PEDESTRIANS' PERSPECTIVES ON ENVIRONMENTAL PROBLEMS, AWARENESS AND WILLINGNESS IN CHANGING CURRENT MODE TO WALKING IN A POSSIBLE WAY TO REDUCE EXPOSURE OF O_3 CONCENTRATIONS TO SCHOOLCHILDREN

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Graphical abstract

Abstract

Increasing ground level ozone has become an important issue because of its adverse effects on health and the environment. Increasing numbers of vehicles is known to be one of the sources of its precursors where gas emissions from vehicle exhausts lead to the production of ground level ozone. Active transports, mainly walking have been found to be the most effective way to reduce the use of private vehicles especially for short-distance travel. In this study, pedestrians' perspectives on the existence of environmental problems and awareness regarding negative effects of these issues and their perceptions towards changing the current mode to active mode were evaluated. According to the surveys conducted at the four selected schools, by referring to the gender, as compared to male respondents, female respondents mostly testified that there were local environmental problems occurred at their area and are aware of the adverse effects of air pollutants exposed to human. As for types of respondents, teachers were much concern with the environmental problems as they spent more time in schools compared than other types of respondents. In terms of race, Indian and Malay respondents were more aware of the negative effects of air pollutants and most willingly to change from current mode to walking. From the analysis of one-way ANOVA and independent t-test, respondents' level of agreement with environmental problems, awareness and potential in changing the current mode to walking were related to the gender, types of respondents and race. Nevertheless, factor of travel distance did not influence the given level of agreement by respondents.

Abstrak

Peningkatan ozon paras tanah telah menjadi isu penting kerana kesan buruknya terhadap kesihatan dan persekitaran. Peningkatan bilangan kenderaan dikenali sebagai salah satu sumber kepada pra penandanya di mana gas pelepasan daripada ekzos kenderaan membawa kepada penghasilan ozon paras tanah. Pengangkutan aktif terutamanya berjalan kaki merupakan cara yang paling efektif untuk mengurangkan penggunaan kenderaan persendirian terutamanya bagi perjalanan jarak dekat. Dalam kajian ini, sudut pandangan pejalan kaki terhadap kewujudan masalah persekitaran dan kesedaran mengenai kesan-kesan negatif terhadap isu ini serta persepsi mereka dalam penukaran mod sedia ada kepada mod aktif telah dinilai. Berdasarkan kajian soal selidik yang dijalankan di empat buah sekolah, berdasarkan jantina, jika dibandingkan dengan responden lelaki, kebanyakan responden perempuan menyatakan bahawa terdapat masalah persekitaran setempat berlaku di kawasan mereka dan mereka juga mengetahui kesan-kesan buruk jika pencemar udara ini terdedah kepada manusia. Berkaitan dengan jenis-jenis responden, guru-guru lebih perihatin dengan masalah persekitaran kerana mereka meluangkan lebih banyak masa di sekolah daripada jenis-jenis responden lain. Berkaitan dengan bangsa pula, responden India dan Melayu adalah lebih mengetahui akan kesan-kesan negatif pencemar udara ini bersetuju untuk mengubah mod sedia ada kepada berjalan kaki. Daripada analisa ANOVA satu-hala dan t-test bebas, tahap persetujuan dengan masalah persekitaran, kesedaran dan potensi dalam mengubah mod sedia ada kepada berjalan kaki adalah berkaitan dengan jantina, jenis responden dan bangsa. Walau bagaimanapun, faktor jarak perjalanan tidak mempengaruhi tahap persetujuan responden.

Kata kunci: Gas pelepasan trafik, kesesakan trafik, pengangkutan aktif, ANOVA satu-hala, t-test bebas

1.0 INTRODUCTION

Traffic emissions are becoming a major problem in developing countries [1-5]. Nitrogen dioxide (NO_2), total volatile organic compounds (TVOC) and carbon monoxide (CO) are known as primary pollutants emitted from vehicle exhausts [6, 7]. These types of pollutants are also considered as ozone (O_3) precursors. Photochemical reactions between these O_3 precursors with sufficient amount of incoming solar radiation will produce O_3 [8-10]. Non-motorized transport, particularly walking seems to be one of the solutions of the decreasing O_3 levels by reducing its precursors. Many researchers have highlighted the importance of walking to reduce traffic emissions and congestion as well as to increase human health [11-13]. de Nazelle *et al*. (2010) reported that conversion of automobile trips of less than 3 miles to non-motorized modes can help reduce traffic emissions [14]. Stephen (2004) mentioned that street connectivity and improved pedestrian facilities in a certain location are essential in order to reduce the potential of depending on natural resources and automobile mode [15]. Schmitz and Scully (2006) also agreed that pedestrian-friendly streets designs may help biological health by the way they have changed their lifestyles and also improved their quality of life [16].

However, there are several aspects to attract people to walk and one of them is the condition of provided pedestrian facilities itself. Pedestrians' perspectives are important in order to have better understandings about their needs on the road to attract them to use the provided pedestrian facilities. Therefore, the objective of this paper is to evaluate pedestrians' perspectives on the existence of environmental problems and awareness regarding negative effects of these issues as well as their perceptions towards changing the current mode to active mode. The focus of this study is on schoolchildren since exposure of air pollutants is more severe to children than to adult [17-19]. Ishaque and Noland (2008) reported that in this situation, children are more likely to be exposed to air pollutants due to their lower breathing height [20]. Gauderman *et al*. (2007) mentioned that lung development is nearly complete by the age of 18 years old [21]. Individuals exposed to air pollutants and had deficit on their lung function before lung development is completed may have higher probability to continue to have unhealthy lung function for the rest of his or her life.

2.0 METHODOLOGY

An originally questionnaire developed by Leather *et al.* (2011) was referred as it is significantly related to this research work which to understand pedestrians' preferences in terms of improvement of the pedestrian facilities and how they consider a specific area as walkable. The questionnaire was modified so that it is compatible with this research work in order to have better understanding of the need of the pedestrian facilities nearby selected area by considering pedestrians' perspective, thus improving the ambient air concentrations of the area. Survey was carried out on three types of respondents which are students, teachers and parents/ guardians from September 2015 to October 2015. The target population is the people who are familiar with the schools surroundings and are aware of the condition of pedestrian facilities provided nearby the schools area.

Four selected schools were chosen as a representative of urban, suburban, rural and industrial area as shown in Table 1. Three of the schools which are SMK Seri Nibong, SMK Tunku Abdul Rahman and SK Seri Tasek are located in the South Seberang Perai District, Penang while SJK (C) Sin Hwa is located in Parit Buntar, Perak. The distribution of the selected schools is shown in Figure 1. South Seberang Perai is a district in Penang which covers an area of 243 km2. This district is known as a developing area which is thriving as an industrialized area mainly in fishing and agricultural industry. Meanwhile, Parit Buntar is a small town located in the north of Kerian District and bordered by Bandar Baharu, Kedah and Nibong Tebal, Penang. Parit Buntar is now greatly developing especially in transportation sector. Table 2 shows the number of respondents involved in the survey arranged by the types of respondents, including the percentage of response in each selected school.

Table 1 Description of selected schools in Seberang Perai, Penang and Parit Buntar, Perak

Site Location	Schools ID	Coordinate	Location
SJK (C) Sin Hwa	SSH	5° 7' 35.2416"N 100° 29' 31.1388"E	Urban
SMK Seri Nibong	SSN	5° 10' 17.601"N 100° 28' 15.7008"E	Suburban
SK Seri Tasek	SST	5° 17' 4.1712" N 100° 30' 11.4012"E	Rural
SMK Tunku Abdul Rahman	STR	5° 10' 8.241"N 100° 29' 10.8306"E	Industrial
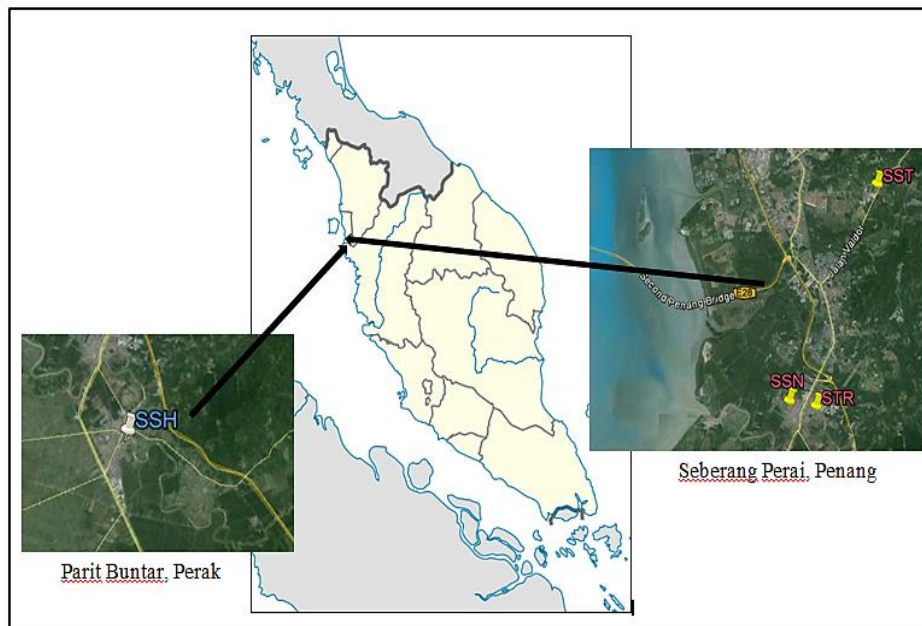
Figure 1 Site distribution of selected schools in Seberang Perai, Penang and Parit Buntar, Perak (not to scale)

Numbers of respondents were selected based on the study conducted by Krejcie and Morgan (1970) based on the total population [23]. The suggested numbers of respondents are determined by referring to a 'table of determining sample size from a given population' which was developed by Krejcie and Morgan (1970). This table indicated that the suitable sample sizes to represents each school as shown in Table 2. The sample numbers should be sufficient to give adequate information to carry out this work.

Respondents from parents/guardians categories were selected as their children were initially chosen to participate in this study. An adequate session of briefings were conducted involving all the participants to ensure that they understand the questions and know the correct answer that they could give to inform the real situation that they faced.

Table 2 Number of respondents involved in the survey

Schools	*Estimated Population	Number of Respondents					% of Response
		Students	Teachers	Parents/ Guardians	Total Respondents	Total Response	
SSH	2055	49	10	49	108	108	100.00
SSN	1666	41	10	41	92	58	63.04
SST	1691	40	10	40	90	53	58.89
STR	4313	103	20	103	226	201	88.94

*Estimated population in 2011

In order to know respondents' perspective on the environmental problems nearby their area as well as their knowledge on the effect of the air pollutions on human health and environment and their attitude in order to improve these environmental problems, questions were asked in the form of Likert-scale. The five (5) scales were: strongly disagree, disagree, neutral, agree and strongly agree. Likert-scale has been used widely in previous research to obtain respondents' preferences of level of agreement of the given statements by an ordinal scale [24-29].

Two inferential statistics used to analyses the questionnaires which were one-way ANOVA and Independent t-test. One-way ANOVA is a procedure to test the hypothesis whether the given population means are equal, where the populations are more than 2. One-way ANOVA compares the means of the samples or groups to make inferences on the population means. One-way ANOVA is also known as single factor analysis of variance where there is only one independent variable of factor [30]. Meanwhile, Independent t-test is used to evaluate the differences between two means of independent or unrelated groups whether both means are significantly different. Two variables were needed in order to undergo independent t-test which were the independent variables (gender) and dependent variable as a test item. The grouping variable divided into two mutually groups, in this case they were male and female, while the test item describes each case on some quantitative dimension such as test performance. Independent t-test evaluates whether mean value of male has significant difference from the mean value of female [31].

3.0 RESULTS AND DISCUSSION

The total number of respondents who responded the given questionnaire for all four selected schools was 420 respondents. Table 3 shows summary of respondents' general profile at four selected schools. In SSH, from 108 respondents who responded to the questionnaire, 41 respondents were male (37.96%) and 67 respondents were female (62.04%). 106 of the respondents were Chinese (98.15%) and 1 respondent was Malay (0.93%). However, 1 respondent left the race question unanswered (0.93%). Out of 108 respondents, 49 respondents were students, 10 teachers and 49 parents and guardians. All 49 students were aged below than 13 years old (100%) and in primary level. 5 of the teachers were aged in a range of 31 - 40 years old (50.00%), 3 teachers were aged between 21 - 30 years old (30.00%), 1 teacher aged between 41 - 50 years old (10.00%) and 1 teacher aged more than 50 years old (10.00%). As for parents and guardians, 31 respondents were aged between 41 - 50 years old (63.27%), 15 respondents were aged between 31 - 40 years old (30.61%), 2 respondents aged below 16 years old (4.08%) and 1 respondents aged more than 50 years old (2.04%).

SSN recorded 58 respondents who responded to the questionnaire. Out of this 58 respondents, 17 respondents were male (29.31%) and 41 respondents were female (70.69%). 41 of the respondents were Malay (70.69%), 13 respondents were Indian (22.41%) and 4 respondents were Chinese (6.90%). 41 respondents from the total numbers of respondents in SSN were students (70.69%) where 25 of them were aged between 13 – 15 years old (60.98%), 11 students were aged between 16 – 18 years old (26.83%) and 5 students were aged below 13 years old (12.20%). 30 students who responded to this questionnaire were in lower secondary level (73.17%) while 11 students were in upper secondary level (26.83%). There was 10 teachers (17.24%) who responded to the questionnaire in this school where 5 of them were aged between 31 – 40 years old (50.00%) and another 5 teachers were aged between 41 – 50 years old (50.00%). As for parents and guardians, only 7 of them responded to the questionnaire out of 41 distributed questionnaires in this school (12.07%). 4 of them were aged between 41 – 50 years old (57.14%), 2 were aged between 31 – 40 years old (28.57%) and 1 was aged more than 50 years old (14.29%).

53 respondents from 420 of total respondents who responded to the questionnaire were obtained from SST. 14 of the respondents were male (26.42%) while 39 of the respondents were female (73.58%). 50 of the respondents were Malay (94.34%), 2 were Indian (3.77%), and 1 was Chinese (1.89%).

Table 3 Summary of respondents' general profile

Item	Schools															
	SSH				SSN				SST				STR			
	S	T	P/G	Total	S	T	P/G	Total	S	T	P/G	Total	S	T	P/G	Total
Gender																
Male	24 (49%)	0 (0%)	17 (35%)	**41 (38%)**	12 (29%)	5 (50%)	0 (0%)	**17 (29%)**	11 (28%)	3 (30%)	0 (0%)	**14 (26%)**	38 (37%)	7 (35%)	30 (38%)	**75 (37%)**
Female	25 (51%)	10 (100%)	32 (65%)	**67 (62%)**	29 (71%)	5 (50%)	7 (100%)	**41 (71%)**	29 (72%)	7 (70%)	3 (100%)	**39 (74%)**	65 (63%)	13 (65%)	48 (62%)	**126 (63%)**
Race																
Malay	0 (0%)	1 (10%)	0 (0%)	**1 (1%)**	25 (61%)	9 (90%)	7 (100%)	**41 (71%)**	40 (100%)	7 (70%)	3 (30%)	**50 (94%)**	9 (9%)	13 (65%)	9 (12%)	**31 (15%)**
Chinese	49 (100%)	8 (80%)	49 (100%)	**106 (98%)**	3 (7%)	1 (10%)	0 (0%)	**4 (7%)**	0 (0%)	1 (10%)	0 (0%)	**1 (2%)**	48 (46%)	5 (25%)	39 (50%)	**92 (46%)**
Indian	0 (0%)	0 (0%)	0 (0%)	**0 (0%)**	13 (32%)	0 (0%)	0 (0%)	**13 (22%)**	0 (0%)	2 (20%)	0 (0%)	**2 (4%)**	44 (43%)	2 (10%)	29 (37%)	**75 (37%)**
Others	0 (0%)	0 (0%)	0 (0%)	**0 (0%)**	0 (0%)	0 (0%)	0 (0%)	**0 (0%)**	0 (0%)	0 (0%)	0 (0%)	**0 (0%)**	2 (2%)	0 (0%)	1 (1%)	**3 (2%)**
Missing	0 (0%)	1 (10%)	0 (0%)	**1 (1%)**	0 (0%)	0 (0%)	0 (0%)	**0 (0%)**	0 (0%)	0 (0%)	0 (0%)	**0 (0%)**	0 (0%)	0 (0%)	0 (0%)	**0 (0%)**
Age (years) – Students																
<13	49 (100%)	-	-	**49 (100%)**	5 (12%)	-	-	**5 (12%)**	40 (100%)	-	-	**40 (100%)**	9 (9%)	-	-	**9 (9%)**
13-15	0 (0%)	-	-	**0 (0%)**	25 (61%)	-	-	**25 (61%)**	0 (0%)	-	-	**0 (0%)**	47 (45%)	-	-	**47 (45%)**
16-18	0 (0%)	-	-	**0 (0%)**	11 (27%)	-	-	**11 (27%)**	0 (0%)	-	-	**0 (0%)**	39 (38%)	-	-	**39 (38%)**
>18	0 (0%)	-	-	**49 (100%)**	0 (0%)	-	-	**0 (0%)**	0 (0%)	-	-	**0 (0%)**	8 (8%)	-	-	**8 (8%)**
Age (years) - Teacher/ Parent/ Guardian																
<16	-	0 (0%)	2 (4%)	**2 (3%)**	-	0 (0%)	0 (0%)	**0 (0%)**	-	0 (0%)	0 (0%)	**0 (0%)**	-	0 (0%)	3 (4%)	**3 (3%)**
16 – 20	-	0 (0%)	0 (0%)	**0 (0%)**	-	0 (0%)	0 (0%)	**0 (0%)**	-	0 (0%)	0 (0%)	**0 (0%)**	-	0 (0%)	0 (0%)	**0 (0%)**
21 – 30	-	3 (30%)	0 (0%)	**3 (5%)**	-	0 (0%)	0 (0%)	**0 (0%)**	-	3 (30%)	0 (0%)	**3 (23%)**	-	11 (55%)	3 (4%)	**14 (14%)**
31 – 40	-	5 (50%)	15 (31%)	**20 (34%)**	-	5 (50%)	2 (29%)	**7 (41%)**	-	4 (40%)	1 (33%)	**5 (38%)**	-	8 (40%)	14 (19%)	**22 (22%)**
41 – 50	-	1 (10%)	31 (63%)	**32 (54%)**	-	5 (50%)	4 (57%)	**9 (53%)**	-	3 (30%)	1 (33%)	**4 (31%)**	-	1 (5%)	44 (59%)	**45 (46%)**
>50	-	1 (10%)	1 (2%)	**2 (3%)**	-	0 (0%)	1 (14%)	**1 (6%)**	-	0 (0%)	0 (0%)	**0 (0%)**	-	0 (0%)	10 (14%)	**10 (10%)**
Missing	-	0 (0%)	0 (0%)	**0 (0%)**	-	0 (0%)	0 (0%)	**0 (0%)**	-	0 (0%)	1 (33%)	**1 (8%)**	-	0 (0%)	4 (5%)	**4 (4%)**

Indicator: Values represent number of samples (percentage); S = Students; T = Teachers; P/G = Parents/ Guardians

40 respondents from this school were students (75.47%) where all of them aged below 13 years old and in primary level 4 of the teachers were aged between 31 – 40 years old (40.00%), 3 were aged 21 – 30 years old (30.00%) and another 3 were aged between 41 – 50 years old (30.00%). As for parents and guardians, there was 2 respondents responded to the questionnaire where 1 of them was aged between 31 – 40 years old (33.33%) and another 1 respondent aged between 41 – 50 years old (33.33%). 1 parent/ guardian left this questionnaire unanswered (33.33%). Difficulties in getting back the questionnaires from parents or guardians after distributing them through students lead to lower percentage of the total response from this school.

STR recorded the highest number of total respondents due to higher population in the school. 75 respondents out of 201 total respondents were male (37.31%) while 126 respondents were female (62.69%). 92 respondents were Chinese (45.77%), 75 respondents were Indian (37.31%), 31 respondents were Malay (15.42%) and 3 respondents stated others (14.93%). 103 respondents from this schools were students (51.24%) where 47 of them aged between 13 – 15 years old (45.63%), 39 students aged between 16 – 18 years old (37.86%), 9 students aged below 13 years old (8.74%) and 8 students aged above 18 years old (17.48%). 20 survey were conducted on teacher (9.95%) where 11 of them aged between 21 – 30 years old (55.00%), 8 teachers aged between 31 – 40 years old (40.00%) and 1 teacher aged between 41 – 50 years old (5.00%). 78 respondents who responded to the questionnaire were from parents and guardians (38.81%). 44 of the respondents aged between 41 – 50 years old (56.41%), 14 respondents aged between 31 – 40 years old (17.95%), 10 respondents aged above 50 years old (12.82%), 3 respondents aged between 21 – 30 years old (3.85%) and 3 respondents aged below than 16 years old (3.85%). However, 4 respondents left this question unanswered (5.13%).

Table 4 shows the summary of travel behaviour of the respondents from home to school. In SSH, 14 respondents (12.96%) lived closer to the school with the distance of less than 1 km. Meanwhile, 84 of them (77.78%) lived between 1 km to 4 km from school and 10 respondents (9.26%) lived between 5 km to 8 km. None of them lived more than 8 km away from school. 81 respondents (75.00%) used car as a mode of transportation to go to school, 11 respondents (10.19%) used motorcycle and 3 respondents (2.78%) used public transportation to go to school. 4 of the respondents (3.70%) used more than one transportation mode while 3 respondents (2.78%) left the question unanswered.

Table 4 Summary of travel behaviour of the respondents from home to school

Item	Schools															
	SSH				SSN				SST				STR			
	S	T	P/G	Total	S	T	P/G	Total	S	T	P/G	Total	S	T	P/G	Total
Distance																
< 1 km	5 (10%)	0 (0%)	9 (18%)	**14 (13%)**	9 (22%)	0 (0%)	0 (0%)	**9 (16%)**	10 (25%)	0 (0%)	1 (33%)	**11 (21%)**	31 (30%)	2 (10%)	24 (31%)	**57 (28%)**
1 km	3 (6%)	2 (20%)	3 (6%)	**8 (7%)**	2 (5%)	0 (0%)	0 (0%)	**2 (3%)**	7 (18%)	1 (10%)	0 (0%)	**8 (15%)**	11 (11%)	3 (15%)	3 (4%)	**17 (9%)**
2 km	18 (37%)	2 (20%)	14 (29%)	**34 (31%)**	5 (12%)	2 (20%)	0 (0%)	**7 (12%)**	14 (35%)	1 (10%)	1 (33%)	**16 (30%)**	17 (17%)	2 (10%)	16 (21%)	**35 (17%)**
3 km	14 (29%)	1 (10%)	15 (31%)	**30 (28%)**	3 (7%)	0 (0%)	1 (14%)	**4 (7%)**	2 (5%)	0 (0%)	0 (0%)	**2 (4%)**	10 (10%)	1 (5%)	9 (12%)	**20 (10%)**
4 km	6 (12%)	0 (0%)	6 (12%)	**12 (11%)**	5 (12%)	1 (10%)	0 (0%)	**6 (10%)**	4 (10%)	0 (0%)	0 (0%)	**4 (8%)**	4 (4%)	0 (0%)	6 (8%)	**10 (5%)**
5 km	1 (2%)	0 (0%)	1 (2%)	**2 (2%)**	5 (12%)	1 (10%)	3 (43%)	**9 (16%)**	2 (5%)	1 (10%)	0 (0%)	**3 (6%)**	5 (5%)	0 (0%)	6 (8%)	**11 (6%)**
6 km	1 (2%)	1 (10%)	0 (0%)	**2 (2%)**	0 (0%)	1 (10%)	0 (0%)	**1 (2%)**	0 (0%)	1 (10%)	1 (33%)	**2 (4%)**	5 (5%)	2 (10%)	4 (5%)	**11 (6%)**
7 km	0 (0%)	1 (10%)	0 (0%)	**1 (1%)**	1 (2%)	0 (0%)	0 (0%)	**1 (2%)**	0 (0%)	0 (0%)	0 (0%)	**0 (0%)**	3 (3%)	1 (5%)	2 (3%)	**6 (3%)**
8 km	0 (0%)	(10%)	0 (0%)	**1 (1%)**	2 (5%)	1 (10%)	0 (0%)	**3 (5%)**	0 (0%)	0 (0%)	0 (0%)	**0 (0%)**	3 (3%)	2 (10%)	0 (0%)	**5 (3%)**
> 8 km	1 (2%)	2 (20%)	1 (2%)	**4 (4%)**	8 (20%)	3 (30%)	3 (43%)	**14 (24%)**	0 (0%)	6 (60%)	0 (0%)	**6 (11%)**	6 (6%)	7 (35%)	4 (5%)	**17 (9%)**
Missing	0 (0%)	0 (0%)	0 (0%)	**0 (0%)**	1 (2%)	1 (10%)	0 (0%)	**2 (3%)**	1 (3%)	0 (0%)	0 (0%)	**1 (2%)**	8 (8%)	0 (0%)	4 (5%)	**12 (6%)**
Mode of transportation																
Walking	0 (0%)	0 (0%)	0 (0%)	**0 (0%)**	2 (5%)	0 (0%)	0 (0%)	**2 (3%)**	1 (3%)	0 (0%)	0 (0%)	**1 (2%)**	12 (12%)	0 (0%)	4 (5%)	**16 (8%)**
Bicycle	0 (0%)	0 (0%)	0 (0%)	**0 (0%)**	2 (5%)	0 (0%)	0 (0%)	**2 (3%)**	11 (28%)	0 (0%)	1 (33%)	**12 (23%)**	4 (4%)	0 (0%)	4 (5%)	**8 (4%)**
Motorcycle (two-wheeler)	5 (10%)	0 (0%)	6 (12%)	**11 (10%)**	5 (12%)	0 (0%)	1 (14%)	**6 (10%)**	6 (15%)	0 (0%)	0 (0%)	**6 (11%)**	16 (16%)	3 (15%)	15 (20%)	**34 (17%)**
Car	39 (80%)	(90%)	39 (80%)	**87 (81%)**	24 (59%)	9 (90%)	6 (86%)	**39 (67%)**	17 (43%)	10 100	1 (33%)	**28 (53%)**	44 (43%)	12 (60%)	45 (68%)	**101 (50%)**
Public Transportation	3 (6%)	0 (0%)	0 (0%)	**3 (3%)**	7 (17%)	0 (0%)	0 (0%)	**7 (12%)**	3 (8%)	0 (0%)	0 (0%)	**3 (6%)**	13 (13%)	2 (10%)	4 (5%)	**19 (10%)**
More than one transportation	2 (4%)	0 (0%)	2 (4%)	**4 (4%)**	0 (0%)	0 (0%)	0 (0%)	**0 (0%)**	2 (5%)	0 (0%)	1 (33%)	**3 (6%)**	8 (8%)	2 (10%)	4 (5%)	**14 (7%)**
Missing	0 (0%)	1 (10%)	2 (4%)	**3 (3%)**	1 (2%)	1 (10%)	0 (0%)	**2 (3%)**	0 (0%)	0 (0%)	0 (0%)	**0 (0%)**	6 (6%)	1 (5%)	2 (3%)	**9 (5%)**

Indicator: Values represent number of samples (percentage); S = Students; T = Teachers; P/G = Parents/ Guardians

24.14% (14 respondents) of the total respondents in SSN lived more than 8 km away from school while 15.52% (9 respondents) of the total respondents lived less than 1 km away from school. 32.76% (19 respondents) of the total respondents needed to travel 1 km to 4 km from home to school every day whereas 24.14 % (14 respondents) of them travel between 5 km to 8 km. Two other respondents (3.45%) had not responded to the question. 39 respondents (67.24%) travel by private cars from home to school, 7 respondents (12.07%) used public transportation, 6 respondents (10.34%) used motorcycles and 2 respondents (3.45%) each travel by bicycles and walking to schools. 2 respondents (3.45%) left the question unanswered.

11 respondents (20.75%) who responded to the questionnaire in SST stated that they travelled less than 1 km to school every day; 30 respondents (56.60%) travelled 1 km to 4 km; 5 respondents (9.43%) travelled between 5 km to 8 km and 6 other respondents (11.32%) travelled more than 8 km from home to school, respectively. 28 respondents (52.83%) travelled to school by private cars, 12 respondents (22.64%) travelled by bicycles, 6 respondents (11.32%) travelled by motorcycles, 3 respondents (5.66%) travelled by public transportations and 1 respondent (1.89%) walk from home to school every day. 3 respondents (5.66%) were found to travel by more than one mode of transportation.

Table 5 Summary of level of agreement with environmental problems, awareness and potential in changing the current mode to walking based on Independent t-test (gender) and one-way ANOVA (type of respondents, race, distance)

Variables	SSH			SSN			SST			STR		
	t	p-value	Sig.	t	p-value	Sig.	t	p-value	Sig.	t	p-value	Sig.
Gender												
Local environmental problem	-0.400	0.690		-1.164	0.249		-2.940	**0.009**	✓	-2.688	**0.008**	✓
Environmental Awareness	-1.708	0.091		1.562	0.126		-2.213	**0.031**	✓	-1.400	0.163	
Respondents' perception in changing mode to walking	1.189	0.237		0.969	0.337		-0.415	0.684		-1.971	0.050	

Variables	SSH			SSN			SST			STR		
	F	p-value	Sig.	F	p-value	Sig.	F	p-value	Sig.	F	p-value	Sig.
Type of Respondents												
Local environmental problem	3.942	**0.022**	✓	1.889	0.161		1.124	0.333		8.244	**<0.001**	✓
Environmental Awareness	1.999	0.141		0.551	0.580		0.147	0.864		2.955	0.054	
Respondents' perception in changing mode to walking	1.652	0.197		0.306	0.738		0.654	0.525		2.621	0.075	
Race												
Local environmental problem	0.053	0.819		0.775	0.466		1.764	0.182		1.700	0.185	
Environmental Awareness	0.892	0.347		0.231	0.795		0.632	0.536		6.862	**0.001**	✓
Respondents' perception in changing mode to walking	0.579	0.448		1.230	0.300		0.142	0.868		10.114	**<0.001**	✓
Distance												
Local environmental problem	1.325	0.234		0.851	0.575		0.917	0.503		0.461	0.899	
Environmental Awareness	1.268	0.264		0.596	0.794		0.707	0.666		1.435	0.176	
Respondents' perception in changing mode to walking	0.887	0.540		1.114	0.373		0.580	0.768		1.921	0.052	

Indicator: t & F = test statistics for independent t-test and ANOVA, respectively; Sig. = Significant

As for STR, 57 (28.36%) out of 201 respondents travelled distance less than 1 km from home to school every day. 112 respondents (55.72%) need to travel 1 km to 4 km; 33 respondents (16.42%) travelled between 5 km to 8 km while 17 respondents (8.46%) travelled for more than 8 km from home to school. 12 others respondents (5.97%) did not responded to this question, respectively. 101 of the respondents (50.25%) travelled by their own car, 34 respondents (16.92%) travelled by motorcycles, 19 respondents (9.45%) travelled by public transportations, 16 respondents (7.96%) walk from home and 8

respondents (3.98%) were using bicycles to go to school every day. 14 other respondents (6.97%) were found to have more than one mode of transportation and 3 respondents (1.49%) did not responded to the question.

Table 5 shows the summary of significance of the level of agreements based on gender, types of respondents, race and distance. Respondents' mean of level of agreement with environmental problems, awareness and potential in changing the current mode to walking are shown in Table 6. Two issues were questioned in environmental problem criterion.

Firstly, issue on air pollution and secondly issue of high traffic volume nearby the school area. There were significant differences between male and female regarding agreement on the existence of local environmental problem at SST and STR. This signified that both genders have different level of agreement on the existence of local environmental where female respondents recorded slightly higher mean level of agreement compared to male respondents. In terms of types of respondents, there were significant differences between students, teachers and parents/ guardians regarding agreement on the existence of local environmental nearby SSH and STR where the p-values were less than 0.05 which are 0.022 and <0.001, respectively.

This shows that there were differences in mean level of agreements where most teachers testified that there were local environmental problems occurred at their area (3.90 and 3.98, respectively).

As for environmental awareness, similar result was also obtained based on the gender of the respondents at SST. Female respondents showed more attention to the awareness of the adverse effects of air pollutants exposed to human. Female respondents recorded slightly higher mean level of agreement compared to male respondents with the value of 4.14 while male respondents recorded the value of 3.69. Meanwhile in STR, there was significant difference in terms of level of agreement between Chinese respondents with Malay and Indian respondents. Nevertheless, there was no significant difference of agreement level between Malay and Indian as the means recorded were almost similar which are 3.92 and 4.05, respectively. Other races are excluded from the analysis due to small sample size.

There was no significant difference found regarding respondents' perception in changing current mode to walking except in STR. There was a significant difference between races which signified that there was various difference of mean value regarding the level of agreement in changing current mode to walking. Indian respondents mostly agreed with the idea of changing the mode of transportation with the mean value of 3.71, so did the Malay respondents which have the recorded overall mean value of 3.60. However, most Chinese respondents seemed neither agreed nor disagreed with the statements of changing the current mode of transportation.

There was no significant difference observed based on the travelled distance of the respondents from home to school. Mean values of level of agreements by respondents who lived in various distance from school were almost similar for all criteria, thus the travel distance did not influence the level of agreement of the environmental problems, awareness and potential in changing the current mode to walking.

4.0 CONCLUSION

The objective of this study is to evaluate pedestrians' perspectives on existence of environmental problem and awareness regarding negative effects of these issues as well as their perceptions towards changing the current mode to active mode. In this survey, three criteria regarding environment issues were looked through by considering respondents' perspective. The criteria were regarding the existence of local environmental problems, environmental awareness and potential in changing current mode specifically automobile mode to walking in efforts to improve these environmental problems. Based on the types of respondents, teachers mostly testified that there were local environmental problems occurred at their area and are aware of the adverse effects of air pollutants exposed to human compared to students and parents/guardians. As for race, Indian respondents are more aware of the negative effects of air pollutants and most willingly to change from current mode to walking. Meanwhile, female respondents were found to be much aware of the existence of environmental problems rather than male respondents. Most female respondents also agreed to the idea of changing the current mode to walking whereas most of male respondents have no stance regarding this idea. From the analysis of one-way ANOVA and independent t-test, respondents' level of agreement with environmental problems, awareness and potential in changing the current mode to walking were related to the types of respondents, race and gender. Nevertheless, the factor of travel distance did not influence the given level of agreement by respondents.

Table 6 Respondent's the level of agreement with environmental problems, environmental awareness and potential on changing the current mode to walking

Items	Environmental problems								Environmental awareness								Potential on changing the current mode to walking							
	SSH		SSN		SST		STR		SSH		SSN		SST		STR		SSH		SSN		SST		STR	
	N	$\bar{x}$	N	$\bar{x}$	N	$\bar{x}$	N	$\bar{x}$	N	$\bar{x}$	N	$\bar{x}$	N	$\bar{x}$	N	$\bar{x}$	N	$\bar{x}$	N	$\bar{x}$	N	$\bar{x}$	N	$\bar{x}$
Gender																								
Male	41	3.16	17	3.53	14	2.71	75	3.09	40	3.54	17	4.31	14	3.69	74	3.76	41	3.56	16	3.80	14	3.31	74	3.40
Female	66	3.23	40	3.78	39	3.62	125	3.44	66	3.79	41	4.11	39	4.14	125	3.90	67	3.41	41	3.64	39	3.39	125	3.57
Type of respondents																								
Students	49	3.09	40	3.79	40	3.29	102	3.14	49	3.67	41	4.19	40	3.99	101	3.84	49	3.55	40	3.68	40	3.35	101	3.44
Teachers	10	3.90	10	3.30	10	3.55	20	3.98	10	4.13	10	4.02	10	4.08	20	4.18	10	3.64	10	3.62	10	3.52	20	3.77
Parents/ Guardians	48	3.17	7	3.79	3	4.00	78	3.36	47	3.62	7	4.26	3	4.17	78	3.77	49	3.36	7	3.83	3	3.27	78	3.51
Race																								
Malay	1	3.00	40	3.65	50	3.34	31	3.50	1	3.00	41	4.17	50	4.02	31	3.92	1	3.00	40	3.68	50	3.37	31	3.60
Chinese	105	3.20	4	4.13	1	5.00	92	3.19	104	3.71	4	4.00	1	3.33	92	3.68	106	3.48	4	3.35	1	3.20	91	3.32
Indian	0	0.00	13	3.73	2	3.50	74	3.36	0	0.00	13	4.21	2	4.25	73	4.05	0	0.00	13	3.83	2	3.50	74	3.71
Others	0	0.00	0	0.00	0	0.00	3	3.50	0	0.00	0	0.00	0	0.00	3	3.61	0	0.00	0	0.00	0	0.00	3	3.20
Distance																								
< 1 km	14	3.04	9	3.78	11	3.55	56	3.28	14	3.37	9	4.20	11	4.11	56	3.91	14	3.41	9	4.02	11	3.35	57	3.61
1 km	8	2.88	2	4.00	8	3.31	17	3.29	8	3.58	2	4.33	8	3.77	16	3.93	8	3.53	2	3.40	8	3.38	17	3.49
2 km	33	3.15	7	3.36	16	3.13	35	3.36	34	3.60	7	4.10	16	4.00	35	3.75	34	3.44	7	3.63	16	3.28	34	3.45
3 km	30	3.15	4	3.13	2	4.00	20	3.23	29	3.81	4	4.58	2	3.83	20	3.44	30	3.39	4	3.70	2	3.60	20	3.11
4 km	12	3.29	6	3.58	4	3.50	10	3.75	12	3.76	6	4.22	4	4.42	10	4.15	12	3.55	6	3.70	4	3.25	10	3.56
5 km	2	3.00	9	4.06	3	3.67	11	3.18	1	4.33	9	4.30	3	4.28	11	3.82	2	4.10	9	3.84	3	3.73	10	3.26
6 km	2	4.00	1	3.50	2	4.50	11	3.45	2	3.50	1	4.00	2	4.58	11	4.00	2	3.60	1	4.00	2	3.20	11	3.80
7 km	1	4.50	1	3.00	0	0.00	6	3.17	1	4.83	1	4.17	0	0.00	6	3.94	1	2.60	1	2.60	0	0.00	6	3.70
8 km	1	4.00	3	3.83	0	0.00	5	3.20	1	3.83	3	4.11	0	0.00	5	4.07	1	3.60	2	3.40	0	0.00	5	3.48
> 8 km	4	4.13	13	3.81	6	3.25	17	3.50	4	4.42	14	3.95	6	3.83	17	3.96	4	4.00	14	3.60	6	3.53	17	3.48

Indicator: N = Number of samples; $\bar{x}$ = Mean of samples

Acknowledgement

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