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The Relationship between Safety and Walking Behavior of Older Adults in China

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Abstract
Perception of safety has been reported as a factor that can impact the walking behaviour of older adults. This paper aimed to investigate the association between the Perception of crime, traffic and walking behaviour of older adults in a small city in China. The subjective method of the questionnaire was used to collect the data on Perception of traffic, crime and walking activities in ChenZhou. The multiple regression analysis methods was used to test the relationship between the perception of traffic, perception of crime and walking activities of seniors. The result showed that perception of traffic was positively related to total walking and recreational walking. In contrast, perception of crime was found to be negatively associated with recreational walking, even though the correlations were very weak. No relationship was found between transportation walking and safety. And there was no relationship between perception of crime and total walking behaviour. Although the result of this study demonstrated that there was a weak positive relationship between safety and walking of seniors, it still cannot ignore the perception of traffic as it was an essential factor in increasing the total walking and recreational walking. And perception of crime can decrease recreational walking.
Keywords: Safety, Perception of Crime, Perception of Traffic, Walking, Older Adults

Introduction

Populations around the world were rapidly aging and this demographic transition will impact almost all aspects of society (WHO, 2017). Lack of physical activity among the rapidly growing middle-aged and elderly population increased the burden of chronic diseases, functional limitations and health-care costs(Public Health England, 2017). Physical activity can be integrated into daily life, such as cycling, walking or taking public transport instead of driving (Carl, 2016). For older adults, walking was the most convenient and easiest way to meet the WHO's weekly recommendation of 150 minutes of physical activity which was convince for most people and did not require special equipment

Whether safety was a serious threat or not, residents who thought their neighbourhood were unsafe may restrict their outdoor physical activities. However, neighbourhood safety has been frequently discussed within the literature as a possible constraint on physical activity, and there was no clear consensus on its impact on physical activity, or walking specifically (Foster et al., 2014). The inconsistent associations between safety and walking may be due to

the difference in architecture, society, region and culture. In the past research, there were two main safety issues related to social environment: Perception of crime and Perception of traffic hazard. If residents believed that the crime rate in the communities was high, they will not assume walking or participating in sports activities in local public places such as parks (Salvo et al., 2018). Safety was essential for the senior's active living, physical activity, and aging-in-place at home. Since the ability of the elderly will decline with age, they may like to seek a high level of protection from the surrounding environment. Adequate neighbourhood lighting and even crosswalks, pedestrian signals and sidewalk surfaces were important for older residents (Wang & Shepley, 2018). Many studies showed that safety was closely related to the active travel of the elderly (Cerin et al., 2013; Lee, 2016; Zandieh et al., 2016). In rural communities, only perceived of crime can affect any walking and walking for recreation of the elderly (Maisel, 2016). For urban women, safety was an important environmental variable that can meet the physical activity recommendations (Lee & Park, 2015). Feelings of unsafety was negatively related to walking for transportation and recreational walking/cycling (Van Cauwenberg et al., 2012). Traffic and crime safety in old-unemployed males and proximity to service facilities and traffic and crime safety in middle-employed females were significantly associated with a low risk of insufficient walking time (Chen et al., 2013). Neighborhood safety-related aspects can moderate the relationship of overall walking for transport with the prevalence of public transit points, but it was positive only in safe places (Cerin et al., 2013). Existence of crosswalks in the neighborhood, street lights, recreational facilities, safe places during the day and having dogs were all important predictors of walking for transportation (Giehl et al., 2017). In high-poverty areas and low-poverty areas, different perception of perceived neighbourhood safety, pedestrian infrastructure and aesthetics will affect people's outdoor walking level (Zandieh et al., 2016). The available research was inconclusive about the safety affecting walking behaviour in neighbourhoods where the built, social, and cultural environment is different. On the other hand, there were differences in the perception of safety among different age groups, and the older adults might be more sensitive. However, most findings were limited to Western, low-density locations and big cities in China, while a larger proportion of the global population resides in Asian small city was rarely. Compared with many other countries, China has the lower crime rate that people do not worried about public safety(Macrotrends, 2022). Finally, older adults are more sensitive to the changes of environment than other age groups. Therefore, the objective of this study was to investigate the relationship between perception of safety and walking behaviour of the older adults in small city in China.

Methods

The methodology part mainly included the selection of research areas and research samples, data collection and analysis.

Study Area

A cross-sectional study was conducted to investigate the association between walking and perception of safety in ChenZhou, China. ChenZhou had an area of 19317 square kilometres, and the total population was about 467 million in 2015 (ChenZhou Bureau of Statistics, 2021). It was located in the southeast of Hunan Province, east of Jiangxi and south of Guangdong. This study was about the active travel of older adults.

Study Sample

The total population of Chenzhou city was 843,500, and the proportion of people over 60 years old accounted for 15.4% of the whole population (ChenZhou Bureau of Statistics, 2021), so the total number of subjects in this study was 129,899. Krejcie & Morgan constructed a formula to calculate the required sample size according to an exact population (Krejcie & Morgan, 1970). According to this method, 383 respondents were needed in this research. Some criteria were set, and only those who met these criteria were randomly selected.

1. Within the age group of 55 years and above.
2. Not have any disability that prevents walking
3. Be able to complete or understand the survey in either English or Mandarin. In China, some people will enter retirement at 55(e.g., females).

This research focused on the behavior of people after retirement, so the best age group was 55 and above. The data was collected through questionnaire. Because of the respondents were elder people, researcher in this study would ask the questions listed in the questionnaire face to face. The data collection lasted from May to October 2021. A convenience sample of 426 participants was recruited from fourteen neighborhoods sites in ChenZhou and 400 valid data. All the participants were over 55 years old, and lived in a house or apartment in the community.

Data Collection and Analysis

The dependent variable was walking in this study, which was divided into three types: total walking, transportation walking and recreational walking. The subjective method of Neighbourhood Physical Activity Questionnaire (NPAQ) Giles-Corti et al (2006); Giles-Corti et al., 2006; Giles-Corti et al (2006)was used to investigate the walking information of the older adults. The NPAQ was a reliable questionnaire established in 2006 and has been widely used by other scholars since then, and its reliability and validity has been verified.

The independent variable in this study was the perception of traffic and crime, which was the indicator of how safe older adults feel from traffic and crime while walking in their neighbourhood. Neighbourhood Environment Walkability Scale (NEWS) has been used to collect the safety data. The reason for choosing (NEWS) was that it was reliable and valid in Chinese seniors, which was tested by (Cerin et al., 2010).

Results

This part described the research results in several parts. The first section showed the process of collecting the subjective data from questionnaire method. Then, it also tested the association between the perception of safety variables and walking activities.

Descriptive Statistics

Because of the characteristics of the elderly, the face to face questionnaire survey method was adopted, and excel was used to input data. A convenience sample of 426 participants was recruited from fourteen neighborhoods sites in ChenZhou and 400 valid data was remained. All the participants were over 55 years of age, and lived in a house or apartment in the community. The Socio-Demographical factors like age, gender, family structure, working condition, educational, driver license has been investigated.

The age distribution showed that divided into three groups, include 55-64, 65-74 and 75+. The gender of respondents showed that women were twice as likely as men. Twelve percent （n=48/400）of older adults live alone，thirty seven percent（n=148/400）of the sample

couple living together and forty one percent people live with their children. Work status is to ask whether you are working full-time or retiring, only thirteen point five（54/400） percent of older adults was full-time work and eighty six point five（375/400） percent sample were retire. Education is to ask about the level of education, such as under high school, undergraduate, master of degree. Most of them were High school or below, reached at 93.8 (375/400) percent. Few older adults has the Bachelor and Master Degree. The variable, drives license, was measured as a yes response if the study participant driver a car. All three of these conditions were needed for a yes response. Only five point five percent (n =22/400) of the sample drove a car. In this research, fifty five percent （n=220/400 of questions were from city neighborhood，forty five percent （n=180/400 of questions were from rural neighborhood.

Table 1
Summary of Categorical Demographic Variables

	Frequency	**Percentage (%)**
Age		
55-64	156	39.0
65-74	149	37.25
75+	95	23.75
Gender		
Males	135	66.3
Females	265	33.8
Family structure		
Live alone	48	12.0
Couple living together	148	7.0
Live with Children	204	51.0
Working status		
Retire	346	86.5
Full-time work	54	13.5
Educational		
High school or Below	375	93.8
Bachelor Degree	21	5.3
Master Degree	4	1.0
Driver license		
Driver	22	5.5
No driver	378	94.5

Neighbourhood Physical Activity Questionnaire (NPAQ) has been used through face to face while collecting data. The walking was divided into three types: transportation walking, recreational walking and total walking. Table 2 displayed the detail of walking information of older adults in one week.

Table 2
Descriptive statistics of walking

	N	Minimum	Maximum	Mean	Median	Std. Deviation
Transportation walking	400	0	380	114.86	80	109.322
Recreational walking	400	0	1320	374.25	240	365.975
Total walking	400	0	1540	489.10	412.50	398.545

Neighbourhood Environment Walkability Scale (NEWS) was used to collect the data on perception of safety. The questionnaire used a Likert five-point scale. Participants were presented with eleven statements, including 4 items in traffic and 7 items in crime. For the traffic perception part, the researcher primarily asked about perceptions of nearby vehicle speeds, traffic conditions, and pedestrian crossing infrastructure. While for the crime part, the respondents were asked about the opinion of the surrounding lighting conditions, the flow of people, the situation of cycling, and crime rate. Table 3 showed the detail of perception of traffic and crime information of older adults with 400 samples.

Table 3 Descriptive statistics of perception of safety

	N Statistic	Mean Statistic	Std. Error	Std. Deviation Statistic	Variance Statistic
Perception of Traffic	400	2.5462	0.01606	0.32112	0.103
Perception of crime	400	2.1357	0.01393	0.27855	0.078

Association of Perception of safety indicators with walking

To examine the relationship between the perception of safety and total walking, multiple regression analysis was used. Multiple regression models demonstrated that perception of traffic was significant with total walking and recreational walking, while the perception of crime was significant with recreational walking. There was no correlation between perception of traffic and transportation walking. Perception of crime also had no effect on transportation walking and total walking. On the other hand, the result showed that the adjusting R square was only about 0.5, demonstrating that the correlation was weak.

Table 4
Perception of safety with Total Walking

N =400 R^2= 0.057
F (2,397) = 12.084 Adj R^2 = 0.053

perception of	B	S.E.	Beta	t	Sig.	95%CI	
traffic	299.572	61.880	.241	4.841	.000	177.919	421.226
crime	-132.805	71.336	-.093	-1.862	.063	-273.050	7.439

Note. CI =confidence interval.

Table 5
Perception of safety with Transportation Walking

N =400		R^2= 0.009					
F (2,397) =1.707		Adj R^2 = 0.004					
perception of	**B**	**S.E.**	**Beta**	**t**	**Sig.**	**95%CI**	
traffic	29.357	17.408	.086	1.686	.093	-4.867	63.581
crime	7.639	20.069	.019	.381	.704	-31.815	47.093

Note. CI =confidence interval.

Table 6
Perception of safety with Recreational Walking

N =400		R^2= 0.057					
F(2,397) = 11.977		Adj R^2 = 0.052					
perception of	**B**	**S.E.**	**Beta**	**t**	**Sig.**	**95%CI**	
traffic	270.215	56.838	.237	4.754	.000	158.475	381.955
crime	-140.444	65.523	-.107	-2.143	.033	-269.260	-11.628

Note. CI =confidence interval.

Discussion

This study aimed to advance the understanding of the relationship between safety and walking, and explored the impact of perception of safety in small city combined with China's national conditions on transportation walking and recreational walking for the senior. This study showed that different cultural and economic conditions will produce different results.

The result of this study showed that perception of traffic was significantly related with recreational walking and total walking, and no relationship was found between transportation walking and perception of traffic. This was consistent with the study of Cerin et al (2013), who found that traffic barrier was positively associated with both overall and within-neighborhood walking for transport of Chinese senior, but the correlations were very weak (total walking: r = 0.057; recreational walking: r = 0.057). Previous studies also found that safety was associated with walking (Corseuil Giehl et al., 2017) and was essential for their active living, physical activity, and aging-in-place at home. Since the ability of the elderly will decline with age, they may like to seek a high level of protection from the surrounding environment. Adequate neighbourhood lighting and even crosswalks, pedestrian signals and sidewalk surfaces were important for older residents (Wang & Shepley, 2018).

Perception of Crime did not show any significant impact on total walking and transportation walking and found a correlation between recreational walking and perception of crime. However, the correlations were very weak (recreational walking: r = 0.057). This was different with the research of Cerin (Cerin et al., 2013), who held the opinion that crime was positively associated with both overall and within-neighborhood walking for transport of Chinese senior. Pervious study also found that safety was closely related to the walking behavior of the elderly (Cerin et al., 2013; Lee, 2016; Zandieh et al., 2016). Feelings of unsafety was negatively related to walking for transportation and recreational walking/cycling (Cauwenberg et al., 2012). In this study, the majority of interviewees were satisfied with the security situation, with few reported cases of theft and robbery. The neighbourhood residents were less sensitive to security， because China's public safety was doing well, which may

explain why there was no association between safety perception and walking activity. This may be because recreational walking is entirely discretionary and, therefore, more easily avoided, whereas transport walking was often done out of necessity(Foster et al., 2014).

Conclusions

In conclusion, the results of this study indicate that perception of traffic had a positive relationship with total walking and recreational walking, and perception of crime has found to have a negative association with recreational walking behavior although the correlations were very weak. We didn't found correlation between perception of crime and total walking; the perception of crime and traffic has no impact on transportation walking. Although the finding of this study showed that there existed a weak positive relationship between safety and walking of senior, we still cannot ignore that perception of traffic was an important factor in increasing the total walking and recreational walking. Meanwhile, the perception of crime can decrease recreational walking. The topic of this study in China has not yet been widely studied and to confirm these results, more research is needed. Further studies on environment and mobility should also include older adults living in suburban and rural areas to globally enrich the scientific data base. These findings might provide recommendation for policy makers and urban planning in the process of urban construction.

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