A Study on Pedestrian's Profile, Activity, and Environment by Descriptive Analysis of Questionnaire Datasets in Kitakyushu, Japan

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Abstract

Various attributes addressing the issues on walking environment and walking condition possibly has distracted the efforts of creating better planning and development to promote walking to the citizen. It will take an enormous effort and time for them to consider all the attributes that are available. Therefore authors assessed the possibilities of the utilization of the Pedestrian PL.AC.E. (ProfiLe, ACtivity, and Environment) and its key-attributes using a survey questionnaire in order to confirm that it could be used as the framework for urban planning or assessment toward promoting a walking-friendly environment. The questionnaire was distributed to the case study area which was the Yahatanishi ward in the city of Kitakyushu, Japan. After collecting and documenting all responses, the results were analyzed using descriptive type of statistical analysis with SPSS.

Keywords: Walking, Pedestrian profile, Walking environment, Assessment, Walkable city

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1. Introduction

By focusing only on improving the walking environment, one often fails to encourage people to walk within the urban setting. Thus one needs also to elaborate and address the factors of walking condition. Many studies from various disciplines were already conducted to define the attributes of walking condition that could be improved. It was concluded that it is necessary to know the pedestrian's preference so that urban design and planning would be more effective in improving the walking environment (Nuzir & Dewancker, 2014). So then the main question remained how to create a cross-field framework consisting common key-attributes of walking to serve as a measure for urban planning or assessment. Authors acknowledge that the attributes were the outcomes of multi-disciplinary studies, thus authors focus on subjects that are related to urban planning.

Prior to this study authors already conducted extensive literature reviews of scientific journals and papers as reported in author`s previous paper (Nuzir & Dewancker, 2016). The manuscripts were collected and then a content analysis was conducted to extract all keywords, generate groups of key-elements from the keywords and later to synthesize common attributes in the current study of walking. After documenting all keywords of the referenced manuscripts, authors then analyzed and ranked them by number of appearances. There were in total 111 keywords with many of them were repeated from one manuscript to another, had similar meaning and terminology, or were related to each other. The word "walking" had been mentioned the most (8 times) within several manuscripts, followed by "walk-ability" (7 times), "built environment" (7 times), physical activity (5 times), pedestrian (4 times), pedestrian attitudes (3 times), Geographic Information System (3), and other keywords which were only mentioned once or twice.

Keyword is considered as a very short point of summary of the manuscript from which reader could understand the main topic. However since many of them were inter-related to each other, authors proposed several keyword groups. For example, since the term "walk-ability" was referred as a scale to assess how suitable a certain area for walking activity (Ariffin & Zahari, 2013), thus authors found its relation with the term of "built environment" which also defined a physical area. Another study also suggested that "walk-ability" often related to certain physical features in the built environment (Lindelöw,

Svensson, Sternudd & Johansson, 2014). Therefore authors suggested both terms to be included in the group of "Pedestrian Environment".

Meanwhile on the other hand the term of "walking" was generally referred as the sole activity of a pedestrian, although this was not entirely correct. From other literatures, we found out that this walking activity itself also had many variations since every single pedestrian would have different behaviors and attitudes (Azmi & Karim, 2012). Therefore the term "pedestrian attitudes" was closely related to the term "walking", thus authors concluded both terms to be considered under the same group which is of "Pedestrian Activity". Based on the same procedure, the other keyword groups were also created. The group of "Pedestrian Profile" consisted of the term "pedestrian" and "physical activity". Authors proposed this group to under-stand the profile of the subject of walking which was the pedestrian. The last two groups were "Research Methods and Theories", which was not related to the content, and "Others", which was consisted of rather mixed and non related keywords. For those reasons, these two groups would not be included in further content analysis.
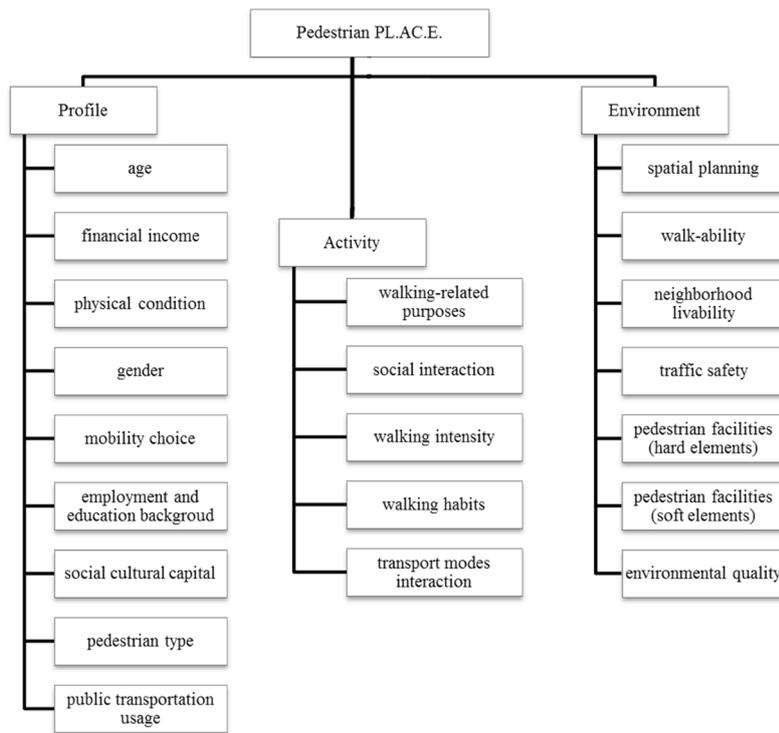
From this process, authors then concluded that these keyword groups could be considered as the key-elements in the study about walking phenomenon. Therefore there were three main key-elements which were: pedestrian profile, pedestrian activity, and pedestrian environment. Authors introduced an abbreviation of "PL. AC.E." which stands for the words of "ProfiLe", "ACtivity", and "Environment" for further reference of these key-elements. Further to this, authors would then continue to explore these key-elements of PL.AC.E. to gather and generate common attributes of walking from the content of the referenced manuscripts.

Authors then continued content analysis by extracting research key-attributes from the manuscripts. The key-attributes are various parameters, factors, or measurements which were being discussed, elaborated, and studied within each referenced manuscripts. The key-attributes were categorized based on the key-elements of PL.AC.E. Authors proposed that the key-element of Pedestrian Profile could be defined by key-attributes as follow: age; financial income; physical condition; gender; mobility choice; employment and education background; social cultural capital; pedestrian type; and public transportation usage. Authors further proposed

that the key-element of Pedestrian Activity could be defined by key-attributes as follow: walking-related purposes; social interaction; walking intensity; walking habits; and transport modes interaction. The last is the key element of Pedestrian Environment of which could be defined by key-attributes as follow: spatial planning; walk-ability; neighborhood livability; traffic safety; pedestrian facilities (hard elements); pedestrian facilities (soft elements); and environmental quality.

Figure 1. Diagram of PL.AC.E and its Key-atributes.

By contextually defining and/or re-defining the PL.AC.E., authors suggest that an urban area could be assessed for its existing performances and/or be improved based on its potentials to become a walk-able area. However it is required to examine and to find the best method to utilize this framework. Therefore in this paper, authors assessed the possibilities of the utilization of the PL.AC.E. and its key-attributes using a survey questionnaire which is the most used method in the study of walking phenomenon. The purpose is to confirm that it can serve as a measure for urban planning or assessment in promoting a walking-friendly environment. The framework should be able to identify the propensity of each key-attribute in order to understand the characteristic of research subject. The propensity could be comprehended by conducting descriptive statistical analysis with frequency procedure (Tsubono et al., 2002; Shokoohi, Hanif & Dali, 2012). The propensity would be valuable information for planning and assessment process.

2. Methodology

2.1 Data colletion using Questionnaire

The method of data collection using questionnaire was selected based on the finding that this is the most common method for data collection in the study of walking phenomenon. The questionnaire was designed to target different kind of respondents and areas so then the result could be representing different scenarios for the validation process. Mainly there were three methods of questionnaire distribution which were distribution in a group at certain time and place, in-directly through third parties, and on street survey. For both in-direct and on-street distribution, return envelopes were provided so that the respondents could send back the filled questionnaires by post without any cost since the envelopes were already registered and stamped.

The questionnaire was prepared based on the key-elements of Pedestrian PL.AC.E. and its key-attributes. Authors generated 3 parts with total of 68 questions written in Japanese. Part 1 was consisted of 15 questions reflecting key-attributes to understand Pedestrian Profile. The questions were designed as categorical type questions with contents of as follow: public transportation usage; transport mode to work, school, daily market, public facilities, and for recreation; car ownership and usage; motorbike ownership and usage; familiar with the term "Climate Change", "Greenhouse Gases (GHG) or CO_2 Emission", and "Low Carbon Principles or Low Carbon City"; type of living place; reason choosing living place; period of living; and physical activity. Several key-attributes related to respondent's identities were asked separately prior to this part within 8 questions which are: employment status; current address; place of work/school; marriage and number of household member; age; gender; hometown; and nationality.

Part 2 was consisted of 25 categorical type questions reflecting key-attributes of Pedestrian Activity as follow: frequent walking location; walking duration; walking purpose; accident with bicycle, car/motorcycle; transports combination; public facilities availability; walking in daytime, night time; walking regularity; walking activity when alone; walking and travel cost; visual attractors; cross-walk attitude; walking route familiarity; common walkway description; favorite walkway part; reason for choosing walking area; walking position adjustment; and interaction with other pedestrians.

And part 3 was consisted of 20 ordinal type questions reflecting key-attributes of Pedestrian Environment with contents of as follow: seating place or rest area; pedestrian crossing/bridge; quality of noise environment; street lighting; pedestrian warning/guidance signage; safety (from traffic); security (from crime); access to open spaces or parks; feeling when walking; width of sidewalk; walkway physical condition; greeneries along the sidewalk; walking comfort; cleanliness; access to public transport; pavement; land-use diversity; accessibility for disable person; route network or connectivity; attractiveness of visual P.O.I. (Point of Interest); aesthetic; general weather condition in summer; general weather condition in winter; population/neighborhood density; and distance to destinations.

2.2 Dataset I: The Students

Following the finalization of the questionnaire, authors conducted the first experiment to assess the questionnaire. The respondents were the first year students of the Department of Architecture, the University of Kitakyushu, Japan. The students were chosen because authors considered them as the most physically fit profiles to conduct intensive walking activity due to their range of age and the majority of them still do not have access to motorized vehicles such as car and motorcycle. The distribution was conducted on April 28th, 2015 between 9.15 A.M. until 9.45 A.M. at the CAD Room of the Department of Architecture, the University of Kitakyushu. 61 sets of questionnaire print-out were prepared based on the number of course participant and distributed to the students. Authors gave brief explanation about the research purposes prior to distribution. Afterward only 58 questionnaires were returned.

2.3 Dataset II: The Typical Families

After the distribution of the questionnaire to the students, authors tried to collect the research dataset from another group of respondents. The typical young nuclear Japanese families were targeted as the respondents which are families generally consisting of working husband/father as head of the household, housewife/mother, and children (mostly at early age) living together in one household. The reason of choosing these families was because author would argue that essentially they could play important role to solve the decreasing population of Japan. As for the above background, the data collection was conducted in collaboration with the local kindergarten which is Asakawa Youchien. This kindergarten is located within the ward of Yahatanishi, Kitakyushu as the case study area. The questionnaire was agreed to be distributed to the parents of the kindergarten pupils of the last (third) grade. 200 sets of the questionnaire were distributed through the children. The distribution was conducted on May 25th, 2015 on each class of the third graders. The deadline of a week later was set up and post paid registered return envelopes were provided. After the deadline, 43.5% (89 sets) of the questionnaire were returned.

2.4 Dataset III: The Urban Commuters

To complement and create variation of inputs to the datasets, the questionnaire was also distributed to the last group which is labeled as The Urban Commuter. This group consists of different types of respondents of which based on direct observation are often found to be walking in the case study area. They are the elderly or senior aged people, the joggers or people who walk with their pet, and then the public transport users. There were 2 methods of distribution, firstly by distributing to their mailboxes and secondly by on-street distribution. For type A, the senior aged people, self-administered questionnaire sets with return envelope were distributed into the respondent's mailboxes in a residential area located at Kifunedai and Honjohigashi, in Yahatanishi. Meanwhile for type B and type C, the joggers and the people on street, the questionnaires were distributed the questionnaire first hand or directly along the jogging track in Hibikino and along the sidewalk at Gakuen Odori towards the Orio Station. The respondents were given one week to answer and return the questionnaire by post. The deadline was June 15th, 2015. In total there were 120 sets of questionnaire distributed and 43 sets were returned. For a complete overview of the dataset III and also the other datasets, please refer to Table 1.

Table 1. Overview of data collection.

Nr	Respondents	Method	Place	Distributed	Returned	(%)
I	The students of the University of Kitakyushu	In-place group administration of printed questionnaire was conducted at a designated time and place.	CAD Room, S Building, Hibikino Campus, the University of Kitakyushu	61 sets	58 sets	95
II	The parents of the Asakawa Kindergarten pupils	Self-administered questionnaire sets with return envelope were distributed through the pupils within each class.	Asakawa Kindergarten in Fujiwara	200 sets	89 sets	43.5
III	The urban commuters A: The elderly or senior aged people	Self-administered questionnaire sets with return envelope were distributed into the respondent's mailboxes in a residential area.	Respondent's houses in Kifunedai and Honjohigashi	70 sets	12 sets	17.1
	The urban commuters B: The joggers and people who walk their pet	Self-administered questionnaire sets with return registered envelope were distributed directly to the respondents on street in a jogging track and the surrounding residential area.	Hibikino area and the surrounding.	20 sets	17 sets	85
	The urban commuters C: The people on street	Self-administered questionnaire sets with return registered envelope were distributed directly to the respondents on street along the sidewalk.	Gakuen Odori street toward Orio station	30 sets	14 sets	46.7

3. Analysis and Results

In order to comprehend and discuss the result of the data collection, series of statistical analysis were conducted using SPSS. After inputting the responses, authors started data analysis by conducting a descriptive analysis using frequency procedure. The purpose was to identify the propensity of each key-attribute in order to understand the characteristic of research subject.

3.1 Pedestrian Profile

From the analysis using frequency procedure it can be concluded that the common attributes from all 3 datasets are that they are not daily-based public transportation users, as seen from Figure 2. This can be concluded since the response of occasional use of public transportation, which is less than once a week, was recorded as the highest response for each dataset. Other result were of that they are/ were studying and/or working in the city of Kitakyushu, their level of knowledge towards environmental terms were very low (refer to Figure 3), and they lives in Yahatanishi, Kitakyushu city currently.
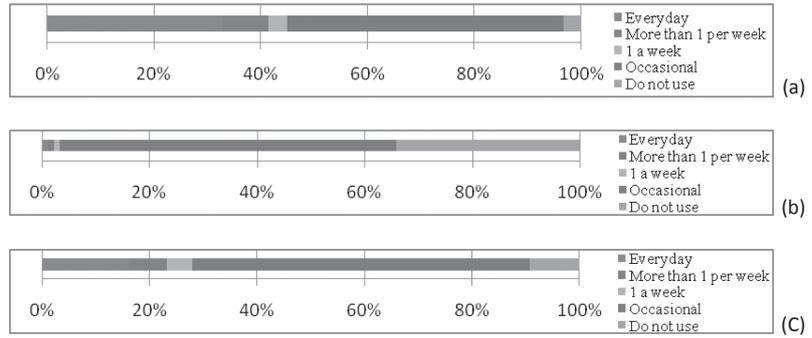

Figure 2. Public transportation usage of: Dataset I (a), Dataset II (b), and Dataset III (c).
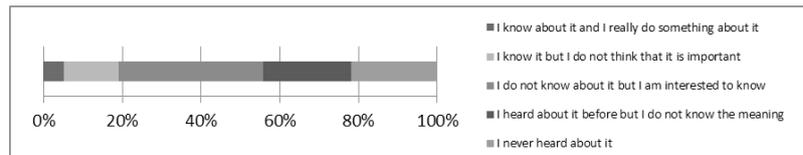

Figure 3. Familiarity towards the environmental terms of Dataset I with Dataset II and III had similar result.

Table 2. Highest responses of each Dataset showing similar result regarding environmental terms.

Environmental Terms	Highest Response of D-I	Highest Response of D-II	Highest Response of D-III
Climate Change	44.8% (I heard about it before but I do not know the meaning)	34.1% (I heard about it before but I do not know the meaning / I never heard about it)	37.2% (I do not know about it but I am interested to know)
Greenhouse Gases (GHG) or CO_2 Emission	55.2% (I do not know about it but I am interested to know)	46% (I do not know about it but I am interested to know)	55.8% (I do not know about it but I am interested to know)
Low Carbon Principles or Low Carbon City	53.4% (I never heard about it)	69.7% (I never heard about it)	30.2% (I do not know about it but I am interested to know)

3.2 Pedestrian Activity

The propensity of the frequent walking location from all 3 datasets indicated that people are walking around their neighborhood despite of lesser percentage from Dataset I. And also walking in the day time was still more preferable than in the night time because of the safety reason. Because safety was not just from crime but also from traffic since it was found that there were conflicts between pedestrian with car/motorbike and also with bicycle of which the later became the most reported. All 3 datasets represent similar common walkway description which is walkway with greeneries. However the small percentage indicated that the responses were heterogeneous (Figure 4).
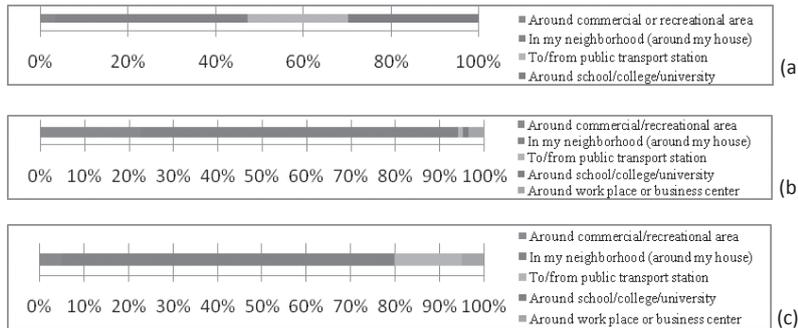

Figure 4. Frequent walking location of: Dataset I (a), Dataset II (b), and Dataset III (c).
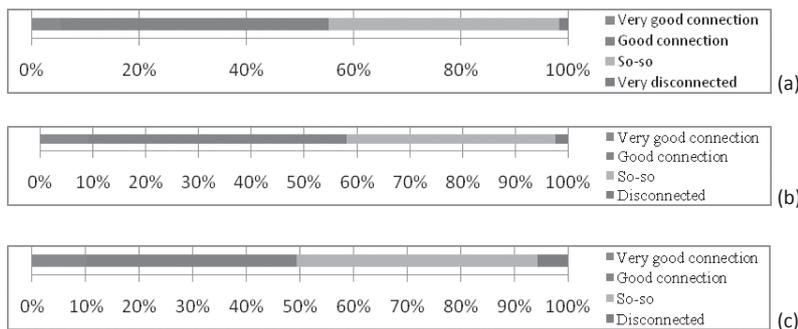

Figure 5. Route network or connectivity of: Dataset I (a), Dataset II (b), and Dataset III (c).

3.3 Pedestrian Environment

Based on the frequency analysis of the pedestrian environment, there are indications of uncertainty or dissatisfaction for factor such as seating places or rest areas, safety (from traffic), quality of noise environment, population/neighborhood density, accessibility for disable person, general weather condition, aesthetic, and land-use diversity. However these are only possibilities since the dissatisfaction was never mentioned clearly instead only by stating "so-so" of which could also represent uncertainty as the result of inexperience profile. On the contrary only the route network or connectivity was appreciated (Figure 5).

3.4 Discussion

Based on the propensities of the Datasets, authors would discuss how to utilize these readings as urban planning recommendations as the purpose of this research. After authors summarized the propensities, several points of recommendations were generated and proposed for each key-element as the following explanation:

a. For the key-element of Pedestrian Profile, authors found that the key-attributes-based questionnaire was able to clearly identify the profile when using it on homogeneous type of respondents for example groups of the same employment status e.g. students (Dataset 1) and groups of the same social cultural capital and gender e.g. housewives living in the same city (Dataset 2). On more heterogeneous respondents (Dataset 3), the profile was concluded to appear lesser in details.

Furthermore for these profiles, authors would categorize them under 3 categories which were Occasional Pedestrian, Recreational Pedestrian, and Functional Pedestrian. Occasional Pedestrian could be defined as group of people who walk only occasionally for random purposes while using another transport mode as the main mobility choice. Recreational Pedestrian

would be defined as group of people who walk more intensively if not daily yet only for recreational or exercise purposes while still using another transport mode as the main mobility choice. Functional Pedestrian would be defined as group of people who actually rely on walking as the main mobility choice and only combine with other transport modes for certain reason such as long distance, fitness problem, time concern, etc. Having set up and defined the categories, authors could identify that Dataset 1 and Dataset 2 would be included in categories ranging from Occasional Pedestrian to Recreational Pedestrian.

Based on this finding, urban planners could analyze the percentage of both profiles within the overall composition focusing on employment status and social cultural capital of Yahatanishi inhabitants. If they represented small percentages then further evaluation of their walking activity and environment would be recommended to improve their walkability. If they represented only small percentages then focus on transforming them to be Functional Pedestrian would be recommended. Consultation workshop or forum group or community discussion could be arranged to listen on their problems and to find solutions during the planning or assessment processes. However, in order to complete the recommendation, more data of the total composition of Yahatanishi inhabitants were required. Please refer to Figure 6.

    b. For the key-element of Pedestrian Activity, authors found that the key-attributes-based questionnaire was hardly able to conclude the common activity when using it on respondents with younger age in average i.e. groups of students (Dataset 1) since they had more irregular daily routines and active living style. Yet it could fairly conclude the common activity of the respondents with older age in average such as groups of housewives living in the same city (Dataset 2) and mixed urban commuters (Dataset 3).
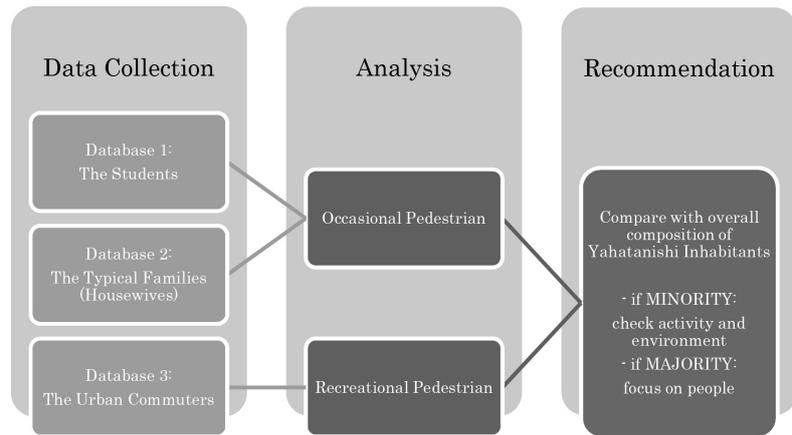

Figure 6. Recommendations from the Pedestrian Profile.

In order to generate recommendation for the key-element of Pedestrian Activity, author tried to refer to previous study that categorized the pedestrian into 2 types based on their walking activity, which were Commuters and Visitors (Xi & Son, 2012). According to this study, Commuters usually determine daily destination, prioritize travel time, and able to modify routes if required. Meanwhile, Visitors have rather non definitive schedules and routes. Referring to this definition, Dataset 1 could be easily categorized as Visitors since there were low propensity of daily destination and route familiarity. Dataset 2 and 3 could also be categorizes as Commuters. However this categorization was not entirely correct yet since some information were still missing. For example here we focused on the activity hence the categorization should refer to the action not the actor. Furthermore although both Dataset 2 and 3 had daily destinations and route familiarity, they were actually different in intensity. Having said that authors would modify the categorization into Visiting with high intensity (Dataset 1) and Commuting with low intensity (Dataset 2), and Commuting with middle intensity (Dataset 3).

Based on this finding, we could conclude that the activity in Yahatanishi area in general representing less intense activity of walking for commuting. Thus urban planners and designers than could use this information to decide whether it needs to be improved in order to have a better walking experience. It was proposed that in order to boost the intensity of non-auto transport modes, density, land-use diversity, and pedestrian-oriented designs could be offered in urban planning recommendations (Cervero & Kockelman, 1997). Additionally by looking at the recommendations from the key-elements of Pedestrian Profile and Pedestrian Environment, planners could also decide whether focusing on the people or the infrastructure when trying to improve or to preserve the activity. Please refer to Figure 7.

Figure 7. Recommendations from the Pedestrian Activity.

c. For the key-element of Pedestrian Environment, authors found that the key-attributes-based questionnaire had difficulties to capture definite measures of the walking environment based on the responses of 3 datasets since the most occurring response was "so-so" of which represented ambiguous meaning of either unsatisfactory or uncertainty. However in order to generate recommendation for optimum results of urban planning processes, authors would argue that both meaning would represent low appreciation

toward the common attributes of Pedestrian Environment. Hence based on this assumption, authors found that from all three datasets, factor of neighborhood density from the attributes of neighborhood livability, and factors of land-use diversity and distance of destinations from the attributes of spatial planning features, all had received low appreciation from the responses. Having said that, authors would conclude that there were spatial arrangement issues in Yahatanishi area especially since all those three factors were related to it. Those spatial issues were occurred especially within the neighborhood of the respondents since based on the propensity of Pedestrian Activity it was seen that the most frequent place of walking was within their own neighborhood (Dataset 1 and Dataset 2).
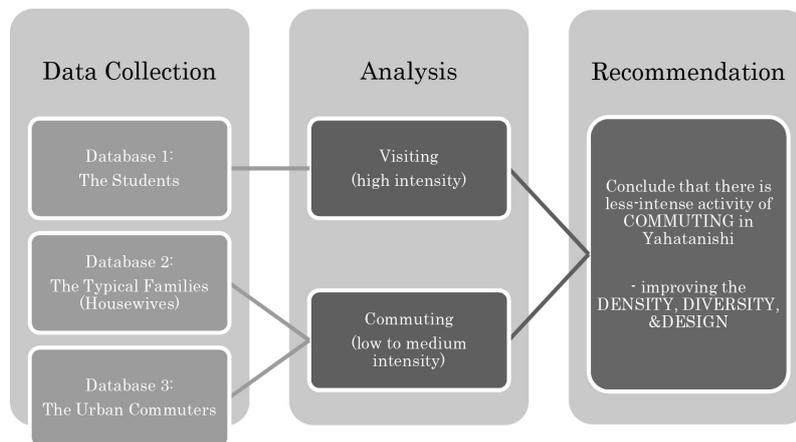
Based on this finding, authors would recommend improving the walking environment by focusing on spatial arrangement especially within the neighborhoods i.e., residential areas for urban planning and design processes. This focus on residential areas was contrasting with the existing condition within the case study showing that better walking environment was mostly occurred in commercial areas or city centers. Authors would also argue that this recommendation could complement other factors for creating good walking conditions suggested by Jan Gehl which were: a continuous and complete pedestrian network; reliable feeling of safety that means protection from motorized traffic; security through collective surveillance and activity, especially in darkness; direct pedestrian routes with sufficient space – wide sidewalks – and no obstacles; stimulating and detailed facades, services and facilities facing the pedestrian streets; comfort, such as low noise, good air quality, cleanliness and weather protection; pedestrian facilities, like clean drinking fountains and toilets; green spaces, flower beds, trees, etc.; seating: formal, informal, and commercial seating; features that invite

leisure activities and play; and art that generates identity with the town (and region) (Hass-Klau, 2015). These factors were also by coincident included in the key-attributes of the Pedestrian Environment. Please refer to Figure 8.

4. Conclusion

The data analysis using frequency procedure towards the key-attributes of Pedestrian Profile was proven to be able to identify the profile of certain people especially in regard with their walking performance. By doing this analysis we could define whether one group represents the profile of pedestrian or not and of which kind. Another study also utilized this procedure to understand the effects of walking on the health of Japanese pedestrian (Tsubono et al., 2002). Furthermore in different study, the influential neighborhood safety factors in walking were determined using the same procedure (Shokoohi et al., 2012).

In this study, from the datasets we could understand that the students do walk indeed yet it is the second choice after cycling and less related to the environmentally friendliness. Meanwhile the housewives are highly dependent on the use of cars. The group of urban commuters showed an indication that they indeed use public transportation for daily purpose such as work. Furthermore they combine it with walking. This study was focused toward walking experience within the ward of Yahatanishi. However authors identified that most of the respondents lived in Yahatanishi.

The propensity of the frequent walking location from all 3 datasets indicated that people are walking around their neighborhood. Thus the respondents profile represented the people who experience walking in Yahatanishi. Based on this finding, it is recommended that the priority and focus of developing a walkable area should be given towards
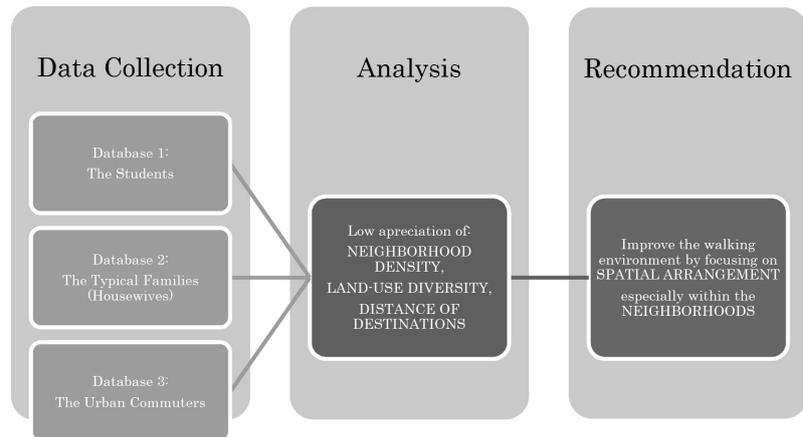

Figure 8. Recommendations from the Pedestrian Environment.

the residential area. However Dataset 3 was more of a random group compared to the other two meaning that we hardly could understand the profile. Therefore this tool requires a designated group of people rather than random sample. It could be based on the neighborhood (the environment) or the social cultural setting (the activities). General sampling will result general reading of which could not assess specific issue on specific area within specific group of people.

By synthesizing key-elements and key-attributes from literatures studies, a tool for comprehensive planning and assessment was proposed so that an urban area could be assessed for its existing performances and/or be improved based on its potentials to become a walk-able area. The tool was able to identify the propensity of the key-attribute in order to understand the characteristic of the research subject.

5. Acknowledgements

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