderate to high reliability. Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, Bartlett's Test of Sphericity and results of the Scree Plot are summarized in Table 3.0. The sampling adequacy was satisfactory, and all the factors were retained based on the IPEN guidelines and the original questionnaire in English. The items in the translated NEWS have sufficient levels of factorial validity and reliability to be used for measuring perceived neighbourhood environment attributes among Malaysian adults.

Table 1.0: Adaptations of the NEWS

Items	Reason for Adaptation
Additions (Land Use Mix-Diversity)	
Distance to places of worship (mosque, temple, church)	Relevant to Malaysians (common religious practice)
Distance to night markets	Common family activity among Malaysians
Distance to wet markets	Common activity among Malaysians (public markets operated by the local authority, small scale wet markets within a neighbourhood)
Distance to beaches/the seaside	Popular family destination among Malaysians
Distance to hospitals	Relevant to Malaysians (health issues and minimal fee charged by Government hospitals)
Distance to private clinics/health clinics	Relevant to Malaysians (health issues and minimal fee charged by Government clinics)
Modifications (Land Use Mix-Diversity)	
Destination 'elementary schools' renamed 'primary schools'	Linguistically represents 'elementary school' in the Malaysian context
Destinations 'coffee place' renamed 'coffee shops/*kopitiam*/café'	Clarifies type of destinations to participants in the Malaysian context
Modifications (Traffic Safety)	
Speed of traffic (miles per hour) converted to kilometers per hour	Relevant to Malaysians where metric system is used

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International Journal of Public Health and Clinical Sciences
e-ISSN : 2289-7577. Vol. 5:No. 1
January/February 2018

Table 2.0: Descriptive Statistics and Test-retest Reliability of the NEWS

Items/Scale	M (SD) [Time 1]	M (SD) [Time 2]	Agreement (%)	ICC Single Measure	Reliability
Residential Density	244.94 (72.017)	257.53 (91.908)		0.726	
1) How common are detached single-family residences in your immediate neighbourhood?	3.16 (1.344)	3.09 (1.215)	53.7	0.825	High
2) How common are townhouses or row houses of 1-3 stories in your immediate neighbourhood?	2.94 (1.347)	2.88 (1.225)	46.3	0.777	High
3) How common are apartments or condos 1-3 stories in your immediate neighbourhood?	1.66 (0.808)	1.72 (0.918)	71.6	0.748	Moderate
4) How common are apartments or condos 4-6 stories in your immediate neighbourhood	1.58 (0.838)	1.57 (0.802)	73.1	0.719	Moderate
5) How common are apartments or condos 7-12 stories in your immediate neighbourhood?	1.28 (0.598)	1.30 (0.603)	76.1	0.471	High (% agreement)
6) How common are apartments or condos more than 13 stories in your immediate neighbourhood?	1.15 (0.399)	1.30 (0.656)	78.8	0.474	High (% agreement)
Land Use Mix-Diversity (*Proximity to stores & facilities*) Time to walk to nearest:	2.67 (0.846)	2.72 (0.844)		0.855	
1) Convenience Store/Grocery shop	4.36 (0.949)	4.37 (0.868)	67.2	0.755	High
2) Supermarket	2.79 (1.354)	2.90 (1.281)	64.2	0.849	High
3) Hardware Store	2.93 (1.341)	3.03 (1.267)	50.7	0.727	Moderate
4) Fruits and Vegetables Market	2.97 (1.446)	3.22 (1.324)	46.3	0.674	Moderate
5) Laundry	2.79 (1.493)	2.85 (1.373)	40.3	0.818	High
6) Clothing Store	2.57 (1.328)	2.79 (1.320)	50.7	0.690	Moderate

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International Journal of Public Health and Clinical Sciences
e-ISSN : 2289-7577. Vol. 5:No. 1
January/February 2018

Table 2-0. Continued

Items/Scale	M (SD) [Time 1]	M (SD) [Time 2]	Agreement (%)	ICC Single Measure	Reliability
7) Post Office	2.34 (1.366)	2.40 (1.303)	61.2	0.832	High
8) Library	1.87 (1.205)	1.81 (1.145)	73.1	0.796	High
9) Primary School	3.03 (1.392)	3.19 (1.395)	63.6	0.870	High
10) Other Schools	2.66 (1.472)	2.84 (1.410)	47.8	0.788	High
11) Bookstore	2.28 (1.204)	2.46 (1.352)	62.7	0.820	High
12) Fast Food Restaurant	2.30 (1.360)	2.43 (1.417)	58.2	0.882	High
13) Coffee Shop/Coffee Place/*Kopitiam*/Café	3.51 (1.295)	3.52 (1.330)	43.3	0.670	Moderate
14) Bank	2.30 (1.243)	2.54 (1.318)	62.7	0.845	High
15) Non Fast Food Restaurant	3.16 (1.377)	3.28 (1.423)	46.3	0.814	High
16) Video Store	2.22 (1.475)	2.19 (1.676)	67.2	0.816	High
17) Pharmacy	2.75 (1.407)	2.72 (1.324)	55.2	0.861	High
18) Salon, Hairdresser or Barber	3.27 (1.332)	3.31 (1.270)	58.2	0.799	High
19) Job or School	1.66 (1.332)	1.78 (1.516)	68.7	0.913	High
20) Bus or Train Stop	2.75 (1.481)	2.88 (1.513)	43.3	0.655	Moderate
21) Park/Playground	3.15 (1.588)	3.09 (1.574)	56.7	0.851	High
22) Recreation Centre	2.22 (1.475)	2.01 (1.212)	64.2	0.797	High
23) Gym	2.19 (1.294)	2.13 (1.140)	49.3	0.686	High
24) Places of Worship (mosque, church, temples, and others)	3.43 (1.448)	3.31 (1.459)	50.7	0.863	High
25) Night Market	2.88 (1.354)	2.94 (1.358)	58.2	0.891	High
26) Wet Market	2.69 (1.282)	2.79 (1.377)	56.7	0.852	High
27) Beach	1.49 (1.035)	1.45 (1.105)	80.6	0.807	High
28) Hospital	2.03 (1.231)	1.87 (1.192)	65.7	0.812	High
29) Health Clinic	2.61 (1.290)	2.69 (1.406)	47.8	0.810	High

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Open Access: e-Journal

International Journal of Public Health and Clinical Sciences
e-ISSN : 2289-7577. Vol. 5:No. 1
January/February 2018

Table 2-0. Continued

Items/Scale	M (SD) [Time 1]	M (SD) [Time 2]	Agreement (%)	ICC Single Measure	Reliability
Land Use Mix-Access (Access to non-residential land uses/services)	2.86 (0.458)	2.85 (0.415)		0.863	
1) I can do most of my shopping at local stores.	2.82 (0.869)	2.84 (0.751)	52.2	0.748	Moderate
2) Stores are within easy walking distance.	2.87 (0.776)	2.79 (0.769)	59.7	0.797	High
3) Parking is difficult in local shopping areas.	2.49 (0.823)	2.43 (0.722)	50.7	0.642	Moderate
4) There are many places to go within walking distance at my home.	2.49 (0.766)	2.49 (0.746)	56.7	0.640	Moderate
5) It is easy to walk to a transit stop (bus, train) from my home.	2.22 (0.951)	2.46 (0.910)	47.8	0.704	Moderate
6) Hilly streets make walking difficult	3.61 (0.627)	3.45 (0.702)	58.2	0.667	Moderate
7) Major barriers (highways, railway tracks, rivers) make walking difficult	3.51 (0.786)	3.46 (0.636)	55.2	0.595	Moderate
Street Connectivity (Neighbourhood street connectivity)	2.67 (0.426)	2.59 (0.395)		0.778	
1) Do not have many dead-end streets/*cul-de-sacs*	3.04 (0.661)	2.81 (0.557)	56.7	0.600	Moderate
2) There are walkways connecting dead-end streets to streets, trails and other dead-end streets	2.07 (0.822)	2.15 (0.764)	50.7	0.697	Moderate
3) The distance between intersections in my neighbourhood is usually short.	2.81 (0.783)	2.69 (0.701)	59.7	0.581	Moderate
4) Many four-way intersections	2.48 (0.704)	2.43 (0.679)	58.2	0.677	Moderate
5) There are many alternative routes for getting from place to place in my neighbourhood.	2.94 (0.833)	2.88 (0.708)	64.2	0.767	Moderate

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Open Access: e-Journal

International Journal of Public Health and Clinical Sciences
e-ISSN : 2289-7577. Vol. 5:No. 1
January/February 2018

Table 2-0. Continued

Items/Scale	M (SD) [Time 1]	M (SD) [Time 2]	Agreement (%)	ICC Single Measure	Reliability
Infrastructure and Safety for Walking and Cycling	1.87 (0.527)	1.99 (0.540)		0.797	
1) There are sidewalks on most of the streets in my neighbourhood.	2.00 (0.739)	2.12 (0.789)	67.2	0.787	Moderate
2) Sidewalks well-maintained	1.93 (0.804)	2.01 (0.749)	53.7	0.600	Moderate
3) Easy access to bicycle and pedestrian trails	1.96 (0.747)	2.00 (0.778)	64.2	0.728	Moderate
4) Sidewalks separated from road/traffic by parked cars	1.61 (0.673)	1.78 (0.670)	64.2	0.645	Moderate
5) Sidewalks separated from streets by grass	1.66 (0.708)	1.90 (0.721)	55.2	0.605	Moderate
6) Safe to bike in the neighbourhood/surroundings	2.37 (0.735)	2.46 (0.725)	56.7	0.712	Moderate
7) Special lanes for bikes and pedestrians	1.55 (0.610)	1.68 (0.612)	59.1	0.640	Moderate
Aesthetics	2.55 (0.397)	2.51 (0.439)		0.603	
1) There are trees along the streets in my neighbourhood.	3.13 (0.7960	3.00 (0.651)	61.2	0.681	Moderate
2) Tress give shade to sidewalks	2.67 (0.824)	2.82 (0.757)	59.7	0.675	Moderate

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Open Access: e-Journal

International Journal of Public Health and Clinical Sciences
e-ISSN : 2289-7577. Vol. 5:No. 1
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Table 2-0. Continued

Items/Scale	M (SD) [Time 1]	M (SD) [Time 2]	Agreement (%)	ICC Single Measure	Reliability
3) There are many interesting things to look at while walking in my neighbourhood.	2.25 (0.560)	2.24 (0.630)	56.7	0.404	Low
4) Free from garbage/rubbish	2.52 (0.612)	2.46 (0.659)	65.7	0.682	Moderate
5) There are many attractive natural sights in my neighbourhood.	2.34 (0.708)	2.25 (0.725)	59.7	0.722	Moderate
6) There are attractive buildings/homes in my neighbourhood.	2.39 (0.695)	2.33 (0.637)	65.7	0.629	Moderate
Pedestrian/traffic/safety hazards (Neighbourhood safety)	2.43 (0.346)	2.43 (0.332)		0.886	
1) [Safety from Traffic Hazard] There is so much traffic along nearby streets that makes it difficult or unpleasant to walk in my neighbourhood.	2.51 (0.842)	2.58 (0.721)	56.7	0.728	Moderate
2) Difficult to walk in the neighbourhood due to heavy traffic along nearby streets	2.37 (0.775)	2.45 (0.724)	61.2	0.761	High
3) Traffic is usually slow on the street I live on	2.51 (0.683)	2.57 (0.609)	67.2	0.754	High
4) [Safety from Traffic Hazard] The speed of traffic on most nearby streets is usually slow.	2.28 (0.647)	2.34 (0.641)	61.2	0.692	Moderate
5) [Safety from Traffic Hazard] Most drivers exceed the posted limits while driving in my neighbourhood.	2.61 (0.738)	2.60 (0.698)	62.7	0.705	Moderate
6) [Infrastructure and Safety for Walking and Cycling] My neighbourhood is well lit at night.	2.70 (0.603)	2.58 (0.655)	67.2	0.748	Moderate

Table 2-0. Continued

Items/Scale	M (SD) [Time 1]	M (SD) [Time 2]	Agreement (%)	ICC Single Measure	Reliability
7) [Infrastructure and Safety for Walking and Cycling] Walkers and bikers on the streets in my neighbourhood can be easily seen by people in their homes.	2.46 (0.745)	2.46 (0.636)	50.7	0.603	Moderate
8) [Infrastructure and Safety for Walking and Cycling] There are crosswalks and pedestrian's signals (traffic/signal light) to help walkers cross busy streets in my neighbourhood.	1.81 (0.701)	1.78 (0.735)	53.7	0.457	Low
9) Crosswalks help pedestrians feel safe crossing busy streets	1.90 (0.699)	1.94 (0.795)	58.2	0.737	Moderate
10) Air pollution (eg. exhaust fumes from vehicles)	2.30 (0.718)	2.42 (0.742)	64.2	0.642	Moderate
11) I see and talk to other people while walking in my neighbourhood	2.49 (0.746)	2.42 (0.700)	55.2	0.490	Low
12) [Safety from Crime] There is a high crime rate in my neighbourhood.	2.82 (0.777)	2.78 (0.714)	68.7	0.835	High
13) [Safety from Crime] The crime rate in my neighbourhood makes it unsafe to go on walks during the day.	2.97 (0.852)	2.88 (0.729)	55.2	0.728	Moderate
14) [Safety from Crime] The crime rate in my neighbourhood makes it unsafe to go on walks at night.	2.39 (0.887)	2.39 (0.797)	55.2	0.694	Moderate
15) Safe for 10-year old to walk alone around the house/block during the day	2.10 (0.819)	2.04 (0.684)	56.7	0.562	Moderate
16) Unattended or stray dogs	2.72 (1.027)	2.64 (0.949)	70.1	0.865	Moderate

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Open Access: e-Journal

International Journal of Public Health and Clinical Sciences
e-ISSN : 2289-7577. Vol. 5:No. 1
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Table 3.0: KMO, Bartlett's Test and Scree Plot Results
(Confirmatory Factor Analysis) for Items C to G

Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy	.512 (Satisfactory)
Bartlett's Test of Sphericity	$p < 0.001$ (Significant)
Factors retained based on IPEN guidelines and original questionnaire in English	6 (Six)

*Curve from Scree Plot also flattened at factor 6.

4.0 Discussion

The World Health Organization (WHO) recognized the importance of the surrounding environment in facilitating physical activity (WHO, 2014). The physical environment where walking, biking and various forms of active or non-motorized transportation is safe and could be well accessed could increase physical activity (Litman, 2004). An environment that is supportive of physical activity also provides facilities and services for leisure, recreation and sports activities and ascertains that there are ample safe spaces for active living (Mozaffarian et al., 2012; Ward Thompson, 2013).

Neighbourhoods environment and designs that are not physically activity friendly discourage physical activity among its residents (Hills & Bryne, 2006). Assessment of the neighbourhood environment attributes generally includes factors such as the number of residents per land unit (residential density), availability and access to a variety mixed land uses such as residential and commercial purposes, facilities and services (land use mix - diversity and land use mix - access), grid-like streets (street connectivity), infrastructure and safety for walking and cycling, neighbourhood appeal and beauty (aesthetics), and safety from traffic and crime (Sallis et al., 2009; Koohsari et al., 2015; Kerr et al., 2015; De Bourdeaudhuij et al., 2015).

An international study of built environments and physical activity under the IPEN protocols involving adults from eleven countries (United States of America, Canada, Brazil, Colombia, Belgium, Lithuania, Norway, Sweden, United Kingdom, Hong Kong, Japan and New Zealand) had shown strong evidence of the relevance of neighbourhood environment attributes and physical activity (Sallis et al., 2009). All the countries assessed the perceived neighbourhood environment attributes and self-report measures of the total physical activity using the same protocols, including the NEWS. In the pooled analyses, five environment attributes were associated with meeting the recommended physical activity guidelines, namely mixed land use, access to transit stations for transportation, availability of sidewalks, biking facilities, and low-cost recreation facilities. Conducted in different environments and cultures, results from this study showed that neighbourhood environment attributes are strongly related to physical activity (Sallis et al., 2009).

Components of the NEWS and their importance in measuring perceived neighbourhood environment walkability

High residential density and diversity of land uses indicated higher walkability and were positively correlated with walking and cycling (Fox & Hillsdon, 2007; Udell et al., 2014). Meanwhile, land use mix is defined as a measure of the number of different types of land uses in a neighbourhood (Saelens et al., 2003b; Aytur, Rodriguez, Evenson, Catellier, & Rosamond, 2008). Increasing evidence points to the fact that environments with a variety of land uses could create more active, healthier, and liveable communities (Frank & McKay, 2010; Aytur et al., 2008).

Street connectivity is one of the major environmental attributes with direct or indirect influences on active transportation, where highly connected street networks increase walkability, whereas streets with longer blocks, fewer intersections, and more dead-ends were less conducive to walking (Berrigan, Pickle, & Dill, 2010). The availability of sidewalks for walking, either for transportation and/or recreation purposes was found to be positively related to physical activity and walking among adults (Bauman & Bull, 2007).

People tend to be more physically active in aesthetically appealing and pleasant environments (Inoue et al., 2010; De Greef, Van Dyck, Deforche, & De Bourdeaudhuij, 2010). Trees along the streets have been found to be a promoting factor for physical activity (Perkins, Heynen, & Wilson, 2004). Trees shield direct sunlight and reduces heat along walking paths, while attractive buildings, and water views may make physical activity for leisure and recreation more pleasurable.

Safe environments that are free from crime increases the walkability of the neighbourhoods and encourage physical activity (WHO, 2014). Residents who felt safe in their neighbourhoods were more physically active with higher levels of walking for transportation and leisure (Evenson et al., 2012; Rech et al., 2012). In a local context, Wan Omar et al (2013) identified crime as a constraint of walking in a qualitative study conducted by them, where threatening and unsafe environment from snatch theft, robberies, assault and abduction were said to discourage many respondents from walking and other outdoor activity (Wan Omar, Patterson, & Pegg, 2013).

5.0 Conclusion and recommendation

As a conclusion, the NEWS in Malay Language has shown sufficient levels of factorial validity and reliability to be used for measuring perceived neighbourhood environment walkability among Malaysian adults. The importance of these attributes and its relationship with physical activity levels and obesity status will be explored in our upcoming papers in detail. Lastly, calculation of the NEWS subscales (perceived neighbourhood environment walkability attributes) will be based on the methods proposed by Cerin and her colleagues after a cross-validation of the confirmatory factor analysis structure of the NEWS (Cerin et al., 2009). The version of NEWS used for this study included all the questions that were originally developed for the survey. For the analysis of results, only the questions or variables that were included and confirmed by Cerin's confirmatory factor analysis paper were used in

IJPHCS
Open Access: e-Journal

International Journal of Public Health and Clinical Sciences
e-ISSN : 2289-7577. Vol. 5:No. 1
January/February 2018

the final calculations to obtain the perceived neighbourhood environment walkability attributes subscales (Cerin et al., 2009).

Acknowledgement

Declaration

The authors declare that there is no conflict of interest.

Authors contribution

Author 1 and Author 2 designed the study and performed data collection; Author 1 contributed supervision and analysis tools; Author 2 analysed the data and wrote the paper.

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