Preferences for Women Active Commuting on Built Environment? Differences between Urban-Rural Areas in Taiwan

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Abstract: Active commuting is an effective way to integrate activities into people's daily life to increase physical activity, and transportation plays a very important part in the promotion of physical activity, mainly carried out through three modes of walking, bicycle or taking public transportation. Compared with the needs of special ethnic groups such as women were often being ignored. Therefore, this study mainly constructs the evaluation indicators of the built environment for women's active commuting in urban-rural areas. Through questionnaires 560 valid women's questionnaires from July to September 2020 without working from home during covid-19 pandemic in Taiwan, "safety" is the primary indicator, and there are significant differences in the built environment of women's active commuting between urban-rural areas. Finally, through PLS-SEM method, it was found that in terms of urban areas, women are most likely to take mass transit (67%), and built environment planning must consider density (unrelated to employment), diversity, distance to mass transit, and design. In terms of rural women, most of them use bicycles (60%). Built environment planning must consider density, diversity, accessibility, distance to public transportation, and design. The more comprehensive development strategy provides in planning and development of the built environment for women's active commuting.

Keywords: Active commuting, Urban-rural Area, Built Environment, Women, PLS-SEM method.

1. INTRODUCTION

The issue of urban-rural differences is an important development issue under the trend of global urbanization in recent years (Koohammad et al., 2017; Fan et al., 2017). The environment between urban and rural areas will affect people's travel behavior (Frost et al., 2010; Hansen et al., 2015; Millward & Spinney, 2011), many studies have also found, residential density, mixed land use, intersection density, can affect physical activity behavior (Ewing & Cervero, 2010; Millward et al., 2014). Urban and rural environments will affect people's physical activity and health, and active commuting is an effective way to integrate activities into people's daily life and increase physical activity (Shephard, 2008; Bopp et al., 2012; Bopp et al., 2013; Fan et al., 2017). Physical activity refers to body movements produced by skeletal muscles that consume calories (Caspersen, Powell, & Christenson, 1985), such as regular physical activities such as walking, cycling, and work activities, can improve physical fitness (Puciato, Rozpara & Borysiuk, 2018). Among them, transportation plays a very important role in the improvement of physical activity. Vigorous commuting mainly consists of three modes: walking, biking or taking public transportation, which are deeply involved in people's daily life. Some research find that the built environment affects active commuting and life satisfaction, which contains street connectivity, design, items such as mixed land use were positively associated with active commuting (Bassett, 2012; Bauman et al., 2012, Yin et al., 2021), and the built environment under urban-rural differences will have different impacts on physical activity, further in-depth research should be conducted on different socioeconomic backgrounds such as gender (Fan et al., 2017).

Furthermore, women's issues and the construction of high-quality urban and rural environments should be given more attention in the Sustainable Development Goals (Sustainable Development Goals, SDGs), because it clearly stipulates that SDG5 achieves gender equality and SDG11 builds inclusive, safe, resilient and sustainable cities and rural planning. Related research points to better work-life balance for women who commute on active commuters (Herman & Larouche, 2021), while there were gender-related differences in the association between the built environment and physical activity, good built environment planning reduces women's sedentary and better physical activity (Nichani et al., 2021), so we should deeply explore the planning and design projects of the built environment that women pay attention to when they are active commuting.

In Taiwan, The Ministry of Communications (2022) surveyed the purpose of public travel, it was found that "commuting" was the highest at 44.5%. The gender survey found that the market share of women in public transportation is higher than that of men (19.3% for women and 12.6% for men). And according to the latest statistics from the "National Health Interview Survey", the rate of insufficient physical activity among the population over the age of 18 in Taiwan is 47.3%, of which 55.2% are women, which is 16.2 percentage points higher than men (39.0%) (Computer and Accounting Office, Executive Yuan, 2022). In terms of urban-rural gap, the market shares of public transport in urban areas (19.9%) is significantly higher than that in non-urban areas (6.3%). The purpose of going out in urban areas is mainly "commuting", "commuting to school" and "business (business)", while in rural areas, the main purposes of travel are "family and personal activities", "shopping" and "leisure". The proportion of women in Taiwan is higher in rural areas than in urban areas (an average of 48.9% in urban areas and 51.21% in rural areas). In terms of annual income, metro areas are higher than rural areas ($47,900 on average in metro areas vs $39,500 in rural areas). In terms of medical quality, the medical conditions in urban areas are higher than those in rural areas (the average number of medical institutions in urban areas is 2,908, and the average number of institutions in rural areas is 364; the average number of people (person/institution) served by each medical institution in urban areas is 970, and 1405 in rural areas). However, in terms of environmental quality, rural areas are higher than urban areas (PM2.5 concentrations in urban areas is 14.95 μg/m3, compared with 14.3 μg/m3 in rural areas) (Directorate General of Budget, Accounting and Statistics, DGBAS, 2022).

However, looking at Taiwan's current urban and rural environment construction and design, the needs of disadvantaged groups such as women are often ignored, and there is no differentiated planning for the different needs of urban and rural areas. Therefore, can through good built environment design, increased physical activity in women through active commuting? Construct a more complete built environment for dynamic commuting, especially in line with the needs of women? And expanded to combine walking, active commuting travel modes such as bicycles and public transportation systems, constructing a diversified dynamic commuting built environment strategy? These are all topics worth discussing. This study mainly focuses on women's issues around rural-urban differences. Firstly, through related research at home and abroad, the preliminary measurement factors of women's active commuting built environment are established, and the decision-making indicators of Taiwan women's active commuting built environment are constructed. Furthermore, it is necessary to understand the female public's emphasis on the indicators of the active commuting built environment in urban areas (Urban Area) and rural areas (Rural Area), and to explore the correlation between the female public's emphasis on active commuting and urban and rural built environment indicators. In addition, the indicators of the built environment for women's active commuting are established to measure the applicability and differences between Taiwan's urban and rural areas, so as to propose a comprehensive overall development strategy, which can be used as a reference for government planning agencies to study the development of the built environment for women's active commuting.

2. LITERATURE REVIEW

The difference between urban and rural environments (Urban and Rural) will have an impact on people's lives. The situation of overweight and obesity is more serious in rural areas than in urban areas in Australia (Cleland et al., 2010), and the physical activity of people who visit parks in rural areas tends to be lower than urban area in U.S.A. (Shores & West, 2010). The accessibility and quality of parks in urban neighborhoods are higher than those in rural areas in U.S.A., which will help people's physical activity and health (Kaczynski and Henderson, 2007). The accessibility, lighting and safety of urban parks and the diversity of recreational equipment are all higher than those in rural areas, which will encourage people to engage in physical activity in Australia (Veitch et al., 2013). In remote rural areas and suburban areas, the impact of the built environment on the physical activity of the respondents is lower than that in urban areas and large rural towns (Losada-Rojas et al., 2022), so the characteristics of the built environment play an important role in the physical activity of urban and rural people (Stefansdottir et al., 2018; Sarkar, et al., 2014; Bassett, 2012; Bauman et al., 2012, Fan et al., 2017) and was also considered an important health promotion strategy (Sarkar , et al., 2014; Frank et al., 2003). Specific neighborhood characteristics were highly correlated with increased physical activity (mainly walking and cycling), while built environment characteristics included mixed land use, medium to high residential density, availability of sidewalks, availability of sidewalks, street connectivity, availability of recreational facilities such as parks and trails, safety, and aesthetics (Frank et al ., 2003; Sallis et al., 2016; Van Dyck et al., 2012), Commuter Cycling focuses on mixed land use, street connectivity, green spaces, and bicycle facilities (Cervero et al., 2009; Yang et al., 2019 ; Wu et al., 2021). Residential density, land use mix, and intersection density can affect physical activity behavior, especially in walking environments (Ewing and Cervero, 2010; Millward et al., 2014). In addition, Gan (2021) pointed out that a large number of empirical studies have demonstrated the relationship between the built environment and mass transit transfer (walking/bicycle) patterns, and the characteristics of the built environment include population density, land use diversity, street design, mass transit accessibility, perceived walkability, and perceived bike-ability. In addition to the applicability of the above indicators to cities, rural applicability is also applied in related research. For example, in rural (suburban) built environments, the improvement and accessibility through bicycles or trails, as well as the maintenance of green spaces, are very important for improving physical activity (Stefansdottir et al., 2018). The accessibility of public transportation can actively encourage rural residents to choose public transportation as a means of commuting, and walking is the best means of transportation that complements public transportation. It is suggested that rural areas can increase the accessibility of public transportation routes and stations, and related facilities to meet the needs of residents, increase land use diversity and provide sufficient trees and other built environment design strategies to enhance perceived environmental attractiveness and safety and security (Ao et al., 2020).

It can be seen from the above that, the built environment in urban and rural areas will affect people's physical activities, and active commuting is an effective way to increase physical activity, physical activity includes leisure time, occupational, household, and transportation, etc., among them, transportation orientation plays a very important role in the promotion of physical activity, it penetrates into people's daily life mainly through active commuting. Active commuting is mainly walking, three modes of cycling or public transport, active commuting increases physical fitness, such as reducing the risk of obesity, diabetes, cardiovascular disease, etc. (Hamer & Chida, 2008). However, most of the current literature on active commuting focuses on the effects on physical and mental health (Baker et al., 2021), but recently some literature has begun to discuss the impact of the built environment on active commuting, such as street connectivity, neighborhood (e.g. more greenery), infrastructure elements (e.g. sidewalks) , safe traffic conditions, distance to the destination, population density, and mixed land use are positively associated with active commuting (Herman & Larouche, 2021). Built environment and active commuting time, body mass index (BMI) and life satisfaction are correlated (Yin et al., 2021). Fan et al. (2017) explored the urban-rural differences in the built environment and dynamic commuting in the United States, using the 3D (density, diversity, and design) built environment characteristics established by Cervero & Kockelman (1997), and found that commuting in urban areas is mainly by mass transit, the rural areas are mainly walking. Rural and urban areas have a similar relationship, for example, there is a positive correlation between road greening and walking commuting. On the other hand, the features of the built environment that contrast rural and urban areas, such as street connectivity for pedestrian commuting, the population density of mass transit commuting and walking commuting, and proposed that further in-depth research should be conducted on different social and economic backgrounds, such as gender, age, etc.

In recent years, more and more related studies have focused on the characteristics of geographical environment, such as residence, community and neighborhood environment, etc., will affect women's physical activity, higher walkability (residential density, street connectivity, land use mix, and net retail area) were also found to be associated with reduced TV viewing time among women (Sugiyama et al., 2007). More neighborhood greening linked to less sedentary time in women (Nichani et al., 2021), residential density is negatively correlated with women’s walking time (Aldred et al., 2016), while the accessibility of travel destinations is positively related to cycling, distance, carrying children and safety considerations cause urban women to commute less by bicycle (Higuera-Mendieta, 2021). Women's sense of security, whether urban or suburban, is more closely related to the built environment (Börjesson , 2012; Basu et al., 2021), which in turn affects their travel decisions, compared with the travel time and cost of women, safety perception has a greater impact on transportation choice (Mark & Heinrichs, 2019), and women pay more attention to aesthetic perception (Su et al., 2014). Also, women who commute to and from get off work using the vitality commuter, have a better effect on work-life balance, the subjective well-being is also relatively improved (Herman & Larouche, 2021). However, about the emphasis placed on the built environment on women's active commuting in different modes of transport, and the association between urban-rural differences is poorly understood, under the current goal of advocating gender equality and a high-quality urban and rural environment, further research is needed.

Based on the above literature, it can be concluded that, the differences in the built environment between urban and rural areas will affect people's physical activity, while active commuting in physical activities mostly focuses on the impact of the built environment on physical and mental health, or focus on walking during active commuting, the individual built environment requirements of dynamic commuter travel modes such as bicycles and public transportation systems; However, the built environment of urban-rural differences will indeed result in different choices of physical activities and means of transportation, and when the gradual development and perception of women's issues are relatively sensitive, it is more urgent to combine the built environment of urban and rural differences, women and the aspect of active commuting, to construct a dynamic commuting built environment that is more in line with the needs of women. Therefore, this study uses Cervero et al. (2009) 5D Density, Diversity (diversity of land use), Design (urban design), Destination Accessibility (accessibility of the region), Distance to transit (distance to transit from mass transit) as the basis, to explore the evaluation index framework for the built environment when women active commuting, as the basis for subsequent research.

A. Density

Residential density and street connectivity affect walking and all physical activity, , for obesity and related chronic diseases, the density of residential areas and the connectivity of streets are important factors(Oakes et al., 2007). many studies have also revealed that medium to high residential density is highly correlated with increased physical activity (Kerr et al., 2016; Sallis et al., 2016; Van Dyck et al., 2012), density includes residential density, public transportation density, employment density, community service facility density, leisure and entertainment facility density, these five densities affect physical activity (Troped et al., 2010). High density of community service facilities means better social care and support, the higher the density of leisure and entertainment facilities and the density of mass transportation, the less the use of medical services (Sarkar, et al., 2014). Population density is positively correlated with walking behavior, but only for metro areas (Fan et al., 2017). The built environment indicators in rural areas (community service facility density, road density, traffic distance and destination accessibility, has a significant impact on the choice of vehicle, the density of community service facilities has the greatest impact on rural residents' choice of means of transport, the higher the density, the greater the probability that rural residents choose bicycles (Ao et al., 2020).

B. Diversity

Frank et al. (2010) pointed out that, living in walkable neighborhoods, as long as you walk or take public transportation more than 2-3 times, will reduce car usage by up to 58%. Also, street connectivity and land use mix factors will also affect residents' willingness to walk. According to the research of Kuzmyak et al. (2003), increasing the mixed use of land can reduce the distance people commute or travel, even by walking or cycling, while employees working in mixed-use commercial districts tend to be willing to choose various modes of transportation to commute, so the mixed use of land can effectively reduce the travel time and distance. Diversified land use can create a friendly built environment space for urban women, such as diverse recreational land uses (shopping, coffee shops, restaurants, etc.) (Sadeghi & Jangjoo, 2022). At public transportation stations and exits, planning can be more conducive to women's daily travel, shopping for daily necessities and social interaction (Chen et al., 2022). Furthermore, Basu et al. (2021) study pointed out that, the perceived risk of being assaulted/robbed/harassed is higher for women in the suburbs, compared with vacant land, residential, commercial and mixed land uses provide pedestrians with a sense of security. Women in suburban areas experience increased perceived safety when traveling through commercial and mixed land-use areas at night, increase the functional use of idle open space, increasing land use diversity can improve perceived safety and reduce gender inequality in safety perception.

C. Design

1. Green space and landscaping

Green space includes parks, open spaces, sports fields, tree-lined roads, trails, community gardens, street trees, nature reserves and relatively rare green walls, green lanes, etc. (Roy et al., 2012). Parks are often regarded as a stronghold for sports activities, which can enhance health and reduce the risk of mortality and disease (Barton & Pretty, 2010). Green space can not only relieve stress, but also be a place for social connection, thereby increasing safety and belonging of residents (Wolch et al., 2014). When women take a leisurely walk in parks, tree-lined open spaces, or even residential areas with small green spaces, their emotional and psychological functioning states are significantly enhanced (Wu & Kim, 2021). Urban women pay more attention to the design and beauty of buildings (Sadeghi & Jangjoo, 2022). In addition, more neighborhood greenery is associated with less sitting time among women (Nichani, 2021), and women perceive tree-filled walking environments as more enjoyable (Yang et al., 2018). Generally speaking, if there are more trees and shacks on the sidewalk, women in suburbs will prefer to walk, especially during the day (Basu et al., 2021), and they can also stay away from annoying environmental pollution such as air pollution and noise pollution (Sadeghi & Jangjoo, 2022).

2. Place and Street Design

Street connectivity and residential density affect walking and all physical activity, and for obesity and related chronic diseases, residential density and street connectivity are important factors (Oakes et al., 2007). Marshall et al. (2014) pointed out that on major roads, fewer lanes, more compact, and more connected street networks were associated with lower rates of obesity, diabetes, hypertension, and heart disease among residents, whereas wider major streets and more lanes lead to higher rates of obesity and diabetes. In addition, Tao et al. (2020) found that street intersection density was positively correlated with walking distance, while Wang et al. (2020) pointed out that street intersection density was positively correlated with bicycle usage frequency around subway stations. Wu et al. (2018) found that after controlling for socio-demographics and trip attributes, adequate cycling facilities, comfortable cycling spaces, and safe parking spaces were positively and significantly related to the integration of subways and bicycles. The presence of good bicycle facilities has the strongest effect, with more intersections and higher cyclists. This was followed by safe, ample parking and a pleasant cycling environment, which indicated that cyclists were most concerned about cycling infrastructure. Providing good cycling facilities is most likely to increase the likelihood of choosing cycling as a mode of transport in combination with mass transit. In the women-related study, it was found that dedicated bicycle lanes were positively associated with cycling among urban women (Higuera-Mendieta et al., 2021). Sidewalk design (such as width and pavement) is also an element of the built environment that urban women pay attention to, because their clothing and shoes may have special needs when walking (such as long skirts or high heels, etc.). Women may walk with young children or push strollers, so well-designed streets can improve women's mobility (Sadeghi & Jangjoo, 2022).

3 Safety

A safe environment, including the improvement of facilities and equipment, public security, traffic, etc., will affect people's willingness to go out. For walking and sports, safety is an important consideration (Michael et al., 2006). Nowadays, as the importance of walking and cycling is getting higher and higher, the safety of walking and cycling is getting more and more attention. Traffic accidents are one of the reasons that hinder people from walking and cycling, especially for women, children and the elderly (Pucher & Buehler, 2006). In urban areas, the lack of safe sidewalks also reduces the number of children walking or biking to school (Srinivasan et al., 2003). Improved traffic safety encourages more people to walk and cycle. Besides traffic safety, social safety is also a factor that people value, pointing out that women attach importance to safety when commuting by bicycle (Orozco-Fontalvo et al., 2019; Montoya-Robledo et al., 2020; Higuera-Mendieta, 2021). Adequate light and effective lighting can create a sense of safety and comfort for urban women in the built environment (Sadeghi & Jangjoo, 2022; Sasani et al., 2017). Suburban women had a higher perceived risk of assault/robbery/harassment when walking at night compared to daytime, and were less likely to be assaulted/robbed/harassed at night if they walked through mixed commercial and land areas (Basu et al., 2022). Women feel safer when walking with others (Paydar et al., 2017; Segar et al., 2017; Yang et al., 2018) and install more surveillance cameras (Cozens et al., 2005; Painter, 1996), as well as clear sightlines, increased lighting, frequent landscape maintenance, and improved built environment design can improve the safety of female pedestrians in suburban walking environments, especially at night (Herbert & Davidson, 1994; Oviedo-Trespalacios & Scott- Parker, 2017).

D. Destination Accessibility

The closer the home is to sidewalks, streets and parks or recreational facilities, the greater the chances of people visiting and effectively reducing the incidence of obesity (Stigsdotter, 2005; Cervero et al., 2009). Van den Berg et al. (2010) believed that residents who live closer to parks and greens experience less stress than those who live farther away from parks and greens. Michael et al. (2006) pointed out that it is important to have a place to stop and meet friends when walking for the elderly, and also mentioned that if the store is closer to the home, the elderly can not only walk and exercise, but also Can do some daily activities (such as purchasing, etc.). Gan (2021) pointed out that walking distance is more sensitive to traveler perception and built environment than cycling distance. Because there are more important factors in the walking distance model than in the cycling distance model, for example, the presence of good walking facilities is significantly related to walking distance, while the presence of good cycling facilities has an insignificant effect on cycling distance, which means that travelers have more sensitive while walking. When destination accessibility is good, residents tend to walk (Ao et al., 2020), and easily using different routes and different means of transportation will increase urban women's willingness to walk (Sadeghi & Jangjoo, 2022).

E. Distance to transit

Michael et al. (2006) indicated that if public transportation is available near people's homes, people will take public transportation instead of cycling or driving to increase walking opportunities or additional activities. The closer the distance to public transportation stations, the more willing residents are to walk and ride bicycles, increasing their physical activity (Cervero et al., 2006; 2009). The shorter the pedestrian's walking distance to the MRT station, the higher the willingness to take the MRT. Conversely, if public transportation is too far away from home, the chances of taking it will decrease (Michael et al., 2006). Women are more sensitive to mass transit station distance and street connectivity (Chen et al., 2022; Dickerson et al., 2019).

From the collection of the above literature, it is found that most of the literature focuses on the impact of individual commuting vehicles or individual indicators of the built environment on physical and mental health, and the discussion on women's issues is relatively limited. There is no set of indicator frameworks and related discussions on women's active commuting in the built environment, and there is no integrated research on urban areas and rural areas. Therefore, this study mainly comprehensively explores the impact of urban and rural built environment characteristics on women's active commuting, which has not been mentioned in the relevant literature. And the correlation of various indicators discussed in the relevant literature is expanded into the built environment assessment indicators for constructing women's active commuting, which will serve as the basis for follow-up research. Therefore, this study modified Sarkar, et al. (2014) and compiled related studies to sort out the indicators of built environment impact on physical activity as shown in Figure 1.

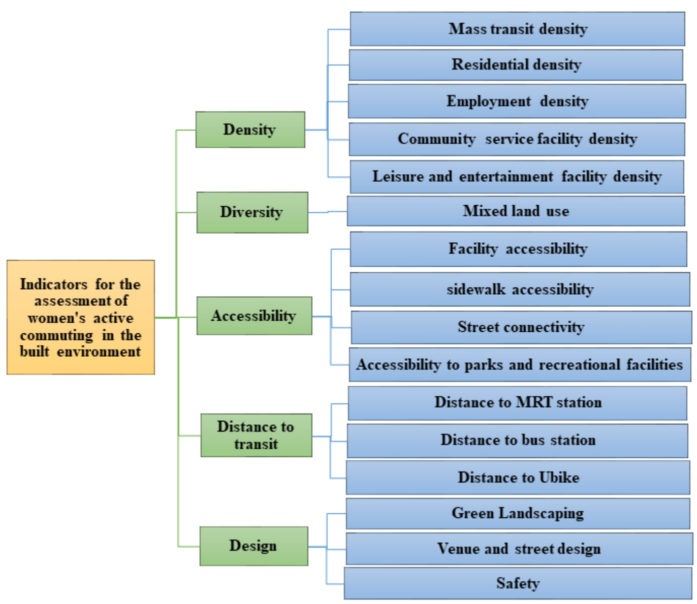


Figure 1. Framework diagram of indicators for the assessment of women's active commuting in the built environment

3. RESEARCH HYPOTHESIS AND RESEARCH METHODS

A. Research Hypothesis

Research Hypothesis is carried out according to the indicators screened by FDM. Previous studies have shown that differences in the built environment between urban and rural areas will affect people's physical activities. Different commuting vehicles will have different built environment indicators, and different genders will have different perceptions and needs. In order to understand the relationship between female active commuting and the emphasis on the built environment under the urban-rural differences, this study puts forward the following hypotheses:

Cervero and Kockelman (1997) found that commuting in urban areas is dominated by mass transit, while in rural areas commuting is dominated by walking, with similar relationships between rural and urban areas. For example, there is a positive correlation between road greening and walking commuting; while rural and urban features of the built environment are opposite, such as street connectivity for walking commuting, population density distance between mass transit commuting and walking commuting. Safety considerations will affect the number of times urban women commute by bicycle (Higuera-Mendieta, 2021). However, there is a paucity of literature on the importance of the built environment and urban-rural differences in active commuting in different modes of transport for women. Based on this, we propose:

H1: Urban and rural women place significant differences in the emphasis on built environment indicators for active commuting

Diversified land use can create a friendly built environment space for urban women, such as diverse leisure and entertainment land use (shopping, coffee shops, restaurants, etc.) (Sadeghi & Jangjoo, 2022). At public transportation stations and exits, planning can be more conducive to women's daily travel, shopping for daily necessities and social interaction (Chen et al., 2022). Urban women pay more attention to the design and beauty of buildings (Sadeghi & Jangjoo, 2022). Bicycle lanes are positively associated with urban female cycling (Higuera-Mendieta et al., 2021). Good sidewalk design (such as width and pavement) can improve the walking activity of urban women (Sadeghi & Jangjoo, 2022). When the destination is well accessible and different means of transportation will increase the willingness of urban women to walk (Sadeghi & Jangjoo, 2022). However, is there an emphasis on different built environments for urban women's active commuting in different vehicles? Based on this, we recommend:

H2: Urban women's active commuting uses different means of transportation (public transportation, bicycles, and walking), which have a significant impact on the importance of different built environment indicators.

The built environment indicators in the rural (community service facility density, road density, traffic distance, and destination accessibility) have a significant impact on the choice of transportation means (Ao et al., 2020). Suburban women have a higher perceived risk of assault/robbery/harassment when walking at night and feel safer if they walk through commercial and land mixed areas ((Basu et al., 2022; Paydar et al., 2017; Segar et al., 2017; Yang et al., 2018). However, is there any emphasis on different built environments for rural women's active commuting in different vehicles? Based on this, we recommend:

H3: Rural women's active commuting uses different means of transportation (public transportation, bicycles, and walking), which have a significant impact on the importance of different built environment indicators.

B. Research Methods

In order to understand the relationship between urban and rural women’s active commuting use of vehicles and the degree of emphasis on the built environment, this study used the partial least squares method structural equation (Partial Least Squares SEM, PLS-SEM) and the statistical software Smart PLS 3 (Ringle, Wende & Becker, 2015) to estimate the model and analyze it. In the past, the covariance-based structural equation modeling (CB-SEM) was often used as the analysis method, but there are still many limitations in the practical application of CB-SEM (such as normal requirements, large samples), so PLS-SEM has been widely used recently (Chen, 2018). PLS-SEM can be used for prediction and explanation, while CB-SEM is limited to explanation (Hair Jr et al., 2017; Wold, 1974). Both the methods are complementary, not competitive. (Dash & Paul, 2021). After the analysis and comparison of CB-SEM, this study is more suitable for PLS-SEM analysis (see as Appendix). PLS-SEM is a multivariate analysis method for estimating path models with latent variables (Hair et al., 2017; Henseler et al., 2016; Sarstedt, et al., 2011), PLS is reflective and Formative (or a mixture of the two) to construct latent variables for observational indicators, with wider use and less data-restricted characteristics, has become an increasingly common analytical tool in the field of market research and social sciences (Hair et al., 2012). The evaluation of the measurement model in the PLS-SEM model mainly includes indicator reliability, construct reliability, convergent validity, and discriminant validity (Hulland, 1999; Hair, et al., 2014). In the index reliability part, in order to examine the explanatory power of factors, the Standardized

Factor Loading (SFL) of each observed variable (Standardized Factor Loading, SFL) generally reaches at least the threshold of 0.7 (Hair et al., 2014), but in practice, it is indeed not easy to achieve, so Hulland (1999) believes that it can be accepted if it is greater than 0.5 (Chen, 2018). In the combined reliability part, the CR value is between 0 and 1, and the higher the value, the higher the internal consistency. The standard must be greater than 0.7 to be consistent (Fornell & Larcker, 1981; Hair et al., 2014). In convergent validity part, the average variation extraction (AVE) is the degree to which all the measurement variable variations in the potential variables can explain the potential variables, that is, the higher the AVE, the higher the degree to which the potential variables are explained by the variation of the measurement variables. According to the average variation extraction (AVE) value should be above 0.5 to ensure acceptable convergent validity, but if the AVE is higher than 0.5, it means that the factor loading must be higher than 0.7, considering the actual aspect of the data, AVE higher than 0.36 can also be regarded as barely acceptable standard (Fornell & Larcker, 1981). Discriminant validity Compared with traditional evaluation methods (cross-loadings (cross-loadings) and Fornell & Larker criteria), heterotrait-monotrait ratio (HTMT) is superior in recent years (Henseler, et al., 2015; Voorhees, et al., 2016). Henseler et al. (2015) believed that the HTMT confidence intervals between all facets did not contain 1, only when it has discriminant validity, if the HTMT value is less than 0.9, then there is discriminant validity between the two reactive facets (Chen, 2018). In addition, structural fit (structural fit) is about the size of the explanatory power, R^2 (R square) and corrected R^2 (R square adjusted) can explain the variation of potential variables, R^2 will be between 0 and 1, but the threshold does not There is no definite standard. Generally speaking, when the R^2 value is close to 0.25, it can be regarded as a little weak explanatory ability; when the R^2 value is close to 0.5, the model needs to have moderate explanatory ability; when the R^2 value is close to 0.75, the explanatory ability of the model is significant (Hair et al. al., 2014); Furthermore, the influence index (f^2) of exogenous variables on endogenous variables, according to the f^2 value evaluation principle of Cohen (1998), when $0.02< f^2 \leqq 0.15$ is called a small effect, $0.15< f^2 \leqq 0.35$ When $f^2>0.35$, it is called medium effect, and when $f^2>0.35$, it is called large effect (Chen, 2018).

4. RESEARCH ANALYSIS AND RESULTS

Based on the aforementioned indicators for assessing women's active commuting in the built environment, in order to investigate the difference in the importance of the indicators between urban and rural women, in this study, the urban and rural residents of the Taoyuan District were surveyed, as the public transportation MRT system in Taoyuan City, the Airport MRT line, straddles urban and rural areas, and the urban and rural governance in the same city is more consistent. In the ticket price section, the MRT price is roughly $ 3 NT dollars/km (about 0.099 US dollars/km), the bus ticket price is 15-30 NT dollars/route (about 0.5-1 US dollars/route), U-bike rental price is 10 NT dollars (about 0.33 US dollars) per 30 minutes within 4 hours. The average commute time for Taiwanese women is 28 minutes. Sampling frame was established in advance with females over 18 years' old who have the ability to make judgments at Taoyuan MRT A8 Chang Gung Hospital Station (urban) and A15 Dayuan Station (rural) and surrounding bus stops and U-bike (public bicycle) rental stations. Furthermore, a questionnaire survey was conducted with simple random sampling. The number of sample size is determined by the statistics of the Ministry of Communications (2021) in the "Survey on the Status of People's Daily Use of Transportation 2020". Women accounted for 19.3% of public transportation, and 11.7% of pedestrians and bicycles. According to the Ministry of Accounting and Accounting Office (2021), the female population in Taoyuan City in 2020 was 1,144,531, the male to female ratio was 1:1.02, and the population over the age of 18 was 1,867,582. After calculation, the estimated female population in Taoyuan City was 942,128 over the age of 18. Therefore, the number of women over the age of 18 using active commuter vehicles is approximately 292,059. The ratio of the urban population to the rural population in Taoyuan City is 1:0.33, so it is estimated that the urban population of women over 18 years old is about 219,044 active commuters; the rural population is about 73,015. In this study, the sample size formula $n=Z^2 \cdot p(1-p)/e^2$ is used to calculate the sample size of this study, where n represents the sample size, Z represents the level of confidence, p represents the true proportion of the parent population, and e represents the tolerable error. Since the value of p cannot be determined, p=0.5 is set to maximize the value of n. Therefore, this study will adopt a confidence level of 95% (Z=1.96), an allowable estimation error of 6% (e=0.06), and a random sample ratio of 1/2 (p=0.5). It is calculated that about 266 samples are needed for both urban and rural sample sizes. However, considering that there may be invalid questionnaires or refusal to answer, 300 questionnaires were distributed in urban and rural areas from July to

September 2020[1], a total of 600 questionnaires, of which 560 were valid questionnaires, and the effective questionnaire rate was 93%.

The questionnaires were divided into three sections: basic information of the respondents, women's use of transport means in active commuting and the importance women attach to commuting in urban and rural areas. The questions in the questionnaire are based on the indicators of each dimension (as shown in Figure 2) to ask about the degree of importance and satisfaction. For example, in terms of density, it includes public transportation density, residential density, employment density, community service facility density, and leisure and entertainment facility density indicators. Questionnaire questions such as: Do you value the mass transit density here? Are you satisfied with the mass transit density here? The importance level was measured on a five-point Likert's scale, with a scale of 1 to 5, with 1 being "very little importance" and 5 being "very much importance".

A. Results of Descriptive Statistics

It can be seen from Table 1 that in the basic information part of the respondents in urban areas, most of the active commuters are college female students aged 18 to 23, most of them are unmarried, and they mainly live in North Taoyuan. 67% of the commuting vehicles used take the "mass transportation system". In rural areas, most of the active commuters are 46-50-year-old women in the agriculture and animal husbandry manufacturing industry. Most of them are married and have three or more children. They mainly live in South Taoyuan and use transportation most often. Most of the commuting vehicles are "bicycles" with a ratio of 60%. As shown in Table 2, in terms of the extent to which urban women value active commuting in urban and rural areas, safety scored the highest (4.51), followed by street connectivity (4.50) and accessibility (4.43). In terms of the extent to which rural women value active commuting in urban and rural areas, safety scored the highest (4.26), followed by distance to bus stops (4.17) and venue and street design (4.03), as shown in Figure 3. It is worth mentioning that among the indicators of the built environment valued for women's active commuting, "safety" is the primary concern. This is why both urban and rural women consider this indicator to be of high importance. In addition, the importance of "safety" is also ranked first among the relevant indicators by experts. Therefore, "safety" can be the primary indicator for the development of an active commuting environment for women in the future.

Table 1 Descriptive Statistics based on the Questionnaire that surveys Urban and Rural Women's Active Commuting in the Built Environment

ge	Number (Urban Area)	Percentage (Urban Area)	Number (Rural Area)	Percentage (Rural Area)	Occupation/Identity	Number (Urban Area)	Percentage (Urban Area)	Number (Rural Area)	Perc (Rur
18-23	73	26%	34	12%	Student	67	24%	4	[illegible]
24-29	29	10%	36	13%	civil servants and teachers	42	15%	36	1
30-35	30	11%	25	9%	Financial industry	31	11%	37	1
36-40	32	11%	20	7%	Construction industry	6	2%	9	3
41-45	28	10%	29	10%	Electronics industry	4	1%	8	3
46-50	27	10%	38	14%	Service industry	52	19%	23	8
51-55	14	5%	25	9%	Agriculture and Manufacturing Industry	4	1%	72	2
56-60	20	7%	32	11%	Information Industry	6	2%	3	[illegible]
61-65	19	7%	26	9%	Freelance	28	10%	8	3
65 or ove	8	3%	15	5%	Other	40	14%	80	2
on level	**Number (Urban Area)**	**Percentage (Urban Area)**	**Number (Rural Area)**	**Percentage (Rural Area)**	**Average monthly income**	**Number (Urban Area)**	**Percentage (Urban Area)**	**Number (Rural Area)**	**Perc (Rur**
entary r below	54	19%	45	16%	NT$ 10,000 or below	72	36%	143	5
r high	23	8%	9	3%	NT$ 10001-20000	29	10%	35	1
school	55	20%	65	23%	NT$ 20001-30000	34	12%	33	1
college	33	12%	122	44%	NT$ 30001-40000	54	19%	39	1
ersity	95	34%	36	13%	NT$ 40001-50000	31	11%	20	7
e school ove	20	7%	3	1%	NT$ 50001 or above	60	21%	10	4

[1] During this period of time, the covid-19 epidemic in Taiwan is well under control and there is no need to work from home. Taiwan's epidemic situation expanded in May 2021 and entered the third-level strict lockdown. At this time, the situation of working from home began.

l status	Number (Urban Area)	Percentage (Urban Area)	Number (Rural Area)	Percentage (Rural Area)	Number of children	Number (Urban Area)	Percentage (Urban Area)	Number (Rural Area)	Perc (Rur
ried	105	38%	172	61%	0	159	57%	74	2
ırried	115	41%	108	39%	1	36	13%	15	5
ant to lose	60	21%			2	65	23%	16	(
					3 or more	20	7%	175	6
e of ence	Number (Urban Area)	Percentage (Urban Area)	Number (Rural Area)	Percentage (Rural Area)	The most commonly used means of transport	Number (Urban Area)	Percentage (Urban Area)	Number (Rural Area)	Perc (Rur
aoyuan[1]	187	67%	104	37%	Mass transit system	187	67%	53	1
aoyuan[2]	75	27%	113	40%	Bicycle	30	11%	169	6
enous as[3]	18	6%	63	23%	Walking	63	23%	58	2
tal	280	100.0	280	100.0	Total	280	100.0	280	1(

[1] "North Taoyuan" is traditionally dominated by southern Fujianese settlements, including Taoyuan District, Guishan District, Bade District, Daxi District, Luzhu District, and Dayuan District.

[2] "South Taoyuan" was the main settlement area of Hakka in the early days, including Zhongli District, Yangmei District, Pingzhen District, Longtan District, Guanyin District, and Xinwu District.

[3] "Indigenous areas" are aboriginal settlements, mainly cultural revitalization areas.

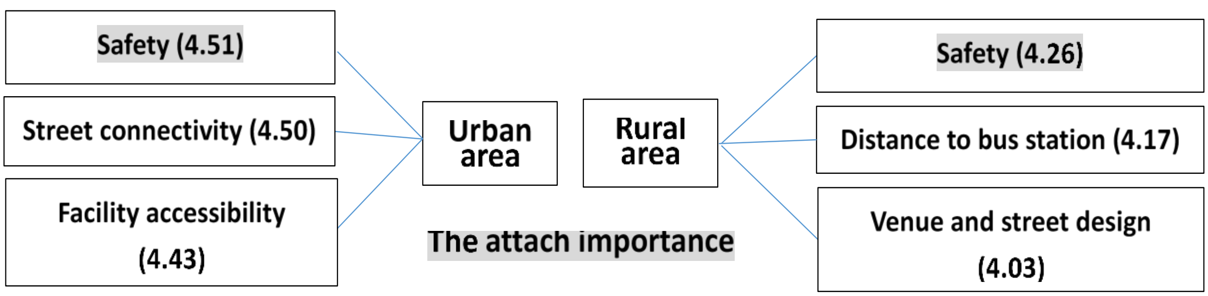


Figure 2. The importance women attach to indicators for assessing vibrant commuting and the built environment in the context of urban-rural differences

B. Difference between urban and rural areas

In order to investigate the importance of the built environment indicators valued for women's active commuting in the urban and rural areas, in this study, independent sample T-tests were used for analysis, as shown in Table 2. It is found that there are significant differences in the use of active commuting transport tools, public transport density, residential density, density of community service facilities, density of leisure and recreational facilities, accessibility of facilities, accessibility of pavements, street connectivity, distance to MRT stations and distance to Ubike, which means that women in urban and rural areas attach different levels of importance to the use of active commuting transport and built environment indicators. So H1 was partially supported. In the future, when planning, the relevant authorities in Taiwan should focus specifically on the above-mentioned indicators, such as the density of public transport in urban and rural areas, which are significantly different, in order to establish appropriate standards and address different needs. In addition, because of the different environments in which rural and urban women live, rural residents attach less importance to the relevant indicators than urban residents, so the relevant authorities should first focus on promoting the concept of active commuting for rural women and the design of related facilities in the built environment.

Table 2. Independent Sample T-Test on Indicators for the Assessment of Active Commuting and Built Environment between Urban and Rural Women

	Category	Average	Standard deviation	T-value	Significance
Means of transport for active commuting (Mass transit, biking, walking)	Urban Rural	1.56 1.91	.836 .705	-5.409	.000***
Mass transit density	Urban Rural	4.2536 3.6750	.84877 1.06664	7.102	.000***
Residential density	Urban Rural	4.4143 3.7964	.69803 .85801	9.347	.000***
Employment density	Urban Rural	2.9393 3.8071	1.11678 .93054	-9.990	.069
Community service facility density	Urban Rural	4.1464 3.9321	.93325 .99048	2.635	.002*
Leisure and entertainment facility density	Urban Rural	4.2286 3.8750	.89877 .78202	4.966	.004*
Mixed use of land	Urban Rural	3.4643 3.6893	1.05349 .97269	-2.626	.297
Facility accessibility	Urban Rural	4.4321 4.0107	.79133 .77360	6.372	.044*
Sidewalk accessibility	Urban Rural	4.2679 3.6821	.85281 1.06880	7.168	.000***
Street connectivity	Urban Rural	4.5000 3.5429	.74776 .91871	13.521	.000***
Parks and recreational facilities	Urban Rural	3.8714 3.9179	2.60917 .75041	-.286	.009
Distance to MRT station	Urban Rural	4.0036 3.7071	.93325 1.03693	3.556	.000***
Distance to bus station	Urban Rural	4.4107 4.1720	.79372 .75606	2.344	.772
Distance to Ubike	Urban Rural	2.7750 3.7214	1.14351 .92413	-10.771	.002*
Green space in the park and green landscaping	Urban Rural	4.0071 3.8714	.77128 .76522	9.846	.473
Venue and street design	Urban Rural	4.1000 4.0321	.86177 .77300	.981	.051
Safety	Urban Rural	4.5107 4.2571	.84239 .83481	-2.325	.079

C. The influence relationship between urban and rural women's active commuting travel mode and the degree of emphasis on the built environment

The results of the analysis (Table 3) showed that the *AVE* values were all above the threshold of 0.5, indicating that the average explanatory power of the constructs was above 50% and that all of them had a degree of convergence. The composite reliability (*CR*) values were all above the threshold of 0.7, indicating that all the constructs had internal consistency reliability. The Cronbach's alpha was also above 0.7. The negative loadings between the variables and the potential variables were all observed to be above 0.5[2], indicating that all the indicators were of medium confidence or higher. In addition, in Table 4, it can be seen that the *HTMT* values for each construct are all less than 0.9 and therefore have discriminant validity. The results of the above analysis show that the measurement models have the threshold and requirements of reliability and validity. The structural model analysis will then be conducted to examine the causal pathways between the constructs.

[2] In terms of the reliability of the indicator, in order to examine the explanatory power of individual factors, the standardized factor loading (SFL) of the observed variables is usually at least 0.7 (Hair et al., 2014), but in practice this is not easy to achieve, so Hulland (1999) suggests that a value greater than 0.5 would be acceptable.

Table 3. Estimation of measurement model parameters

Construct	Indicator	Factor loading	Cronbach's α	Composite reliability (CR)	Average Variation Extracted (AVE)	R^2 (Corrected)
Urban Area						
Density	Mass transit density	0.882	0.763	0.819	0.587	0.349
	Residential density	0.767				
	Employment density	0.614				
	Community service facility density	0.660				
	Leisure and entertainment facility density	0.880				
Diversity	Mixed use of land	0.788	0.997	0.998	0.992	0.253
Accessibility	Facility accessibility	0.677	0.707	0.770	0.664	0.825
	Sidewalk accessibility	0.775				
	Street connectivity	0.794				
	Parks and recreational facilities	0.882				
Distance to public transportation station	Distance to MRT station	0.834	0.844	0.798	0.580	0.972
	Distance to bus station	0.684				
	Distance to Ubike	0.742				
Design	Green space in the park and green landscaping	0.838	0.736	0.850	0.655	0.438
	Venue and street design	0.634				
	Safety	0.689				
Rural Area						
Density	Mass transit density	0.752	0.717	0.831	0.547	0.716
	Residential density	0.862				
	Employment density	0.736				
	Community service facility density	0.666				
	Leisure and entertainment facility density	0.907				
Diversity	Mixed use of land	0.696	0.998	1.000	1.000	0.663
Accessibility	Facility accessibility	0.643	0.718	0.823	0.565	0.785
	Sidewalk accessibility	0.739				
	Street connectivity	0.838				
	Parks and recreational facilities	0.705				
Distance to public transportation station	Distance to MRT station	0.829	0.684	0.752	0.607	0.964
	Distance to bus station	0.827				
	Distance to Ubike	0.614				
Design	Green space in the park and green landscaping	0.858	0.789	0.730	0.582	0.604
	Venue and street design	0.848				
	Safety	0.972				

Table 4. Discriminant validity (HTMT)

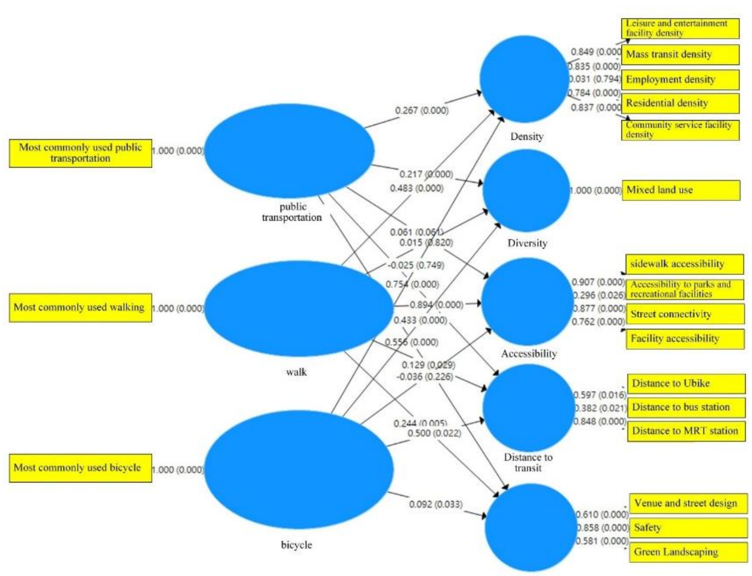
	Public transportation	Bicycle	Walking	Density	Diversity	Accessibility	Dist to tr
Urban Area							
Public transportation							
Bicycle	0.539						
Walking	0.889	0.509					
Density	0.889	0.677	0.822				
Diversity	0.414	0.454	0.449	0.572			
Accessibility	0.678	0.545	0.741	0.296	0.507		
Distance to transit	0.309	0.885	0.829	0.114	0.627	0.321	
Design	0.504	0.410	0.489	0.809	0.354	0.313	0.8
Rural Area							
	Public transportation	Bicycle	Walking	Density	Diversity	Accessibility	Dist to tr
Public transportation							
Bicycle	0.135						
Walking	0.201	0.234					
Density	0.437	0.207	0.599				
Diversity	0.279	0.462	0.045	0.120			
Accessibility	0.262	0.093	0.867	0.877	0.075		
Distance to transit	0.216	0.228	0.751	0.203	0.704	0.016	
Design	0.760	0.247	0.585	0.914	0.452	0.864	0.5

In terms of structural suitability, the R² values (Table 4) reveal that density, accessibility, and distance to mass transit have high explanatory power and design and diversity have moderate explanatory power in the urban and rural women's active commuting in the built environment. Furthermore, from the f^2 values (Table 6), it can be found that for urban areas, public transport → (density, diversity, accessibility and design) is a small effect, public transport → distance to public transport is a large effect; bicycle → (density, diversity, accessibility) is a small effect, bicycle → design is a medium effect, bicycle → distance to public transport is a large effect; walking → (distance to public transport, design) is a small effect, walking → diversity is a medium effect, and bicycle → (walking, accessibility) is a large effect. In urban areas, public transport → (density, diversity, accessibility and design) is a small effect, public transport → distance to public transport is a large effect; bicycle → (density, diversity, accessibility) is a small effect, bicycle → design is a medium effect, bicycle → distance to public transport is a large effect; walking → (distance to public transport, design) is a small effect, walking → diversity is a medium effect and bicycle → (walking, accessibility) is a large effect.

Table 7. f^2 as a useful measure of local effect size

Urban Area			
	Public transportation	Bicycle	Walking
Density	0.08	0.02	0.50
Diversity	0.02	0.09	0.34
Accessibility	0.03	0.04	0.66
Distance to transit	1.721	5.948	0.03
Design	0.12	0.24	0.05
Rural Area			
	Public transportation	Bicycle	Walking
Density	0.10	0.03	0.34
Diversity	0.06	0.24	0.05
Accessibility	0.02	0.07	4.40
Distance to transit	19.32	8.83	0.576
Design	0.523	0.03	0.102

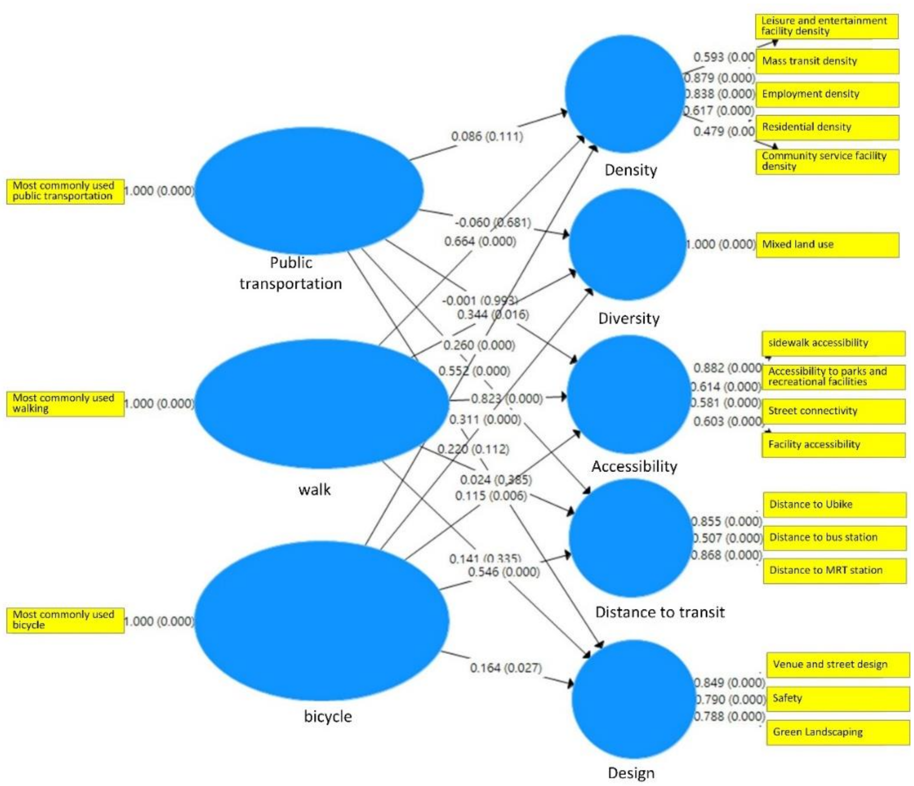
Furthermore, the results of the bootstrapping 5,000-trip analysis were used to assess the model's suitability and PLS-SEM model path coefficients (Dijkstra & Henseler, 2015). The results of the analysis of the PLS structural model paths of urban women's use of transport and the built environment for active commuting are shown in Figure 4. Among the built environment indicators that women valued when using 'public transport' for active commuting, only accessibility had no significant effect, while the rest had a significant effect. For women using 'walking' for active commuting, only diversity had no significant effect, while the rest had a significant effect. When women used 'bicycles' for active commuting, only accessibility and density had no significant effect, the rest had a significant effect. Therefore, when planning and designing the built environment for women's active commuting in urban areas, those involved in public transport-compatible built environment planning should consider density (unrelated to employment), diversity, distance to public transport and design. For pedestrian-oriented built environment planning, density, accessibility, distance to public transport and design should be considered. For bicycle-based built environment planning, diversity, distance to public transport and design should be considered to encourage active commuting by urban women (Fig. 3). So H2 was partially supported.



	Path coefficient (β value)	T-value	P-value
Mass Transit -> Accessibility	0.061	1.857	0.063
Mass Transit -> Diversity	0.217	3.486	0.000
Mass Transit -> Density	0.267	4.881	0.000
Mass Transit -> Distance to transit	0.754	10.498	0.000
Mass Transit -> Design	0.556	8.779	0.000
Walking -> Accessibility	0.894	62.688	0.000
Walking -> Diversity	0.015	0.223	0.823
Walking -> Density	0.483	7.346	0.000
Walking -> Distance to transit	0.129	2.189	0.029
Walking -> Design	0.244	2.800	0.005
Biking -> Accessibility	-0.036	1.217	0.224
Biking -> Diversity	0.433	8.059	0.000
Biking -> Density	-0.025	0.314	0.754
Biking -> Distance to transit	0.500	2.343	0.019
Biking -> Design	0.092	2.149	0.032

Figure 3. Analysis of urban women's use of transport in active commuting and PLS structural model paths for the built environment

The results of the analysis of the PLS structural model paths in the built environment in relation to the means of transport used by rural women for active commuting are shown in Figure 5. Of the built environment indicators that were valued when women used 'public transport' for their active commuting, only distance to public transport had a significant effect, while the rest had no significant effect. Only distance to public transport had no significant effect in relation to design when women used 'walking' for active commuting, while the rest had a significant effect. When women use 'bicycle' for active commuting, there is a significant effect for all indicators. Therefore, when planning and designing the built environment for rural women's active commuting, in the indicator of "public transport", the relevant units should give priority to the distance to public transport and provide more public transport venues to increase women's use of public transport (The current percentage is only 19% as shown in Table 2), and then continue to plan for other indicators after improvement is seen. When planning for the pedestrian-compatible built environment, the relevant units must consider density, diversity and accessibility. When planning for the bicycle-compatible built environment, density, diversity, accessibility, distance to public transport and design must be taken into account. Given the relatively high rate of bicycle use in rural areas (the current percentage is 60% as shown in Table 4), rural women attach great importance to various built environment indicators (Fig.4). So H3 was partially supported.



	Path coefficient (β value)	T-value	P-value
Mass Transit -> Accessibility	-0.001	0.009	0.993
Mass Transit -> Diversity	-0.060	0.402	0.688
Mass Transit -> Density	0.086	1.592	0.111
Mass Transit -> Distance to transit	0.552	17.145	0.000
Mass Transit -> Design	0.220	1.584	0.113
Walking -> Accessibility	0.823	11.864	0.000
Walking -> Diversity	0.344	2.388	0.017
Walking -> Density	0.664	12.833	0.000
Walking -> Distance to transit	0.024	0.848	0.396
Walking -> Design	0.141	0.958	0.338
Biking -> Accessibility	0.115	2.721	0.007
Biking -> Diversity	0.311	4.394	0.000
Biking -> Density	0.260	6.950	0.000
Biking -> Distance to transit	0.546	30.615	0.000
Biking -> Design	0.164	2.241	0.025

Figure 4. Means of Transport Used by Rural Women in Active Commuting & Model Paths Analysis of PLS structures for the Built Environment

5. CONCLUSIONS

This study constructs urban and rural women's built environment assessment indicators for active commuting, and takes the MRT line as an example to explore the relationship and difference in the importance of women's benchmarking in urban areas and rural areas. In addition to planning more in line with actual needs, it is also more important for past planning and research has not yet explored. The results of the questionnaire analysis on the importance of urban and rural women to the evaluation indicators of the built environment for active commuting found that "safety" is the most important development indicator in urban and rural areas. It is consistent with past literature that both urban and rural women's sense of security is more closely related to the built environment, and it is also an important indicator that affects women's travel decisions with dynamic commuter vehicles (Higuera-Mendieta, 2021; Aldred et al., 2016; Börjesson, 2012; Mark & Heinrichs, 2019; Basu et al., 2021). In the part of safety indicators, it can be designed with enough light and effective lighting at night, more surveillance equipment, patrol boxes, emergency call buttons, etc. that women are concerned about. Furthermore, through the independent sample T-test and the partial least squares structural equation to understand the difference and influence relationship between urban and rural women's use of active commuting vehicles and the importance of the built environment, it is found that urban and rural women have different active commuting vehicles and important indicators are described as follows:

In urban areas, women use vehicles most frequently to travel on mass transit systems (67%). The planning of public transportation in conjunction with the built environment must consider density (female who excludes public transportation as a common mode of transportation pays less attention to the employment density of the built environment), diversity, distance to public transportation, and design. Walking fits with the built environment planning must consider density, accessibility, distance to mass transit, and design. Cycling of built environment planning must consider diversity, distance to mass transit, and design in order to encourage urban women to commute vigorously. Furthermore, three active commuting travel mode all pay attention to the "distance to public transportation" and "design". Therefore, planning items such as width, pavement, building design and beauty, and more greening and landscaping should be designed for women to improve the mobility of urban women, because their clothing and shoes may have special needs when walking (such as long skirts or high heels, etc.) and walking or pushing a stroller with young children (Higuera-Mendieta et al., 2021; Sadeghi & Jangjoo, 2022; Nichani. 2021).

Among rural women, bicycles (60%) are the most commonly used means of transportation. Rural women pay less attention to the indicators of the built environment for active commuting than urban residents. Therefore, relevant units should first focus on promoting the concept of rural women's active commuting and the design of related facilities for the built environment. In addition, the distance to public transportation should be given priority, and public transportation sites should be added (the bus stops and Ubike rental stations can be prioritized according to demand planning) to increase the utilization rate of public transportation by women (the current situation is only 19%). In addition to public transport, cycling and walking both value "density", "diversity" and "accessibility". It is the same conclusion as Yang et al. (2018) proposed that the lower density and land use diversity in rural areas will make the total travel distance much higher than that in urban areas. Therefore, mixed land use and diversity are increased. For example, the suburbs can be designed as commercial streets (shopping, coffee shops, restaurants, etc.) in public transportation stations or main streets. Planning is more conducive to women's daily travel, shopping for daily necessities, and social interaction (Basu et al., 2021), which is an important goal for encouraging women to commute in rural areas.

Furthermore, past literature has pointed out that women are more sensitive to mass transit station distance and street connectivity (Chen et al., 2022; Dickerson et al., 2019). According to the analysis results of this study, in addition to safety (design) being the most important indicator for women in urban and rural areas to commute vigorously, the distance to "mass transportation stations" is an important factor that women will consider in both rural and urban built environments index. Active commuting and women's issues are undoubtedly in their infancy in Taiwan, and there is still a lack of prospective research on integration and appropriateness of consideration. This article uses scientific analytical tools to integrate concepts of women, active commuting, and the built environment. It also explores the degree of importance that women attach to indicators and the differences between urban and rural areas. The results of the study hope to provide references for the built environment for active commuting among women in Taiwan with urban-rural differences, so as to better meet the needs of environmental design.

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