WALKING TO OCCUPATIONAL ACTIVITIES WITHIN THREE NEIGHBOURHOODS IN BASRA CITY.

Qaaid Al-Saraify, David Grierson

Abstract

Recognizing the demand for a reliable subjective instrument to gather information on walking to occupational activities on the neighbourhood scale, this paper outlines the Neighbourhood Walking to Occupational Activities Questionnaire (NWOAQ) recently developed at the Department of Architecture, University of Strathclyde. The approach follows reliable techniques in the design of questionnaires including the analysis of currently available instruments, interviews with the potential case study participants, and the use of the Theory of Planned Behaviour (TPB). It describes the testing of NWOAQ, following a 'mixed method' adopted to sample the population of three case studies in Basra City, in Iraq (Al-Saymmar, Al-Mugawleen, and Al-Abassya). Cronbach's 'Alpha Test' (Cronbach, 1951) was conducted on three significant variables selected; 'the perceived environment' variables; the 'constructs of the TPB' variables; and the 'walking outcome' variables. This displayed different alpha levels, which were; 0.76; 0.74; and 0.87, respectively. Based on CAT, the level of internal consistency that would render a group of indicators reliable should be no less than 0.60.

Keywords: *Neighbourhood, Walking to Occupational Activities, Subjective Instrument, Questionnaire.*

INTRODUCTION

The relationship between the physical environment and preferred pedestrian travel behaviour within the neighbourhood unit has long been a topic of research within urban-related studies (FRIEDMAN et al., 1994; S. HANDY, 2006; HANDY, 1992, 1996; HESS et al., 1999; KITAMURA et al., 1997; LEE & MOUDON, 2006a, 2006b, 2008; LEE et al., 2006). Additionally, physical activity is generally highly linked to the characteristics of the social and physical environment within ecological models of physical activity (EMPA) and health studies (FENG et al., SCHWARTZ, 2010; LE MARCHAND et al., 1997; MARTÍNEZ-GONZÁLEZ et al., 1999; SALLIS et al., 2006; WING et al., 2001). Particular qualities of the physical environment have been commonly used by both groups of researches. For example, the qualities of 'density', 'diversity', 'proximity', and 'accessibility' are used by both. However, EMPA distinctly considers multiple levels of individual, social and physical environments. This expanded scope regarding the relationship between physical activity and built environment is based on potential influences of non-physical factors on physical activity (CLIFTON et al., 2007). EMPA studies focus on which individual and social factors of the built environment are simulative of physical activity to provide evidential research (SALLIS et al., 2015). Similarly this study recognises the need for a multilevel subjective instrument to gather information about walking to the occupational activities at the neighbourhood scale, and recent research work in support of this objective has developed the Neighbourhood Walking to Occupational activities Questionnaire (NWOAQ). A review of relevant literature has defined the multilevel of influence on walking, interviews conducted by this study have defined the domains of the occupational activities, a review of previous questionnaires has identified key components of the new instrument, perceived environmental factors follow the Neighbourhood Environment Walkability Scale (NEWS) instrument of physical activity, and the TPB is utilised to examine aspects of individual cognition that link social and physical environments to walking activity.

DEFINING THE MULTILEVEL OF INFLUENCE ON WALKING

The ecological models reviewed by this study holistically address theoretical propositions and empirical evidence on four levels relating to; 'individual', 'social', 'built environment', and 'governmental policies' (BAUMAN et al., 2002; DING et al., 2011 and 2012; SALLIS, 1993; SALLIS et al., 2006; SALLIS et al., 2007). In this study, the initial level of inspection involves two active living domains namely, 'occupational activities' and 'walking as a mode of transport'. The next level of inspection represents perceived social and physical environments. Finally, the third level represents the individual, and includes personal informa-

tion and individual beliefs around walking as measured by the TPB constructs. Governmental policies were utilised, as in previous EMPA studies, as an intervention level that may contribute to enhance the physical activity of the residents.

A REVIEW OF MEASUREMENT INSTRUMENTS OF PHYSICAL ACTIVITY

Several instruments have been adopted by various studies, however the most prominent has been the International Physical Activity Questionnaire (IPAQ) developed by the World Health Organization (WHO) and the Centre for Disease Control and Prevention (CDC) (BOOTH, 2000). This is used to obtain physical activity monitoring data. For example, a 2007 study of physical activity by Cerin et al. utilized the IPAQ Long Form. The study consisted of one-hour/seven days of self-reporting at the individual level, where participants used accelerometers for the direct measurement of walking over seven successive days. Three types of activity were classified into 'sedentary', 'light', and 'moderate-to-vigorous' intensities, and an accelerometer was used with the IPAQ to objectively measure the walking distance, the minute counts, and the average activity hours per day. Furthermore, a regression analysis was undertaken to associate physical activities with medical treatment (CERIN et al., 2007; CERIN et al., 2007).

The second and third most widely used instruments to inspect physical activity on the neighbourhood scale among the reviewed studies were the Neighbourhood Physical Activity Questionnaire (NPAQ) (Giles-Corti et al., 2006) and the Neighbourhood Environment Walkability Scale (NEWS) (SAELENS et al., 2011). Both instruments aim to develop context-specific questionnaires on physical activity at a neighbourhood scale; these are similar to IPAQ, but are conducted on a short-term basis, and examine three types of walking; within the neighbourhood; outside the neighbourhood, and for recreation. The NPAQ was designed to further inspect both walking activity and the characteristics of the neighbourhood environment. Contextually, the neighbourhood is defined as 10 to 15 minutes of walking activity, following a 400-metre radius (MCCORMACK et al., 2006; PIKORA et al., 2002 and 2003), and less than a one-kilometre radius (FRANK et al., 2004 and 2005). Thus, following a review of these questionnaires, thematic dimensions of IPAQ and NPAQ can be summarised as follows:

- The domains of the physical activities relate to what people do in everyday life, and fit a mode of transportation, namely: walking, biking, or using an automobile.
- According to the level of load on the human body, the activities can be classified into different intensities including, walking, light, moderate, vigorous, and sedentary. Moreover, walking can always be considered as a moderate intensity physical activity.
- They depend on a self-report approach as a reliable method to examine the physical activities of participants, who complete the format either by recall or as the activity occurs.
- A typical weeklong period is the most commonly agreed duration to probe the physical activity of the participant.
- Types of variables include: duration in minutes, number of steps, distance, and the frequency of the activity (Matthews & Welk, 2002).
- The minimum period of activity is 30 minutes per day for walking, which was considered appropriate for a healthy active lifestyle. Also, national and international organisations considered ≧150 minutes per week a good rate for a healthy lifestyle.
- Besides the subjectively measured physical activity (IPAQ and NPAQ), studies used "Actigraph accelerometers" to objectively measure physical activity. However our research utilises Q-GIS for this purpose.
- These instruments depend on different methods to test their reliability, which includes the intraclass correlations coefficient (ICC), Cohen Kappa statistic tests, or Cronbach's alpha.

DEFINING OCCUPATIONAL ACTIVITIES AND WALKING (LEVEL – 1)

The occupational active living domain is one of four active living domains defined by Sallis and colleagues (SALLIS et al., 2006). They defined the occupational domain of activities as including all human activities related to everyday routines, such as going to work or shopping. However, no existing study has yet defined the sub-domains of these occupational activities. Thus, the interview method was selected for our study in order to define a set of precise everyday activities concerning the occupational domain at the neighbourhood scale in Basra City.

NWOAQ was tested, following a 'mixed method' adopted to sample the population of three neighbourhood case studies in Basra City, Iraq (Al-Saymmar, Al-Mugawleen, and Al-Abassya). Nine participants from the three neighbourhoods (three participants from each neighbourhood) were involved. The snowball method was adopted for this purpose, enabling the recruitment of six males and three females, aged between 22 and 45 (with a mean age of 33.5 years). This sampling method used required the researcher to identify and approach both gender types of participant (THOMPSON, 1990). The participants were individually interviewed (from 19st to 22th September 2015), during which time one question was posed: "what are the main activities that you daily do in your neighbourhood?" The interviewer then let

		Work		Leisure		Shopping		Services	
		Go to job	Training or study	GYM or Practice a sport	Meet with friends	Food	Consumer goods	Doctor	Personal business
1	Participant	+	-	+	+	+	-	-	-
2	Participant	-	-	-	-	+	-	-	-
3	Participant	-	-	-	-	+	-	-	+
4	Participant	-	-	-	+	+	+	-	+
5	Participant	-	-	-	+	+	-	+	-
6	Participant	-	+	-	-	+	-	-	+
7	Participant	-	-	-	-	+	-	-	-
8	Participant	-	-	-	-	+	-	-	-
9	Participant	-	-	-	+	+	-	-	+
10	Participant	-	-	-	+	+	-	-	-
11	Participant	-	-	-	-	+	+	-	-
12	Participant	+	-	-	-	+	-	+	+
	Total	2	1	1	5	12	2	2	5

+ :positive, the activity is mentioned by the participant.
- :negative, the activity is not mentioned by the participant.

Table 1. Analysis of the interviews based on the defined activities. (Source: The Authors).

the individual speak for 20 minutes without interruption, and took notes as the participant spoke. The purpose of the interview was explained before the interview, and prior to the participant being invited to sign their consent to participate. Following this, three urban specialists (doctoral members of staff within the Architecture Department of the University of Basra) who reside out with the neighbourhoods were also interviewed.

The transcripts were analysed line-by-line, focusing on, and highlighting, the precise names of the activities mentioned by the interviewees. As a primary scan of the responses, information about the types of activity was thematically patterned into four topics that included: 'shopping', 'leisure', 'services', and 'work'. Then, a line-by-line scan about more precise activities was conducted to identify the activities of each topic. After this, a clustering process was conducted to align them with the four main topics, and an analytic table was generated based on the defined activities, (Table 1).

The eight elicited activities included, going to work (6.45%); studying or attending a training course (3.23%); practicing a type of sport or going to the gym (3.23%); meeting with friends (16.13%); going food shopping (38.7%); shopping for consumer goods (6.45%); visiting a doctor (6.45%), or conducting personal business (16.13%). Thus, the most common neighbourhood activity amongst the interviewees was 'going shopping for food'. These activities are commensurate with those defined by Sallis et al. (2006), who stated that the occupational activities include human activities in the built environment, for example, work, study, shopping, meeting friends or colleagues (SALLIS et al., 2006).

Outlining the Instrument For Walking And Occupational Activities

The self-report questionnaire instrument (NWOAQ) is specific to: the neighbourhood context, the occupational active living domain, and walking. It subjectively inspects walking to seven occupational active living domains, namely: undertaking work and study; practising a type of sport; going to the Gym; meeting with friends or equivalents; shopping for food; shopping for consumer goods; visiting a doctor, or conducting personal business. These were defined in the context of Basra City concerning everyday life activities conducted on a neighbourhood scale. Similar to the ecological models studied the time scale of our study is a typical one-week period. The intensity levels of these activities were omitted in this research because our study is specifically concerned with walking activity, which is pre-classified as of moderate intensity.

In partition (B) of the final questionnaire, the design of the instrument posits a simple arrangement of the variables in a table of four columns relating to information about the type of activity, the address of the daily activities, the time duration (5-30 minutes), and whether the transport mode is walking or not. The daily time span of the activities relevant to our study is from 7:00 am until 12:00 midnight. Each activity must be described by the address of the destination. A map of the participants' neighbourhood was provided to help them choose the block-based address of their house and the destination address. Moreover, because the instrument is context-specific, the definition of context relies on the agreed definition of 'neighbourhood' within existing urban design studies, i.e. an area within 10-minute walking distance (400-metre radius) (MOUDON et al., 2006); furthermore, a 15-minute range and 600-metre radius, is the required distance to meet the (30-minutes) recommended walking activity criterion for an active lifestyle (Organization, 2011). Partition E (Figures 1,2 and 3) of the questionnaire provides the map of the neighbourhood where the block of participant's address for each residential area is labelled as (Bi) and the destinations in each case study are labelled as (Di).

Defining the perceived environment factors (Level – 2)

In addition to aspects related to the physical activity, the Neighbourhood Environment Walking Scale (NEWS) instrument is designed to examine two levels of built environment determinants; 'neighbourhood design' and 'recreational environment'. Therefore, in terms of perceived environment factors, this study builds upon existing factors include the neighbourhood aesthetics, perceived safety from crime, perceived safety from traffic, satisfaction with neighbourhood services, perceived residential density, perceived land use diversity, perceived access to local shops, ease of walk to public transport, self-report availability

of sidewalks, and bike lanes were adopted from the NEWS instrument. These factors were based on evidence supporting their significance within previous studies (CERIN et al., 2013; DE BOURDEAUDHUIJ et al., 2003; SALLIS, et al., 2002). In total thirteen statements concerning the perceived physical environment of the neighbourhood were defined within the questionnaire, which related to sidewalks, recreation facilities, public recreation facilities, streetlights, a pleasant neighbourhood for walking, and neighbours' physical activity. Accordingly, thirteen variables were developed of this partition and included in the final independent variables that have resulted from the application of the final questionnaire (Table 5). Moreover, each statement was followed by an agreement Likert scale of 5 points and participants were asked to choose the number that represents their satisfaction with the statement. This section is represented in partition (C) of the questionnaire.

Individual traits level of measurement (Level – 3)

Two sections of the final questionnaire are related to the individual trait measurement levels. The first concerns personal traits within partition A of the final questionnaire, and includes fourteen items about the demographic and social status of the participant. The second concerns the individual beliefs about walking, partition D of the final questionnaire, which is based on the Theory of Planned Behaviour TPB, and measures the beliefs of participants in relation to walking.

Socio-demographic information

The personal traits level includes three types of information, including: demographics, social condition, participant height, and participant weigh, which is based on personal information frequently used in ecological models from physical-activity studies. In this regard, the analytic framework depends on two types of item. The first is the demographic and includes gender, age, working situation, income, disability, height, weight (for body mass index BMI, calculated as kg/m). The second is related to living conditions and includes family size and children (with/without), children (under 18-yrs), house ownership, and whether the participant practices sport or exercise. Fifteen items comprise partition (A), and are based on personal information. According to the World Health Organization's (WHO) International Obesity Task Force, the BMI (average body mass index) of Asians is 25 kg/m^2. WHO's criteria demonstrates that between 18.5 and 24.9 is considered a normal BMI; a BMI of 25 is considered overweight, whilst a BMI of 30 is considered obese. In this research, these values were considered as thresholds to categorise participants (LOVASI et al., 2009; NORMAN et al., 2006). The following shows the calculation to determine the BMI of participants.

$$BMI = W\ (kg) / H\ (m^2)$$

W weight in kilograms
H height in metres

Equation 1: BMI equation. (Lovasi et al., 2009; Norman et al., 2006).

TPB-related walking behaviour measures

Based on the literature reviewed concerning ecological models, the Theory of Planned Behaviour (TPB) is widely adopted to examine the individuals' cognitions that mediate social and physical environments and walking activity (GILES-CORTI et al., 2002; MADDISON et al., 2009; RHODES et al., 2006 and 2008). This is based on the four constructs of the theory, which are: 'behavioural attitude' (BA), 'social norms' (SN), 'perceived behavioural control' (PBC), and 'intention'. Thus, this research utilized the theory element of the TPB to inform the self-report instrument (questionnaire). However, the design of questions related to our study is based on the original thesis by Ajzen (2006), and the social and physical environment factors adopted by the authors are based on our review of EMPA.

General concepts about belief-based measurement

The measurement of beliefs follows the principles of measuring latent variables that cannot be directly measured since they are unobservable (AJZEN, 1991). Ajzen defined the TACT elements, which stand for Target, Action, Context, and Time, as a means to measure such behaviour; for example, an athlete exercises (A) on a racetrack (T) in a town's sport-yard (C), for 30-minutes, on daily basis (T). However, AJZEN (2011) states that, regardless of how the TACT elements are defined, two principles must be assured and these are 'compatibility' and 'specificity'. In terms of compatibility, a statement question addressing the three constructs (BA, SN and PBC) ought to be defined by compatible elements. Moreover, in terms of specificity, the TACT elements must be reasonably specific (although it is possible to generalize) to a certain extent. However, the instrument must achieve "internal consistency" and ensure that it examines the implied beliefs about the behaviour in question (AJZEN, 2011).

Belief-based measurement of walking

For each construct there are instrumental beliefs and affective beliefs that moderate the instrumental one. According to Ajzen (1991), both affective and instrumental beliefs result in the 'attitude' of the person; the affective belief is the expectation of the person to act, which could be considered as the evaluation of the judgment (or instrumental belief) of the person, while the instrumental belief measures the expected benefit of the behaviour in question (AJZEN, 1991). In this regard, attitude is dictated by behavioural beliefs and

Partition D: The beliefs about walking
Attitude to questions:
1. I aim to walk for 30 minutes each day within my neighbourhood because it is healthy. Disagree: __1__ : __2__ : __3__ : __4__ : __5__ : __6__ : __7__ Agree
2. I think walking is healthy. ◯ to some extent, ◯ to a large extent, ◯ to a very large extent, ◯ to an extremely extent
3. I aim to walk for 30 minutes each day within my neighbourhood because the environment is pleasant. Disagree: __1__ : __2__ : __3__ : __4__ : __5__ : __6__ : __7__ Agree
4. I think walking is entertaining. ◯ to some extent, ◯ to a large extent, ◯ to a very large extent, ◯ to an extremely extent
5. I aim to walk for 30 minutes each day within my neighbourhood because it is safe. Disagree: __1__ : __2__ : __3__ : __4__ : __5__ : __6__ : __7__ Agree
6. I think walking is harmful. ◯ to some extent, ◯ to a large extent, ◯ a very large extent, ◯ an extremely large extent
7. I aim to walk for 30 minutes each day within my neighbourhood because of the fresh air. Disagree: __1__ : __2__ : __3__ : __4__ : __5__ : __6__ : __7__ Agree
8. I think walking is an opportunity to breathe fresh air. ◯ to some extent, ◯ to a large extent, ◯ to a very large extent, ◯ to an extremely extent
9. I do not want to walk for 30 minutes each day within my neighbourhood because it waste my time. Disagree: __1__ : __2__ : __3__ : __4__ : __5__ : __6__ : __7__ agree
10. I think that walking wastes time. ◯ to some extent, ◯ to a large extent, ◯ to a very large extent, ◯ to an extremely extent
Subjective norms questions:
11. People encourage me to walk daily within my neighbourhood. Disagree: __1__ : __2__ : __3__ : __4__ : __5__ : __6__ : __7__ : agree
12. I do consider the opinion of others. ◯ to some extent, ◯ to a large extent, ◯ to a very large extent, ◯ to an extremely extent
13. Family members encourage me to walk daily within my neighbourhood. Disagree: __1__ : __2__ : __3__ : __4__ : __5__ : __6__ : __7__ : agree
14. I do consider my family's opinion. ◯ to some extent, ◯ to a large extent, ◯ to a very large extent, ◯ to an extremely extent
15. My doctor encourages me to walk for at least 30 minutes daily within my neighbourhood. Disagree: __1__ : __2__ : __3__ : __4__ : __5__ : __6__ : __7__ : agree
16. I do consider my doctor's opinion. ◯ to some extent, ◯ to a large extent, ◯ to a very large extent, ◯ to an extremely extent

Table 2. The beliefs about walking in the neighbourhood of the NWOAQ. (Source: The Authors).

the expected results of doing the activity, weighted by the evaluation of the expected results (AJZEN & FISHBEIN, 1988). Subjective norms are dictated by normative beliefs, namely the importance of the socially predicted consequences of the activity, and are weighted by the motive of the person to agree with the recommended beliefs of others (AJZEN & FISHBEIN, 1988). PBC is dictated by control beliefs, which refers to the participant's assessment of the condition that makes a particular behaviour possible, weighted by the perceived power that renders the participant capable of that behaviour (AJZEN, 1991).

In this study, the questionnaire on beliefs related to walking behaviour is modelled in accordance with Ajzen's procedure (AJZEN, 2011). The walking behaviour beliefs assigned to measure the walking attitude are related to 'health', 'safety', 'environment', 'fresh air' and 'time', and a moderator weights each item. Thus, five instruments and five moderators were designed to measure the attitudinal beliefs of walking as represented in partition D (Table 2), items 1 to 10. The normative beliefs assigned to measure the subjective norms construct were related to 'people', 'family', and 'doctors', and a moderator weights each item. Thus, three instruments and three moderators were designed to measure the subjective norms, as represented in partition D (Table 2), items 10 to 16. The control beliefs assigned to measure the perceived control beliefs are related to the 'proximity of destinations', the 'ease of movement in the streets', the 'diversity of destinations', the 'crowd of people in the streets', and the 'intensity of houses' and, again, a moderator weights each item. Thus, three instruments and three moderators were designed to measure the

Perceived behaviour control:
17. I find the proximate destinations in my neighbourhood are walkable in 15 minutes. **Disagree: __1__ : __2__ : __3__ : __4__ : __5__ : __6__ : __7__ : agree**
18. I think that proximate destinations facilitate walking. **◯ to some extent, ◯ to a large extent, ◯ to a very large extent, ◯ to an extremely extent**
19. I find that it is easy to walk in the streets of my neighbourhood for 30 minutes daily. **Disagree: __1__ : __2__ : __3__ : __4__ : __5__ : __6__ : __7__ : agree**
20. I think the design of the streets in my neighbourhood facilitate walking. **◯ to some extent, ◯ to a large extent, ◯ to a very large extent, ◯ to an extremely extent**
21. I am capable of walking to different destinations in my neighbourhood. **Disagree: __1__ : __2__ : __3__ : __4__ : __5__ : __6__ : __7__ : agree**
22. I think the diversity of destinations facilitates walking **◯ to some extent, ◯ to a large extent, ◯ to a very large extent, ◯ to an extremely extent**
23. I find crowds in the streets of my neighbourhood do not impede my walking for 30 minutes daily. **Disagree: __1__ : __2__ : __3__ : __4__ : __5__ : __6__ : __7__ : agree**
24. I think that crowds in the streets of my neighbourhood impede walking. **◯ to some extent, ◯ to a large extent, ◯ to a very large extent, ◯ to an extremely extent**
25. I find the density of buildings in my neighbourhood does not impede my walking for 30 minutes daily. **Disagree: __1__ : __2__ : __3__ : __4__ : __5__ : __6__ : __7__ : agree**
26. I think the density of buildings impedes my walking. **◯ to some extent, ◯ to a large extent, ◯ to a very large extent, ◯ to an extremely extent**
Intention:
27. I intend to walk for 30-minutes daily in my neighbourhood. **Disagree: __1__ : __2__ : __3__ : __4__ : __5__ : __6__ : __7__ : agree**

Table 3. The Perceived walking control in your neighbourhood of the NWOAQ. (Source: Authors).

PBC, as represented in partition D (Table 2), items 17 to 26. A Likert scale measures participant beliefs, and the affect factor (that moderates the behavioural belief) can be measured on any scale but must be similarly applied to all of the constructs. In this research, the instrumental beliefs are measured by the Likert scale ranging from 1 (disagree) to 7 (agree). The evaluation is as follows: (1) when the consequences are considered as affective (to some extent); (2) when the consequences are considered as affective (to a large extent); (3) when the consequences are considered as affective (to a very large extent); (4) when the consequences are considered as affective (to an extreme extent). Each instrument was multiplied by its motive factor to provide the score for the beliefs construct. This is related to walking behaviour for 30-minutes on the neighbourhood scale. The final list of 27 questions comprised the following: ten questions for attitude (five beliefs and five moderators); six questions for subjective norms (three beliefs and three moderators; ten questions for PBC (five beliefs and five moderators), and one question for the direct measurement of the intention to walk as represented in partition D (Table 3).

METHODOLOGY

A mixed research methodology is adopted in this study based on six criteria, defined by CRESWELL (2013), in order to guarantee its reliability. These criteria are follows; (1) defines the measurement instruments; (2) selects whether sample is random or non-random; (3) defines the population and sample size; (4) determines the time of the survey; (5) checks "how do the variables cross-reference with [the] research question and items of survey"; and (6) discusses the statistical method of data analysis, and how the results will be interpreted (CRESWELL, 2013, p:180). Moreover, this

study could be considered an exploratory sequential mixed method design (CRESWELL, 2013) because its approach starts with a qualitative (induction) level, and then quantitatively applies the NWOAQ questionnaire (which forms the deduction level) within three residential neighbourhoods. These three case studies represent the three evolutionary stages of the urban form of Basra City. These neighbourhoods are: Al-Saymmar (Figure 1), Al-Mugawleen (Figure 2), and Al-Abassya (Figure 3). The physical tissue of each neighbourhood is sampled on a 10-minute (400-metre radius), and a 15-minute (600-metre radius) walking criteria. Cadastral maps were developed in this study and utilised as the main source of information to conduct the objective measurements. The random sampling method is based on a clustering sampling technique, which relies on the spatial factor (in this research, a cluster of blocks 400x400-metres in size) rather than the specific ratio of the population (KISH, 2004; KISH & FRANKEL, 1974). The research adopts this method in response to a lack of information about the case study population.

Three hundred questionnaires were distributed amongst each neighbourhood, which amounted to 900 out of approximately 1,400 housing units within the three neighbourhoods in the defined (400x400-metre) areas. This number represents approximately (64%) of the targeted houses. The participants were asked to respond to the questionnaire within typically one week (Sunday to Saturday), during the total period of the study (from 1st to 20th October 2015), where the first date is the first day of distributing the questionnaire and the second date is the last day of collecting the questionnaire. Only 325 (53.8%) were returned and the number of valid participations totalled 175, which accounts for 22% of the separated formats, after applying the cleaning check criteria. The Al-Saymmar neighbourhood returned responses from 62 participants, whilst the Al-Mugawlen neighbourhood provided 58, and the Al-Abassya neighbourhood provided 52. The validity of the random sample size was computed based on the margin of error (or confidence interval) statistical method (Barlett, Kotrlik, & Higgins, 2001; Ci, 1987). In this regard, the total population is approximately computed from the average size of the Iraqi family, which is 7.7 persons per family based on Dorling's research (DORLING, 2007), and the number of housing units within the sampled area (400x400m). Thus, the approximate population of the three neighbourhoods is 10,346, the number of residential units within the three neighbourhoods multiplied by 7.7, which is the average family size, which is equal to 10,364. Thus, the depended sample size in this research was 175 out of 10,364, which produced a 95% confidence interval of accuracy and a 6.2% tolerance of error ratio, based on the confidence interval

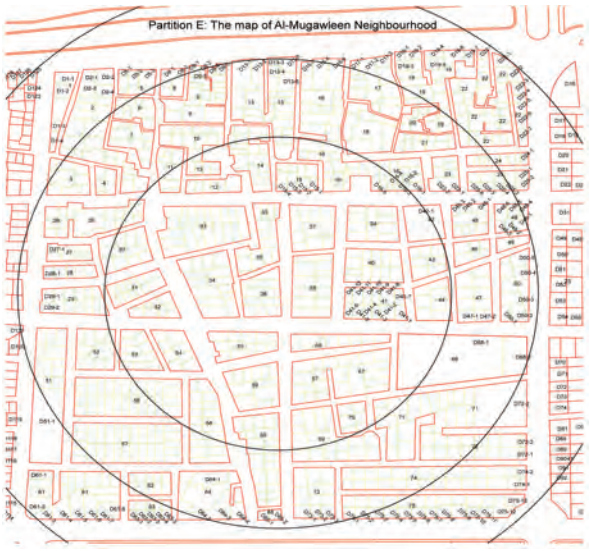

Figure 1. The map of Al-Saymmar neighbourhood of the NWOAQ. (Source: Authors).

Figure 2. The map of Al-Mugawleen neighbourhood of the NWOAQ. (Source: Authors).

of the accuracy test that was run by the SPSS software.

Adopting a mixed method with multiple case study research helped to develop 45 variables that were based on the self-report method in the NWOAQ questionnaire (Table 4). Of the 45, 14 were sociodemographic and BMI variables within partition (A); four were behavioural outcome variables related to walking (partition B); 13 were the perceived environment (partition C), and 14 were the beliefs-based measures of walking (partition D). These variables were systematically entered into SPSS, and based on individual participants.

Reliability tests

The reliability of the adopted subjective measures in this research firstly comes from the utilisation of the measure considered as reliable in previous studies

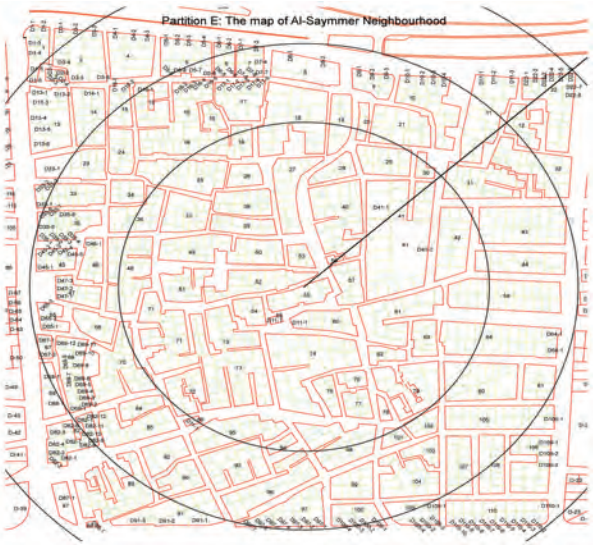

Figure 3. The map of Al-Abassya neighbourhood of the NWOAQ. (Source: Authors).

Sociodemographic and BMI	Perceived and beliefs factors of walking	Walking outcome variables
1) Gender 2) Age 3) Exercise 4) Family type 5) Number of bedrooms 6) House type 7) Family member 8) Underage 9) Income 10) Cars number 11) Work status 12) BMI 13) House ownership 14) Period of living	1) Attitude to walk (5) 2) Subjective Norms SN belief to walk (3) 3) Perceived behavioural control PBC to walk (5) 4) Intention to walk (1) 5) Perceived environment factors (13)	1) Total walking distance per a week. 2) Total walking journeys per a week. 3) Total walking minutes per a week. 4) ≥150 walking minutes per week.
14 variables	27 variables	4 variables

Table 4. The 45 variables that were based on the self-report method in the NWOAQ. (Source: Authors).

according to the significance of their influences on the physical activity. Cronbach's Alpha Test was conducted on the perceived environment variables, the constructs of the TPB variables, and the walking outcome variables and showed different alpha levels, which were 0.76, 0.74, and 0.87, respectively. It is noted that the level of internal consistency that makes a group of indicators reliable should not be less than 0.6; moreover, the test was conducted by the assistance of the SPSS in this study.

CONCLUSION

Following EMPA, the NWOAQ provides an effective instrument for an individual level of measurement. This is due to the generation of appropriate qualities and quantities of dependent and independent variables, which involves the application four levels of measurement to gather information related to walking to occupational activities from residents, as demonstrated in selected neighbourhoods in Basra City.

The approach taken in its development recognises urban ecology as a systems-based approach to understanding the city, which focuses on the "structural details and richness of processes that take place within the boundaries of the system" (CANTRELL & HOLZMAN, 2015), p.254). The ecological processes of an ecosystem occur on different spatial scales or organisational levels (GRIMM et al., 2000), which require different observational lenses (PICKETT, CADENASSO, & McGRATH, 2013). Hence, the study of an urban tissue as an ecosystem must carefully delineate the scale since it defines the operations of interaction within the chosen structure. In this regard, the scales used by this research, namely the 400-meter radius and 600-meter radius, efficiently contributed to the development of 45 variables, which have facilitated the testing of the internal consistency of the NWOAQ instrument, based on Cronbach's Alpha Test. It is our intention to conduct more studies to reveal ecological processes which might explain how walking to occupational activities includes 'determination', 'moderation', and 'mediation processes' between social and physical environments and walking to occupational activities.

REFERENCES

AJZEN, I. (1991) The theory of planned behavior. *Organizational behavior and human decision processes*, 50(2), 179-211

AJZEN, I. (2011) *The theory of planned behaviour: reactions and reflections.* Taylor & Francis, 1113-1127,

AJZEN, I., & FISHBEIN, M. (1988). Theory of reasoned action-Theory of planned behavior. University of South Florida.

BARLETT, J. E., KOTRLIK, J. W., & HIGGINS, C. C. (2001) Organizational research: Determining appropriate sample size in survey research. *Information technology, learning, and performance journal*, 19(1), 43

BAUMAN, A. E., SALLIS, J. F., DZEWALTOWSKI, D. A., & OWEN, N. (2002) Toward a better understanding of the influences on physical activity: the role of determinants, correlates, causal variables, mediators, moderators, and confounders. *American journal of preventive medicine*, 23(2), 5-14

BOOTH, M. (2000) Assessment of physical activity: an international perspective. *Research quarterly for exercise and sport*, 71(sup2), 114-120

CANTRELL, B. E., & HOLZMAN, J. (2015) *Responsive landscapes: strategies for responsive technologies in landscape architecture.* First Edition, Routledge

CERIN, E., CONWAY, T. L., CAIN, K. L., KERR, J., DE BOURDEAUDHUIJ, I., OWEN, N., SALVO, D. (2013) Sharing good NEWS across the world: developing comparable scores across 12 countries for the Neighborhood Environment Walkability Scale (NEWS). *BMC public health*, *13*(1), 309

CERIN, E., LESLIE, E., DU TOIT, L., OWEN, N., & FANK, L. D. (2007a) Destinations that matter: associations with walking for transport. *Health & place*, 13(3), 713-724

CERIN, E., MACFARLANE, D. J., KO, H. H., & CHAN, K. C. A. (2007b) Measuring perceived neighbourhood walkability in Hong Kong. *Cities*, 24(3), 209-217

CI, B. (1987) Confidence intervals. *Lancet*, 1, 494-497

CLIFTON, K. J., LIVI SMITH, A. D., & RODRIGUEZ, D. (2007) The development and testing of an audit for the pedestrian environment. *Landscape and urban planning*, 80(1-2), 95-110

CRESWELL, J. W. (2013) *Research design: Qualitative, quantitative, and mixed methods approaches.* Fourth Edition, Sage publications

CRONBACH, L. J. (1951) Coefficient alpha and the internal structure of tests. *Psychometrika*, 16(3), 297-334

DE BOURDEAUDHUIJ, I., SALLIS, J. F., & SAELENS, B. E. (2003) Environmental correlates of physical activity in a sample of Belgian adults. *American Journal of Health Promotion*, 18(1), 83-92

DING, D., SALLIS, J. F., CONWAY, T. L., SAELENS, B. E., FRANK, L. D., CAIN, K. L., & SLYMEN, D. J. (2012) Interactive effects of built environment and psychosocial attributes on physical activity: a test of ecological models. Annals of behavioral medicine, 1-10

DING, D., SALLIS, J. F., KERR, J., LEE, S., & RoOSENBERG, D. E. (2011) Neighborhood environment and physical activity among youth: a review. *American journal of preventive medicine*, 41(4), 442-455

DORLING, D. (2007) Worldmapper: the human anatomy of a small planet. *PLoS Medicine*, 4(1), e1

FENG, J., GLASS, T. A., CURRIERO, F. C., STEWART, W. F., & SCHWARTZ, B. S. (2010) The built environment and obesity: a systematic review of the epidemiologic evidence. *Health & place*, 16(2), 175-190

FRANK, L. D., ANDRESEN, M. A., & SCHMID, T. L. (2004) Obesity relationships with community design, physical activity, and time spent in cars. *American journal of preventive medicine*, 27(2), 87-96

FRANK, L. D., & ENGEIKE, P. (2005) Multiple impacts of the built environment on public health: walkable places and the exposure to air pollution. *International regional science review*, 28(2), 193-216

FRIEDDMAN, B., GORDON, S. P., & PEERS, J. B. (1994) Effect of neotraditional neighborhood design on travel characteristics. Transportation Research Record, 1466, 63

GILES-CORTI, B., & DONOVAN, R. J. (2002) The relative influence of individual, social and physical environment determinants of physical activity. *Social science & medicine*, 54(12), 1793-1812

GILES-CORTI, B., TIMPERIO, A., CUTT, H., PIKORA, T. J., BULL, F. C., KNUIMAN, M., SHILTON, T. (2006) Development of a reliable measure of walking within and outside the local neighborhood: RESIDE's Neighborhood Physical Activity Questionnaire. *Preventive medicine*, 42(6), 455-459

GRIMM, N. B., GROVE, J. G., PICKETT, S. T., & REDMAN, C. L. (2000) Integrated approaches to long-term studies of urban ecological systems: Urban ecological systems present multiple challenges to ecologists—Pervasive human impact and extreme heterogeneity of cities, and the need to integrate social and ecological approaches, concepts, and theory. *AIBS Bulletin*, 50(7), 571-584

HANDY, S. (2006) Community Design and Travel Behavior. Research on Women's Issues in Transportation, 29 -38

HANDY, S. L. (1992) Regional versus local accessibility: neo-traditional development and its implications for non-work travel. Built Environment (1978-), 253-267

HANDY, S. L. (1996) Understanding the link between urban form and nonwork travel behavior. *Journal of planning education and research*, 15(3), 183-198.

HESS, P., MOUDON, A., SNYDER, M., & STANILOV, K. (1999) Site design and pedestrian travel. Transportation Research Record, *Journal of the Transportation Research Board*(1674), 9-19

KISH, L. (2004) *Statistical design for research* (Vol. 83), John Wiley & Sons

KISH, L., & FRANKEL, M. R. (1974) Inference from complex samples. *Journal of the Royal Statistical Society*. Series B (Methodological), 1-37

KITAMURA, R., MOKHTARIAN, P. L., & LAIDET, L. (1997) A micro-analysis of land use and travel in five neighborhoods in the San Francisco Bay Area. *Transportation*, 24(2), 125-158

LE MARCHAND, L., WILKENS, L. R., KOLONEL, L. N., HANKIN, J. H., & LYU, L. C. (1997) Associations of sedentary lifestyle, obesity, smoking, alcohol use, and diabetes with the risk of colorectal cancer. *Cancer research*, *57*(21), 4787-4794

LEE, C., & MOUDON, A. V. (2006a) *The 3Ds+ R:* Quantifying land use and urban form correlates of walking. *Transportation Research Part D: Transport and Environment*, 11(3), 204-215

LEE, C., & MOUDON, A. V. (2006b) Correlates of walking for transportation or recreation purposes. *Journal of physical activity and health*, 3(s1), S77-S98

LEE, C., & MOUDON, A. V. (2008) Neighbourhood design and physical activity. *Building research & information*, 36(5), 395-411

LEE, C., MOUDON, A. V., & COURBOIS, J. Y. P. (2006) Built environment and behavior: spatial sampling using parcel data. *Annals of Epidemiology*, 16(5), 387-394

LOVASI, G. S., NECKERMAN, K. M., QUINN, J. W., WEISS, C. C., & RUNDLE, A. (2009) Effect of individual or neighborhood disadvantage on the association between neighborhood walkability and body mass index. *American journal of public health*, 99(2), 279-284

MADDISON, R., VANDER HOORN, S., JIANG, Y., MHURCHU, C. N., EXETER, D., Dorey, E., TURLEY, M. (2009) The environment and physical activity: The influence of psychosocial, perceived and built environmental factors. *International journal of behavioral nutrition and physical activity*, 6(1), 19-29

MARTINEZ-GONZALEZ, M. Á., MARTINEZ, J. A., HU, F., GIBNEY, M., & KEARNEY, J. (1999) Physical inactivity, sedentary lifestyle and obesity in the European Union. *International journal of obesity*, 23(11), 1192-1201.

Matthews, C. E., & Welk, G. (2002). Use of self-report instruments to assess physical activity. *Physical activity assessments for health-related research*, 107-123.

McCORMACK, G. R., GILES-CORTI, B., BULSARA, M., & PIKORA, T. J. (2006) Correlates of distances traveled to use recreational facilities for physical activity behaviors. *International journal of behavioral nutrition and physical activity*, 3(1), 18-28.

MOUDON, A. V., LEE, C., CHEADLE, A. D., GARVIN, C., JOHNSON, D., SCHMID, T. L., LIN, L. (2006) Operational definitions of walkable neighborhood: theoretical and empirical insights. *Journal of physical activity and health*, 3(s1), S99-S117

NORMAN, G. J., NUTTER, S. K., RYAN, S., SALLIS, J. F., CALFAS, K. J., & PATRICK, K. (2006) Community design and access to recreational facilities as correlates of adolescent physical activity and body-mass index. *Journal of physical activity and health*, 3(s1), S118-S128

ORGANIZATION, W. H. (2011) Health economic assessment tools (HEAT) for walking and for cycling. Economic Assessment of Transport Infrastructure

PICKETT, S. T., CADENASSO, M. L., & McGRATH, B. (2013) Ecology of the city as a bridge to urban design, In: S. T. PICKETT, M. L. CADENASSO & B. McGRATH (Eds) *Resilience in ecology and urban design, (2013)*. Springer, Dordrecht, *7-28*

PIKORA, T., GILES-CORTI, B., BULL, F., JAMROZIK, K., & DONOVAN, R. (2003) Developing a framework for assessment of the environmental determinants of walking and cycling. *Social science & medicine*, 56(8), 1693-1703

PIKORA, T. J., BULL, F. C., JAMROZIK, K., KNUIMAN, M., GILES-CORTI, B., & DONOVAN, R. J. (2002) Developing a reliable audit instrument to measure the physical environment for physical activity. *American journal of preventive medicine*, 23(3), 187-194

RHODES, R. E., BROWN, S. G., & McINTYRE, C. A. (2006) Integrating the perceived neighborhood environment and the theory of planned behavior when predicting walking in a Canadian adult sample. *American Journal of Health Promotion*, 21(2), 110-118

RHODES, R. E., COURNEYA, K. S., BLANCHARD, C. M., & PLOTNIKOFF, R. C. (2007) Prediction of leisure-time walking: an integration of social cognitive, perceived environmental, and personality factors. *International journal of behavioral nutrition and physical activity*, 4(1), 51-62.

SAELENS, B., SALLIS, J., BLACK, J., & CHEN, D. (2011). Neighborhood Environment Walkability Scale (NEWS): University of Sydney, Sydney, NSW, http://www. cpah. health. usyd. edu. au/pdfs/NEWS. pdf and http://www. cpah. health. usyd. edu. au/pdfs/NEWSscoring. pdf, viewed March.

SALLIS, J. (2002) *Neighborhood Environmental Walkability Scales (NEWS),* http://www-rohan.sdsu.edu/faculty/sallis/NEWS.pdf

SALLIS, J. F. (1993) Epidemiology of physical activity and fitness in children and adolescents. *Critical reviews in food science and nutrition*, *33*(4-5), 403-408

SALLIS, J. F., CERVERO, R. B., ASCHER, W., HENDERSON, K. A., Kraft, M. K., & Kerr, J. (2006). An ecological approach to creating active living communities. *Annu. Rev. Public Health, 27*, 297-322.

SALLIS, J. F., & GLANZ, K. (2006) The role of built environments in physical activity, eating, and obesity in childhood. The future of children, 89-108

SALLIS, J. F., & KERR, J. (2007) Physical activity and the built environment, 228-229

SALLIS, J. F., OWEN, N., & FISHER, E. (2015). Ecological models of health behavior. *Health behavior: theory, research, and practice. 5th ed. San Francisco: Jossey-Bass*, 43-64.

THOMPSON, S. K. (1990) Adaptive cluster sampling. *Journal of the American Statistical Association*, 8*5*(412), 1050-1059

WING, R. R., GOLDSTEIN, M. G., ACTON, K. J., BIRCH, L. L., JAKICIC, J. M., SALLIS, J. F., SURWIT, R. S. (2001) Behavioral science research in diabetes: lifestyle changes related to obesity, eating behavior, and physical activity. *Diabetes care*, 24(1), 117-123

Authors

Qaaid Al-Saraify
PhD Architecture,
University of Basra, Basra-Iraq
Qaaid.alsaraify@gmail.com

David Grierson
Reader and Deputy Head of the Department of Architecture
University of Strathclyde, Glasgow-UK
d.grierson@strath.ac.uk