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Investigating the Common Perceptual Qualities of Urban Morphology and Subjective Wellbeing Scales for Urban Mobility Studies: A Literature Review.

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ABSTRACT

The impact of the built environment, urban form, and urban morphology on individual's perception, experience and wellbeing has been the focus of many studies in the past few decades. Additionally, the impact of the built environment and its spatial characteristics has been recently studied from different approaches. Literature review shows that various research has been conducted on the impact of the built environment and travelers' behavior and modal choice. However, few studies have been conducted on the impact of the built environment on travelers' perception during mobility. Thus, this manuscript attempts to theoretically establish a link between the epistemology of urban form and morphology, urban mobility and transportation, and subjective wellbeing. A review of the body of literature on urban form, morphology and built environment is carried out. This to identify the main points related to subjective wellbeing which are listed by urban planning and design pioneers. In addition to reviewing literature on transportation, urban mobility, and travel behavior and its relationship with subjective wellbeing. This to highlight the main subjective wellbeing variables that are effective, as long as transportation and urban mobility is concerned. Afterwards, a review is conducted on the field of subjective wellbeing metrics, scales, and schedules. In which each scale is reviewed to identify the fields it was deployed in for further studies. The manuscript concludes by highlighting the subjective wellbeing scales that could be deployed in further studies related to urban form, morphology, built environment characteristics, and urban mobility. The findings could be deployed in further urban studies that target measuring subjective wellbeing in relation to the characteristics of the built environment.

1. Introduction

Urban morphology is a study of cities and the impact they have on their residents (Oliveira 2016, 2022; Conzen 1960). It looks at how urban environment, form, and realm shape the current challenges that urban residents face. These challenges are often complex and multifaceted, ranging from the availability of affordable housing to the quality of air in densely populated areas. It is essential to understand the urban environment from a holistic perspective to address these issues to be able to provide better quality of life and wellbeing.

Overall, urban morphology provides a comprehensive look at both the physical and social aspects of cities. By studying how urban

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mobility and transportation fit into this equation, researchers can better understand how human activity impacts the current state of cities and the challenges that urban residents face (Moudon 2022; Chiaradia 2019; Kirstjansdottir 2019). Ultimately, this research can be used to provide solutions that better serve the needs of all city dwellers. Moreover, urban morphology and the built environment have a great influence on the user experience of residents.

Urban mobility focuses on the experiences of urban residents during the process of transit across the city. This includes understanding how transportation options such as public transit or private automobiles can impact mobility and access to resources throughout the city. It also focuses on understanding how urban form affect travellers' behaviour (Adkins et al. 2012; Masoumi et al. 2019). On the other hand, it also tackles how transportation networks affect urban growth of cities (Dingil et al. 2018). Additionally, examining how people engage with their local environment can reveal areas where resources are needed or where investment can be made to improve quality of life.

Places that are designed to be walkable, with public spaces and access to local amenities can contribute to an improved quality of life by providing opportunities for people to socialize, exercise, and rest (Singleton 2019; Adkins et al. 2012). Furthermore, these environments can reduce travel time perception and make journeys more enjoyable. Research has also demonstrated that urban morphology has an impact on how people perceive places and their satisfaction with them, as well as their sense of belonging and attachment. The built environment also affects the way that people interact with each other, which can positively or negatively influence the user experience (Hajrasoulih et al. 2018). Thus, it is important to consider the influence of urban morphology and built environment on the user experience when designing urban areas. By doing so, cities can create spaces that are enjoyable to use, improve quality of life, and provide a sense of community for their residents.

The relationship between urban morphology, travellers' perception, and subjective well-being scales is of a great importance for urban planning. Urban morphology or the city form is defined as the physical structure and arrangement of a city, according to the renowned urbanist Kevin Lynch. The concept of "lived space", as proposed by Le Febvre (Kroesen et al. 2017; Fuchs 2019; Lefebvre 2004), has been used to identify how residents experience their environment. In this regard, (Cervero and Kockelman 1997) have discussed that the level of both physical activity and satisfaction among residents with their neighbourhoods are related to the physical form of the city. Moreover, travellers' perception is also an important factor in this relationship. Some studies shows that travellers have a higher subjective well-being scale when they have access to areas with more complex shape, diversity, and richness than when they interact with regular shapes (Ewing and Cervero 2010; Manville 2017; Rodrigue 2020). Understanding how people interact with their environment is key to providing solutions that best meet their needs. Therefore, understanding how urban morphology influences travellers' perception and subjective well-being scales can provide essential information for urban planners to create better cities.

2. Methodology

The methodology adopted in this manuscript consists of four phases (See Figure 1). First phase in which the primary focus of this review is to explore how the pioneers of urban planning and design tackled the following topics: urban morphology, urban mobility, and transportation. This literature review discusses a range of urban planning concepts theories. Multiple databases have been utilized, including academic journals, books, and relevant websites. Then the methodology proceeds with the second phase which highlights, identifies, and delineates the perceptual qualities implied in different urban design theories and concepts. In addition to highlighting the perceptual qualities implied in the topic of urban mobility, travel, and transportation. Afterwards, it discusses the Subjective Wellbeing Being scales and their attributes. The third phase of the methodology attempts to link between the perceptual qualities extracted from reviewing literature on urban design theories and concepts, and the perceptual qualities which are tackled by different psychometric scales. The literature review manuscript is conducted in a narrative manner while following a line of argument. This line of argument attempts to link the perceptual qualities of urban morphology during mobility to the existing subjective wellbeing (SWB) scales. This highlights the most suitable SWB scale to be deployed in further urban studies and analysis, which is further elaborated in the fourth phase of the adopted methodology.

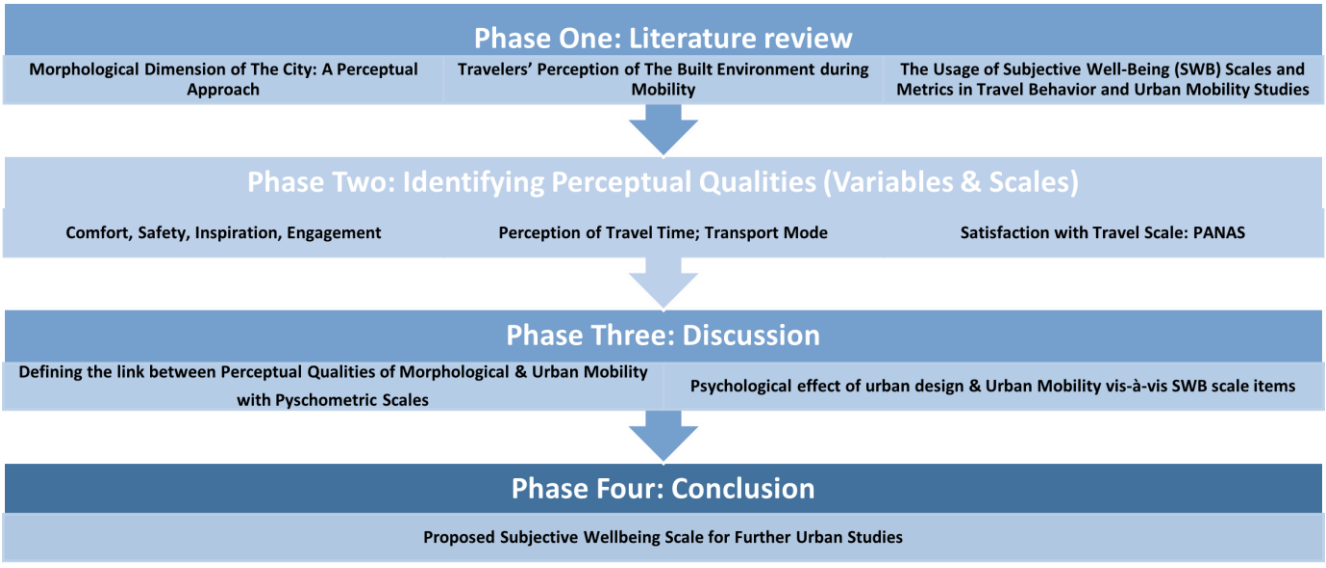

Figure 1 Literature Review Methodology (Source: Author)

3. Literature Review

The literature review is divided into four sub-sections to facilitate the introduction of the study of urban morphology, travel and urban mobility, and wellbeing in the transportation planning area, and to investigate the body of literature existing that deal with urban morphology, travel behaviour and wellbeing separately. A review of earlier studies of pioneer scholars on urban morphology and its influence on human beings is first conducted. Then, a brief theoretical overview of the existing body of literature on studying wellbeing of people, followed by a review of some general studies on wellbeing and transportation and mobility. Then, a summary of the most important results found in the literature regarding transportation and urban mobility, and wellbeing. Finally, this manuscript concludes with summarizing results obtained from reviewing literature; identifying gaps in the literature review; and exploring potentials of establishing a link to fill this gap.

This literature review focuses on scholars who focused on behavioural urban design: which generates its value, codes, and methods from a study of how human beings live and behave. Some of those scholars are: Camillo Sitte, Jane Jacobs, Kevin Lynch, William Whyte, and Gordon Cullen. The purpose of this manuscript is to understand how the built environment shapes the experience of the citizens and their perception, it is essential to understand how to explore, understand and explain the citizens' subjective wellbeing, which is quietly related to how they perceive the city.

3.1. Morphological Dimension of The City: A Perceptual Approach

Many scholars have studied perceptual properties since the late twentieth century. Scholars of urban design and planning have examined the relationship between the city and human perception. Some scholars approached this issue from many perspectives, such as perception of city elements and components, perception of the rhythm of the city while moving, perception of time in the city, and so on.

Urban morphology and built environment characteristics shapes the experience of the city residents, influence their behaviour, and impacts their perception (Lynch 1976, 1960; Appleyard et al. 1965; van Coeverin et al. 2016; Sarkar et al. 2013; Alhadeff-Jones 2019; Simonsen 2005; Lefebvre 2004).

In his book, City Planning According to Artistic Principles, Camillo Sitte outlines several important considerations for those designing urban spaces (Collins et al. 2015). First, he argues that public squares and streets should be designed to be beautiful and pleasant, rather than functional. Second, he believes that cities should be designed to reflect the culture and values of their inhabitants. Third, he argues that city planning should consider the psychological effects of the urban environment on its residents. Fourth, he argues that urban spaces should be designed to promote social interaction and community life. Moreover, he believes that cities should be designed to be accessible and convenient for all residents. Most importantly, he argues that city planning should consider the psychological effects of the built environment on its residents (cited in (Collins et al. 2015)).Finally, he believes that the art of city planning should be used to create a harmonious and beautiful urban environment.

According to Sitte (1889) (cited in (Collins et al. 2015)), the crucial part of the city is not the architectural shape or form of buildings, yet it is the intrinsic create nature of urban spaces, where the whole of the city is more than the sum of its parts. He further argues that urban planners in the twentieth century focused on 2-D planning and disregarded the vertical dimension of planning a city. He further implies that the result affected the efficiency of the city as a place of aesthetical quality. Sitte further investigates the spatial architecture of cities, squares, and monuments, and compares the qualities of the ancient cities with the stagnant new cities. He further studied the perception of proportions between monuments and their surroundings from a psychological standpoint, opposing the manner of very wide streets and squares. He furtherly argues that the dogma of orthogonality and symmetry might lead to pragmatic urbanism. He further implies that this pragmatic urbanism is devoid of any artistic qualities (Collins et al. 2015).

Lynch (1976) defines time as a “biological rhythm” that differs from that of the objective timepieces (i.e., clocks, watches). According to Lynch, Time and Place is a mental continuum as fundamental as spacetime, time and place may be the fundamental to the existence of the material universe. Lynch's research focuses on how this intrinsic sense influences how humans perceive and change the physical environment, especially in cities. Given a set of social patterns, he argues that physical characteristics and patterns impact people. He goes on to suggest that understanding the city's overall structure requires an examination of these physical factors. Lynch emphasises, however, that these studies should be tied to a single environment. Lynch contends that the influence of physical city features is closely tied to a single cultural setting. He also examines the dangers of attempting to develop cross-cultural theory that addresses the influence of physical characteristics on human perception. He emphasises how this could impose the values of one context on another.

In his book, Unwin (1909) “Town Development in Practice” takes a more practical approach to city planning. He was a town planner who worked on several noteworthy projects, notably Letchworth Garden City. According to Unwin, city planning is about building a liveable and appealing urban environment, not merely the layout of streets and squares. Unwin offers eight basic principles of city planning in his book “City Planning: A Theoretical and Applied Analysis”. This manuscript is not delineating those principles extensively. However, it focuses on one of the principles that supports the adopted argument. One of the essential principles the Unwin discusses is the negative psychological impacts of noise on the user. This principle is in support for the argument of this manuscript. Since it highlights the importance of the perceptual qualities of urban spaces, forms, and morphology.

Cullen (1961) developed a theory and approach to urban visual analysis. His theory was drawn upon psychology of perception, in which human perceptions of time, space, and visual stimulators was the main factors of his theory. He introduced the concept of the townscape, which delineated the relationship between the physical qualities of the city and psychological aspect of the people. Townscape,

according to Cullen, is the pattern of the city's architecture, which includes roads, streets, trees, and other environmental components. The Townscape is one method for identifying a city's physical shape using tangible imagery. A townscape can also be identified by the pattern of the buildings and roadways, which provokes a variety of feelings in the viewer. The shape and mass of the structure have influence on the physical form of urban space. From the psychological and physical perspective, the viewer perceives the relationship between the physical configuration of the urban environment and the size of the building mass. Subsequently, the viewer perception of such urban environment influences his overall wellbeing.

Cullen (1961) implies that values should be incorporated into urbanism so that people can emotionally experience an enjoyable, pleasant, liveable urban environment through their psychological and physical senses (Xu et al. 2021; Hajrasoulih et al. 2018; Cullen 1961). He introduces four concepts: serial vision, place, content, and functional tradition. He further elucidates that human perceive the surroundings first through their optical sense. Thus, he introduces the concept of serial vision, where the city is portrayed as unveiling itself in “a series of twitches or disclosure”. Serial vision, according to Cullen, is described as the visual images that a viewer experiences when travelling from one position in an area to another. He further links the concept of serial vision with psychological perception of the people. From that perspective, Cullen’s description of serial vision implies a movement in the city, which this paper attempts to explore further in the following sections.

Place, the concept in which (Cullen 1961) delineates as how we locate and perceive ourselves in relation to our surroundings. According to Cullen, people own places based on how they feel in them. He further elucidates that when one sits on a cliff’s edge, one be will acutely aware of his surroundings. While when one sits at the end of a long tunnel will be aware of the cave’s enclosing boundaries. The place is shaped by its boundaries, which further influences the psychological status and perceptual qualities of human beings.

Appleyard et al. (1965) in “the view from the road” investigates the relationship between street design and the social lives of its users. He further elucidates that the design of streets can have an impact on its users’ quality of life. Appleyard argues that streets intended for heavy car traffic inhibit social interaction among neighbours, but streets designed for pedestrians and bikers encourage a sense of community and social relationships. Moreover, he elucidates that the physical architecture of streets can have an impact on citizens' safety and well-being. For example, roadways with large lanes and high-speed restrictions may increase the chance of accidents, whereas streets with narrower lanes and lower speed limits may be safer for walkers and bicyclists. Appleyard did not delineate the proper width for what he considered a “Liveable Street” or a safe street. However, his argument was drawn upon the fact that the physical design of streets should prioritize people over cars, which in turn makes streets safer, more pleasant, and more convivial to social interaction.

Thus, (Appleyard et al. 1965) established a link between street design and its characteristics, and the safety and well-being of the users. However, Appleyard’s studies were conducted in a comparative analysis between different cities, pinpointing the influence of street design on some qualitative aspects such as: liveability of the street, social interaction, safety, and well-being. However, the intrinsic perception and subjective well-being of the users was not measured according to psychological metric or scales.

Jacobs (1961) argues that the design of streets is an essential factor which contributes to the health, liveability, and vitality of cities. She argues that streets should be planned to be safe, liveable, and appealing for pedestrians. She elucidates that this can be achieved by placing a variety of uses in proximity to one another (i.e., residents, shops, workplaces). She further argues that streets should be planned, designed, and established to create a sense of community and social interaction. She delineates that this can be accomplished through diversity in the social, socio-economical, and cultural aspects of the people. She elucidates that this mix deters crime and creates a sense of safety in cities.

According to (Appleyard et al. 1981) and (Jacobs 1961), streets should be planned, designed, and established to prioritize people over cars, pedestrians over vehicles. They both argue that essential feature of liveable streets is mix of uses, and physical street design that encourages social interactions. (Jacobs 1961) furtherly argues another essential feature for a liveable city is diversity of population in the city.

Additionally, (Jacobs 1961) elucidates the qualities of a liveable and safe street: short blocks, density, aged buildings. According to her, streets with shorter blocks provide a sense of enclosure and make it simple for people be attentive to the street and its users, which in turn creates a sense of safety. She further delineates that streets should be densely populated, since this creates a sense of community and increases the number of people attentive to the street and its users as well. This in turn contributes to the overall sense of safety. (Jacobs 1961) further discusses that aged buildings which have been amended through time, are more interesting, appealing, stimulating than new buildings. She delineates that this fosters the sense of community, social interaction. While it also creates a pleasant overall experience of the city.

Trancik (1986) formulate his theory of urban design which emphasize the importance of finding lost space. He argues that by doing so, it can help to create a more liveable environment for the citizens living within cities. He further argues that by utilizing the existing infrastructure of contemporary cities, and by examining different approaches to urban design, we can create a more vibrant and attractive city. According to Trancik (1986), an effective urban design should focus on providing more access to public transportation and green spaces, as well as developing a way to integrate the culture of a city into its physical form. He believes that by using these strategies, cities can become more prosperous and enjoyable places to live. Trancik's theories of urban design provide a useful framework for both urban planners and architects to consider when developing their work. His ideas promote a more holistic approach to urban design and suggest ways in which we can find lost space and bring new life into our cities.

Benedikt (1979) defines the environment as a collection of visible surfaces in space. He states that “An isovist is the set of all points visible in space and with respect to an environment from a certain vantage point”. The size and shape of an isovist might alter depending on its position. Some prominent size and shape traits are quantified using numerical metrics. These metrics yield a set of scalar isovist

fields. An alternate description of habitats is formed by sets of isovists and isovist fields. The method appears to be applicable to behavioural and perceptual investigations in architecture, particularly in view control, privacy, 'safety,' and dynamic complexity and spaciousness judgements (Batty 2001; Othman et al. 2019).

Table 1-**An overview on the Literature Works in Urban Design That Tackles Perceptual Qualities of the Urban Realm (Physical Perceptual Qualities; Psychological Effect; and Implied Psychological Status). (Source: Collected, deducted, and outlined by Author from publications for the listed scholars)**

Scholar	Book/Theory	Principles	Variable/Dimension	Physical Perceptual Effect	Psychological Effect	Implied Psychological Status
Camillo Sitte, 1889	City Planning according ot Artistic Principles	The aesthetics of the city and its urban form	Psychological aspect of human beings	The overall perception of the urban space. (Squares, monuments, public buildings…etc)	Inspiration from the artistic characteristics of the city's urban form.	Inspiration
Raymon Unwin, 1909	Town Planning in Practice	Buildings shaping the streets are becoming almost as continuous walls defining the street boundaries.	Physical Boundaries of streets. Psychological aspect of human beings	Disturbance, Comfort…	Disturbance/Comfort	Comfortness
		Psychological impacts of noise.				
Kevin Lynch, 1960 (a)	The Image of the City	Perception of City Elements.	Nodes	Elements of the city which impacts the perceptual qualities of the users (Nodes, Edges, Landmarks, Districts, Paths)	Attentiveness and inspiration from the Rhythm of the city as a function of perception of urban elements.	Inspiration
			Edges			Engagement
			Districts			
			Landmarks			
Kevin Lynch, 1960 (b)	The Good City Form	Vitality	Sense: How the city can be perceived and identified.	People's perception of the city.	Behavioural Effect	Engagement
		Sense	Fit: the mutual relationship between the place and the user behaviour and how each of them affects the other.	How people's behaviour is influenced by physical aspects of the space & Vice Versa.		
		Fit				
		Access				
		Control				
		Efficiency and Justice				
Jane Jacobs, 1960	The Death and life of Great American Cities	Street design should prioritize people over cars.	Mix of uses	Safety	Safety	Comfortness
		Liveable streets are streets of mix of uses, diverse population, and safety, social interaction.	Diversity of population		Social interactivity	Engagement
			Short blocks~safety			
			Density			
			Aged Building			
Gordon Cullen, 1961	The Concise Townscape	Links the psychological aspect of the people with the city's physical aspect.	Serial vision	People's feelings are provoked by Townscapes characteristics.	Sense of wonder	Inspiration
		How the pattern of the buildings and roadways influences the psychology of people.	Place	Surroundings shape human's emotions and entice people to move and explore, while fostering a sense of wonder, excitement, and tranquillity	Excitement	Engagement
		Psychological perception of the people	Content		tranquillity	Comfortness
			Functional tradition			Activeness

Kevin Lynch, 1976	What Time is this Place?	- How this intrinsic sense influences how humans perceive and change the physical environment, especially in cities.	Perception of time & Space	Human intrinsic sense of time and space	Rhythm	Inspiration
		- How physical characteristics and patterns impact people.	Physical characteristics of cities & its Impact on People.		Visual Engagement	Engagement
		- He delineates the dangers of attempting to develop cross-cultural theory that addresses the influence of physical characteristics on human perception.	Degree of imageability, visual clarity, legibility.			
Donald Appleyard, 1981	The View from the Road	Physical design of the streets influences the liveavility of the street, social interaction, and safety and well-being	Physical characteristics of the streets: street width and traffic speed.	Social interaction	Safety	Safety
				Safety	Well-being	Comfortness
				Well-being		
Roger Trancik, 1986	Finding Lost Space: Theories of Urban Design	Linking sequential movement	Exterior landscaping as a link directly movement	Interaction of human beings with the surrounding landscape, urban wall frontage.	Rhythm	Inspiration
						Comfortness
		Lateral enclosure & Edge continuity	Continuity of urban wall frontage.		Rhythm, Comfort,	Engagement
			Urban wall height			
			Integration of two functions in one form			
		Integrated Bridging	Continuous of sequential line of sight			
		Axis & perspective	Patterns of public space usage.		Inspiration, comfort	
		Indoor/ outdoor fusion				
					Inspiration, Activity	
Michael Benedikt, 1979	To Take Hold of Space	An isovist is the set of all points visible in space and with respect to an environment from a certain vantage point.	Visibility of urban spaces	View Control Safety		Comfortness
				Dynamic Complexity		Engagement
				Spaciousness Judgements		Inspiration
Henri Le Febvre, 1985	Rhythmanalysis	Rhythmanalysis: Rhythm can be defined as movements and differences in repetition, as the interweaving of concrete times, but it always also implies a relation of time to space or place	Rhythms and patterns of the built environment	Inspiration and engagement because of the city's rhythm.		Inspiration
			Rhythms of work and leisure.			Engagement
			Rhythms of movement through the environment.			
			Rhythms of social interactions within the environment.			

3.2. Travelers' Perception of The Built Environment during Mobility

Many scholars tackled the impact of the built environment on the traveller's travel behaviour and choices. However, from the position of urban planning and design, the topic of the impact of built urban environment on the traveller's subjective perception is still under investigation. The impact of the built environment, its characteristics, form, and height on the overall travel experience is the focus of this paper. The travellers as commuters travel through urban corridors, streets, and paths which has different geometrical qualities, intensities and rhythm which impacts their perceptual qualities.

According to Unwin (1909), Buildings shaping the streets are becoming almost as continuous walls defining the street boundaries. Today's cities & streets do not differ from what Unwin described earlier in the beginning of the twentieth century. Those continuous walls represented as rhythm of repetitive or distinctive features of the built environment (i.e., Building Facades with distinctive quality, proportions, or impression).

The term Rhythmanalysis, as first coined by Henri Le Febvre in 1981, is a method of analysing the rhythms and patterns of everyday life to understand how space is produced and experienced. Lefebvre delineates "Rhythmanalysis" as a method of understanding how space is produced and experienced (Lefebvre 2004; Fuchs 2019). It is a way of studying the rhythms and patterns of everyday life, such as the rhythms of work and leisure, the rhythms of the built environment, and the rhythms of social interactions (Simonsen 2005; Alhadeff-Jones 2019; Kroesen et al. 2017). Lefebvre argues that these rhythms are not just a result of natural processes but are also shaped by social and political forces. Moreover, (Lefebvre 2004) views rhythm as being fundamentally linked to notions of time, particularly repetition. It may be observed in how our towns and cities operate, in urban life, and in how people move across space. Similar to how our bodies' and society's rhythms collide on natural biological and social timeframes, the study of rhythms offers a unique perspective on the issue of daily existence. Lefebvre reframes a variety of themes—including the thing, the object, living in an urban or rural setting, the function of the media, political discipline and the idea of dressage, music, and others—using the idea of rhythm (Simonsen 2005; Alhadeff-Jones 2019; Kroesen et al. 2017). Le Febvre further argues that the built environment is not just a physical reality, but also a social construct that reflects the power relations within a society. He further explains that when studying all the previous aspects, scholars can gain a deeper understanding of how the built environment is produced and experienced. This manuscript attempts to highlight, explore, and investigate the perceptual qualities implied in the concept of "Rhythmanalysis". Specifically, during mobility, transit and moving along urban corridors and streets.

According to Le Febvre, as cited in (Simonsen 2005), he states "Rhythm can be defined as movements and differences in repetition, as the interweaving of concrete times, but it always also implies a relation of time to space or place". Le Febvre explores the he rhythms of the city, resembled in the rhythms of traffic, the rhythms of daily life, the rhythms of work, and rhythm of leisure (Aboutorabi and Wesener 2010; Kroesen et al. 2017). He further implies that the built environment is not a neutral, objective reality, but a social construct that reflects the relations of power and domination within a society. By analysing the rhythms of the built environment and how they shape social interactions and experiences, we can gain insights into how urban spaces are produced, the power relations they reflect and how they can be transformed to better serve the needs of all members of society.

As previously discussed, the concepts and theories of the pioneers and scholars of urban design implied various perceptual qualities in their proposed principles. Those perceptual qualities as previously discussed could be listed, but not in an exhaustive manner as follows: safety, comfort, engagement. This implies the need to identify a link between the impact of the morphological dimension of the urban environment, urban mobility, and the Subjective wellbeing metrics and scale. This to develop a framework that would be further replicated in different context. Since the subjective wellbeing scales and metrics needs to be test, recalibrated, and verified for different context. Although there are several scales and metrics to measure SWB & feelings, the topic is still under investigation, specifically when urban environment, built environment and urban mobility is concerned. This manuscript attempts to explore, delineate, and assess these measures. In order to decide which scale would be suitable for further analysis in urban planning studies. And to furtherly explore any further requirements to be able to deploy such scales and metrics.

3.3. The Usage of Subjective Well-Being (SWB) Scales and Metrics in Travel Behavior and Urban Mobility Studies:

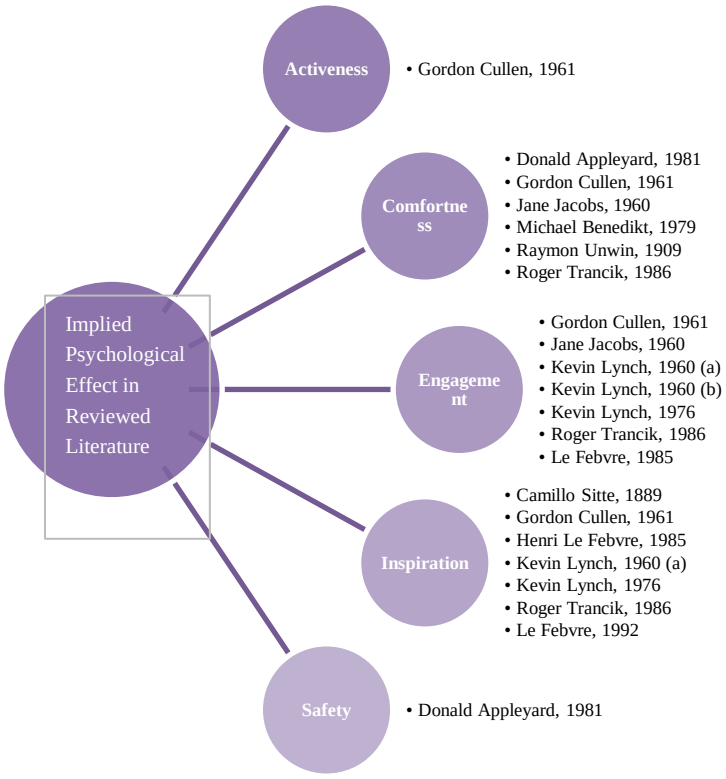

Figure 2 Perceptual qualities extracted from literature review on urban design theories (Source: Author)

A brief review on psychological literature shows that the concept of wellbeing is tackled philosophically from different approaches: hedonic approach; and eudaimonic approach (Waterman 1993; Pereira et al. 2015; Mars et al. 2022).

According to the hedonic approach, humans attempt to optimise their pleasure experiences by satisfying preferences and minimising suffering in order to improve their fulfilment in terms of happiness (Nordbakke and Schwanen 2014; Mars et al. 2022). The hedonic approach describes the enjoyment-discomfort continuum of human experience. Hedonic enjoyment can be measure through positive affect and the pursuit of pleasure in life. It is often associated with materialistic possessions (i.e., materialistic objects) and other forms of external gratification (i.e., opportunities) that people seek to enhance their happiness. While on the other hand, hedonic discomfort is measured through understanding the negative affect. This negative affect is usually emerges when one does not possess certain materialistic possessions (Waterman et al. 2008). On the contrary, eudaimonic approach considers happiness of individuals as coming from within. According to eudaimonic approach, which wellbeing is achieved when individuals live in accordance with their value system, otherwise, individuals will be in a state of discomfort (Waterman et al. 2008; Waterman 1993; Martela and Sheldon 2019).

Literature review on psychological wellbeing shows that scholars have questioned the true nature of wellbeing: is it an objective phenomenon or subjective one. According to (Nordbakke and Schwanen 2014), wellbeing can be both, objective and subjective. From one side, hedonic approach, as earlier discussed, depends on one's own perception, experience, and possessions (i.e., external factors) on which their evaluation is based. In this case wellbeing is 'subjective' since it is subjective to external factors (i.e., Subjective Wellbeing). While eudaimonic approach is based on the fact that one's own wellbeing is objectively based on his/her own values, goals and objectives (Ryan and Deci 2001; Mars et al. 2022).

Thus, since this paper studies the influence of external factors on individual perception and wellbeing, the hedonic wellbeing approach is adopted in this manuscript. In which subjective wellbeing is studies through different methods. Some of these methods are Satisfaction with Life Scale, Positive and Negative Affect Scale, Satisfaction with Travel Scale, and Flourishing scale (Diener et al. 2022; Diener et al. 1985; Chatterjee et al. 2020). These methods will be further elaborated in the next sections.

The usage of Subjective Well-Being (SWB) Scales in travel behaviour and travel perception in urban mobility has been increasingly studied in recent years. This is due to the growing awareness of the importance of the quality of life for city dwellers and the need to understand how different aspects affect this quality. SWB Scales have allowed researchers to measure satisfaction with travel, which is an important component of urban mobility. These scales have also been used to better understand how people adapt their travel behaviours according to the available resources and their needs. Moreover, they have provided valuable insights into how people perceive their

environment when travelling and how this affects their subjective well-being. Therefore, SWB Scales are essential tools to obtain a comprehensive view of urban mobility, travel time perception and related travel behaviour in order to improve the quality of life in cities.

When investigating the metrics and scales of subjective wellbeing and how to measure it, it was found that various scales are deployed in the field of psychology and cognitive theory (Table 2). This manuscript discusses some of these metrics and scales, and further elaborate more on how to deploy these scales in the field of urban design and planning. These scales ranges from measuring the overall satisfaction level of humans, measuring the positive and negative affect scales of specific experiences, measuring satisfaction of travel experience, and measuring the psychological wellbeing.

Table 2- An overview of Subjective Well-being Scales in the field of psychology and cognitive theory. (Source: collected from (Diener et al. 1985; Watson et al. 1988; Diener et al. 2010; Ettema et al. 2011; Esalas et al. 2021); Vastfjall, D. et al. 2002; Ryff et al. 2007)

Metric/scale	Scholar	Scale Items (What it measures)
Satisfaction with Life Scale (SWLS)	Diener et al. (1985)	Living Satisfaction Purpose in life Hope
Positive and Negative Affect Scale (i-PANAS)	Watson et al. (1988)	Positive Affect: Negative Affect:
Flourishing Scale	Diener et al. (2010)	Competence Relatedness Self-Acceptance
Satisfaction with Travel Scale (STS)	Ettema et al. (2011)	Negative activation- Positive deactivation: hurried, worries, stressed/ relaxed, confident, calm. Negative deactivation – positive activation: tired, bored, fed up/ alert, enthusiastic, engaged. Cognitive evaluation: Travel was worst/best Travel was low/high standard. Travel worked well/poor
Swedish Core Affect Scale (SCAS)	Vastfjall, D. et al. (2002)	Peppy, Energetic, active, dull, quiet, passive, pleased, Glad, harmonious, depressed, in a bad mood, sad, optimistic, in a good mood, enthusiastic, tired, faint, bored, calm, relaxed, serene, nervous, tense, stressed.
Psychological Wellbeing Scale (PWB)	Ryff et al. (2007)	Autonomy items Environmental mastery scale items Personal growth scale items.

One of the most significant notions in positive psychology is subjective well-being. It is the subjective perception and experience of good and negative emotional responses, as well as global and specific cognitive assessments of life satisfaction. Thus, Satisfaction with Life Scale has been developed by (Diener et al. 1985) to measure the overall satisfaction with life. "A person's cognitive and affective evaluation of his or her life" have been characterised as "life satisfaction" (Diener et al. 1985; Diener et al. 2022). Living satisfaction, purpose in life, and hope are some of the most essential aspects influencing an individual's thoughts and sentiments in dangerous situations. Furthermore, these characteristics influence how the current situation, and the future are assessed if the risk persists for an extended period and people's quality of life begins to degrade.

Recently in the last two decades, another scale was developed to measure one's needs for competence, relatedness and self-acceptance. (Diener et al. 2010) developed this scale "Flourishing Scale", which is composed of 7-point Likert scale on 8 questions as follows: I lead a purposeful and meaningful life ____ My social relationships are supportive and rewarding ____ I am engaged and interested in my daily activities ____ I actively contribute to the happiness and well-being of others ____ I am competent and capable in the activities that are important to me ____ I am a good person and live a good life ____ I am optimistic about my future ____ People respect me.

Ettema et al. (2011) developed the Travel Satisfaction Scale (STS), a 9-item scale to assess subjective well-being connected to travel. This scale measures overall satisfaction with travels and is based on two categories of subjective well-being, cognitive and affective, and refers to the whole trip experience with different travel modes rather than each part of it (Esalas et al. 2021; Ettema et al. 2012). The STS items assess emotional well-being (Ettema et al. 2011) are based on the Swedish Scale of Central Affect (SCAS; Gärling, 2007) and the

Russell model's Scale of Central Affect (1980; 2003). This approach is based on two dimensions of affect: Activation and valence. The degree of stimulation of the person by stimuli from the environment, which stretches on an activation-deactivation continuum, is referred to as activation. While valence is the individual's judgement of those affects in terms of positive to negative. It is founded on the premise that trip satisfaction may be a measure of subjective well-being in a certain domain (travel) (Ettema et al. 2011; Esalas et al. 2021).

This study which was carried out by (Ettema et al. 2011) was based on the concept that shifting from car to public transport impacts the satisfaction with travel, and as a result, contributes to the overall satisfaction with daily activities and life. Thus, this scale serves as a very efficient, reliable, and concrete system when measuring satisfaction with different travel modes experience. However, this manuscript attempts to find a scale that can measure satisfaction of users towards the overall urban mobility experience. This entails measuring their satisfaction the overall experience resembled in the surrounding built environment, mobility mode, and urban morphology altogether. Accordingly, there was a need to explore, find, and delineate a scale that could be deployed to measure the overall urban mobility experience.

To conclude, the previous discussed wellbeing scales and methods were deployed in the field of transportation and mobility to understand the influence of transportation and mobility services and transport externalities on individuals' perception and experience. While they are rarely deployed to understand the influence of urban morphology, urban form and built environment on individuals' perception, experience, and overall wellbeing during mobility. Thus, the next sections explore, discuss, and assess the suitability of each wellbeing scale to be further deployed to measure the influence of urban morphological variables on individuals' wellbeing, specifically during mobility.

Travel behaviour studies are an important way of understanding the impacts of transportation systems on user satisfaction and well-being. To measure such impacts, it is necessary to use metrics that capture both the positive and negative aspects of travelling. Two of the most widely used well-being metrics applied to travel behaviour studies are the Satisfaction with Life Scale (SWLS) and the Positive and Negative Affect Scale (PANAS). The SWLS captures a person's general satisfaction with life, while the PANAS measures both positive and negative emotions associated with travelling. Additionally, researchers have developed the Satisfaction with Travel Scale (STS) to measure people's satisfaction with their travel experiences. This scale consists of items that measure aspects such as cost, convenience, comfort, reliability, and safety. Taken together, these three metrics provide an effective tool for measuring user satisfaction with respect to travel behaviour studies. They can be used to assess overall user satisfaction with transportation systems as well as identify areas for improvement in order to enhance the overall user experience.

Furthermore, with the advancement of digital technologies, researchers can collect and analyse data more accurately and efficiently than ever before. For instance, in a recent study, the Swedish Core Affect Scale and the Psychological Wellbeing Scale were used to measure psychological wellbeing to study how it affects travel behaviour. The results of the study clearly demonstrated that greater levels of psychological wellbeing are linked to increased levels of flourishing when it comes to travelling. People who were high in psychological wellbeing showed higher levels of satisfaction with their trips and a greater sense of purpose than those who were lower in psychological wellbeing. This research therefore highlights the importance of understanding how psychological wellbeing can influence travel behaviour, and sheds light on potential benefits for individuals as well as society.

4. Discussion

As previously discusses, the analysis of the body of literature on urban design, urban form and the built environment shows that it is quietly attributed to many perceptual qualities related to the user experience, and not only related the physical qualities of the space. The literature review also shows that a vast amount of research has been conducted on the perception, satisfaction, and wellbeing of the users in specific domains (i.e., transport and mobility). Thus, it is imperative that more studies are to be conducted in attempt to link between the measures of subjective wellbeing during the whole process of mobility. This process that includes movement, scenery of the urban context in motion, and the impact of the physical context during mobility (Confined corridors, continuous/discrete urban blocks…etc.).

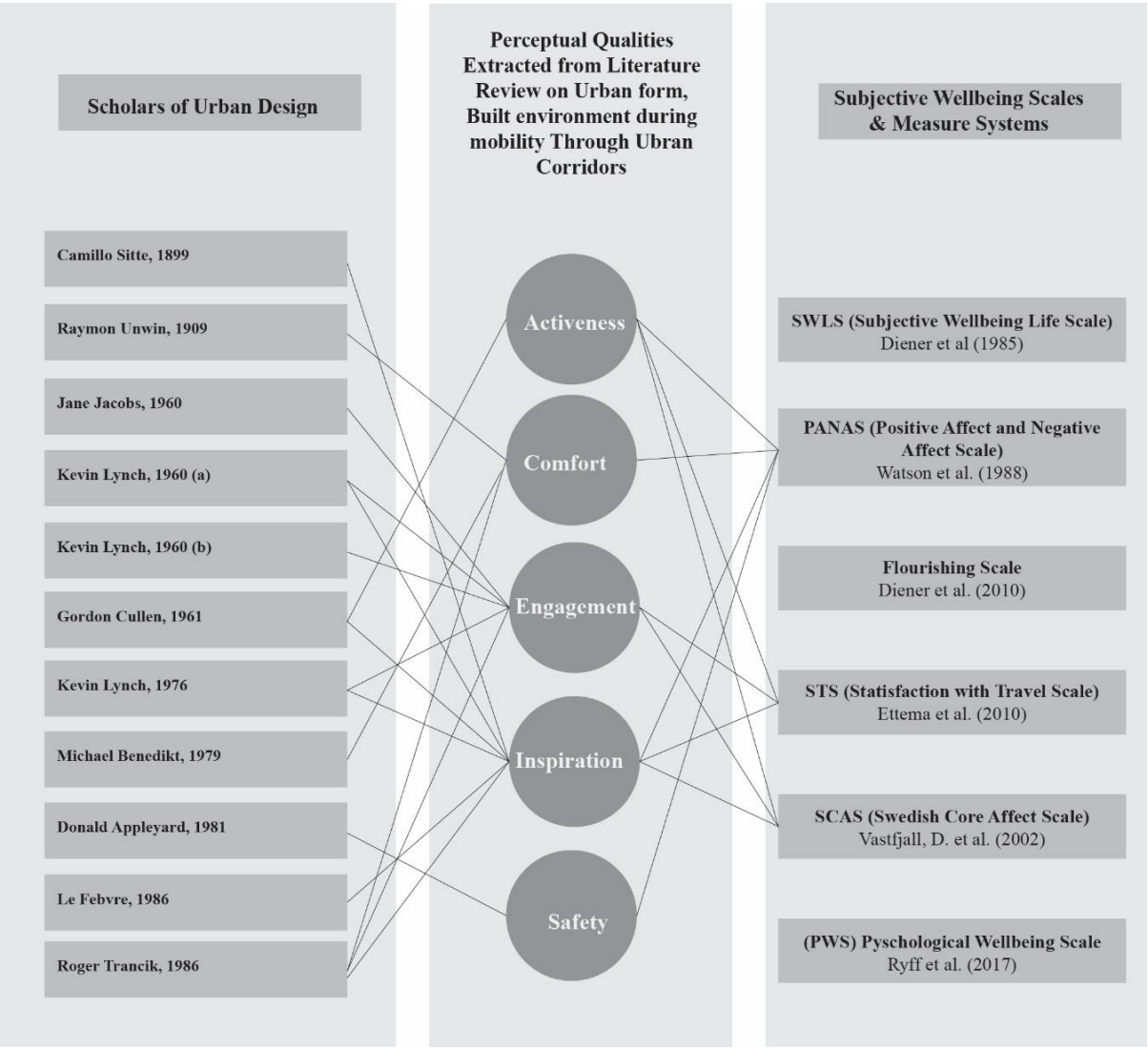

Figure 3 Linking Perceptual Qualities extracted from Literature review on urban design to perceptual qualities tackled by psychological wellbeing scales and metrics (Source: Author**)**

4.1. Defining the link between Perceptual Qualities of Morphological & Urban Mobility with Pyschometric Scales

This manuscript attempted to narrow down the perceptual qualities related to urban design theories into five main perceptual qualities: activeness, comfort, engagement, inspiration, and safety (See Figure 3). It is the result of a deductive analytical process that started with analysing the perceptual qualities attributed to both: urban design and psychological wellbeing scales simultaneously. Whereas the base of this study originates from the domain of urban design, trying to link it to the most appropriate psychological wellbeing scale. In which PANAS, STS, and SCAS are the scales which mostly attributed to the extracted perceptual qualities from urban design theories. In which they are mostly attributed 3 of these qualities: Activeness, engagement, and inspiration.

Reviewing psychological wellbeing scales and the perceptual qualities attributed to them shows that the PANAS scale is the most suitable scale to be further adopted, utilised, and deployed in further urban design and planning studies. Since it targets measuring the

wellbeing status during a certain situation. In addition to the very fact that it could be used to compare the users experience on different time intervals. This could serve a reliable tool to understand, measure and assess the impact of different urban configurations of a specific urban space, realm, or context.

As previously discussed, the (PANAS) method has been adopted, applied, and tested in various cultural and contextual settings, yet an international version of the PANAS was developed to further understand the effect of culture on emotions. Thus, the International Positive and Negative Affect Schedule Short-Form (I-PANAS-SF) was developed by Thompson (2007). The I-PANAS-SF is a multi-item scale designed to assess the affective component of SWB. The ten items are drawn from the initial pool of 20 PANAS items (Watson, et al., 1988). Active, determined, attentive, inspired, and alert are the five positive emotional states. Fear, nervousness, upset, hostileness, and shame are the five negative emotional states. Respondents are asked to score these positive and negative descriptors based on how well they explain how they felt during a specific time. Thompson (2007) studied the scale's stability, reliability, convergent and validity, and concluded that it was psychometrically acceptable.

As a conclusion, this manuscript proposes that the international PANAS (i-PANAS) scale serves as suitable scale to be further deployed in future urban studies, especially in the global south. It could be applied and tested in different context helps to avoid potential cultural and contextual biases that could lead to misinterpretations of results. As such, the use of the international PANAS for assessing perceived travel time during mobility is a reliable and valid method that can produce significant outcomes.

4.2. Psychological effect of urban design & Urban Mobility vis-à-vis SWB scale items: PANAS As a Scale for Further Exploration in Urban Studies

PANAS has been widely used in social, health and behavioural science research, providing an international Positive and Negative Affect Scale for researchers to utilize (Watson et al. 1988). In terms of assessing perceived travel time during mobility, PANAS can be used to measure the impact of one's travels on their emotional state. It can also be used to investigate the relationship between travel time and leisure activities during mobility. Furthermore, this scale can be used as an indicator of quality of life experienced during travel.

In addition to the measured emotional state, PANAS can also provide insight into the overall experience of travel time during mobility. As such, it can be a useful tool for assessing overall satisfaction levels with transportation services (Ettema, et al., 2012; Esalas, et al., 2021). Moreover, it can help identify areas of improvement in terms of improving travel conditions for commuters and those using public transportation services. In conclusion, PANAS is an effective tool when attempting to evaluate the perceived travel time during mobility in the 90s. By utilizing this scale, researchers can gain valuable insight into the effect that travel has on individuals' emotions and their overall quality of life during transport.

The Positive and Negative Affect Scale (PANAS) has been used in multiple research studies to assess travel, mobility and transportation studies. The use of this scales in assessing perceived travel time during mobility can play a vital role. As it allows for a comprehensive understanding of the effects of travel on individuals. Furthermore, by using the PANAS, researchers can understand the impact of the urban form and mobility modes on positive and negative. In conclusion, assessment of perceived travel time with the PANAS provides a comprehensive approach for understanding how different emotions can influence travel time and behaviour.

5. Conclusion

The concept of wellbeing in transportation and mobility field has been the focus of many studies the recent decade. Psychological and subjective wellbeing measurements and scales have been developed, tested, and improved to better assess subjective wellbeing in the most reliable, valid, and solid manner. Nonetheless, there is a growing body of literature on the influence of the built environment and urban form on individuals travel behaviour. However, the satisfaction and overall experience of the commuters should also be taken into consideration when urban mobility experience is concerned. Due to the very fact that it is strongly linked to the overall quality of life. There is a need to take into consideration the psychometric scales and measurements in urban studies. Thus, this need makes it an imperative to study, test, and delineate the perceptual qualities of the urban form and urban mobility. Consequently, when there is a concrete, solid and wholesome understanding of such perceptual qualities of the different aspects of urban design field, a psychometric scale could be identified, verified, and adopted for further studies. This would help establishing a link between the field of urban design, urban mobility and urban planning with the field of psychology and wellbeing.

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