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THEORIZING ON TRAVEL BEHAVIOR USING SOCIAL PSYCHOLOGY AND LIFESTYLE THEORY

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ABSTRACT. Studies that model the effects of the built environment on travel behavior are well represented in the literature. Usually, these models are controlled for socio-economic differences among respondents, and sometimes take into account personality traits (such as perceptions, attitudes and lifestyles). However, far less is know about the conceptual relationship that exists between spatial, socio-economic and personality characteristics on the one hand and travel behavior on the other. Answering this query involves combining and linking theories stemming from transport geography (e.g., utility-maximizing theory, activity-based approach) and social psychology (e.g., theory of planned behavior, theory of repeated behavior). Using key-variables from these theories, this paper aims to develop a new conceptual model for travel behavior. This conceptual model brings together concepts such as 'perceptions', 'attitudes', 'preferences' and 'lifestyle'. Furthermore, travel behavior is considered to be influenced by spatial behavior and activity behavior.

INTRODUCTION

Living, working, shopping and recreating are spatially separated activities. In order to participate in these activities, people have to travel. Policymakers try to control travel behavior, for instance through urban planning. Concepts of the New Urbanism in the United States and the Compact City Policy in Europe aim at reducing car use and travel distances. High-density and mixed-use neighborhoods are believed to be associated with shorter trips and more non-motorized trips. After all, travel distances between various activities shorten within these neighborhoods, which encourage non-motorized travel.

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Numerous empirical studies measure the effects of the built environment on people's travel behavior. Literature reviews such as Ewing and Cervero (2001) or van Wee (2002) distinguish various spatial characteristics, ranging from aggregated measures such as density and diversity to more disaggregated measures such as neighborhood type and dwelling characteristics. The results are generally controlled for socio-economic and demographic differences among individuals and households. A limited number of studies take attitudes and preferences towards urban form and/or travel into account as well (e.g., Collantes and Mokhtarian, 2007; Bagley and Mokhtarian, 2002; Kitamura *et al.*, 1997; Handy, 1996). Consequently, key-variables in empirical studies refer to three components that influence travel behavior: (i) a spatial component, (ii) a socio-economic component and (iii) a personality component. Furthermore, some studies suggest relationships *between* these components as well, which results in an indirect effect on travel behavior. It is conceivable that people's travel behavior is not always consistent with the spatial possibilities and constraints of a location, e.g., the residence. They may choose a residential location that facilitates their travel preferences, so that the connection between urban form and travel behavior may be more a matter of residential location choice than of travel choice. This mechanism is referred to as "self-selection" (e.g., Bagley and Mokhtarian, 2002; Bhat and Guo, 2007; Cao *et al.*, 2005).

Nevertheless, almost none of the empirical studies mention a theoretical framework that justifies the relationships between travel behavior and spatial, socio-economic and personality characteristics. Such theoretical justification cannot be found in one comprehensive theory. Answering this query would, therefore, involve combining and linking theories stemming from transport geography (e.g., the activity-based approach justifies the inclusion of a spatiotemporal component in travel behavior research) and social psychology (e.g. the theory of planned behavior justifies the inclusion of attitudes in travel behavior research). Using key-variables from these theories, this paper aims to develop a new conceptual model for travel behavior research. This conceptual model will unravel the relationships between people's travel behavior and spatial, socio-economic and personality characteristics.

The paper is structured as follows. Section 2 explores theories from transport geography, whereas useful theories from social psychology are described in Section 3. According to Handy (*9*) theories in transport geography refer to the mechanism determining travel behavior, whereas theories in social psychology define specific factors influencing travel behavior. Because this paper aims at a better understanding of how *people* travel, we will only review theories with a disaggregate approach. Theories with an aggregated approach, such as the gravity model, do not provide insights into the mechanisms underlying people's travel behavior (*10*). Section 4 describes the lifestyle theory. This theory will be used in Section 5 to combine theories from transport geography and social psychology into a new conceptual model for travel behavior. Finally, some conclusions are drawn.

THEORIES FROM TRANSPORT GEOGRAPHY

Transport geography concentrates on the movements of people, but also of freight and information. Because it is a sub-discipline of geography, transport geography traditionally underlines the spatial component and links spatial opportunities and constraints with the origin, the destination, the nature and the purpose of these movements (Rodrigue *et al*., 2006). However, since the development of time geography by Hägerstrand (1970), a time dimension is incorporated as well. Travel behavior is nowadays studied within a spatiotemporal context.

Moreover, travel is generally considered as a derived demand: people do not travel for its own sake, but in order to access desired activities in other locations. This idea has been further elaborated in the activity-based approach. Consequently, people's activity pattern must be analyzed within a spatiotemporal context in order to understand their travel behavior.

Time Geography

Hägerstrand (1970) suggested a spatiotemporal framework: geographers should not only analyze the spatial aspects of the individual's activity pattern, but also the temporal aspects of it. Therefore he introduced the concepts of space-time paths and space-time prism (STP). The space-time path traces the spatiotemporal position of the individual's activity pattern and travel behavior. The path is a three-dimensional representation where a two-dimensional horizontal plane embodies geographic locations and a vertical axis embodies time. A vertical line of the path symbolizes no movement over space, a sloped line symbolizes velocity. This path is, however, limited in space and in time. For example, different locations are within reach of the pedestrian compared to the motorist. Thus, only a particular set of locations in space and time is available. This set is known as the STP and it is determined by the location and duration of activities, an individual's time budget, and the travel velocities allowed by the transportation system. Whereas the path describes the observed movement throughout space and time of an individual, the STP indicates what portions of space are accessible for an individual at each moment in time (Lenntrop, 1976; Miller, 1991).

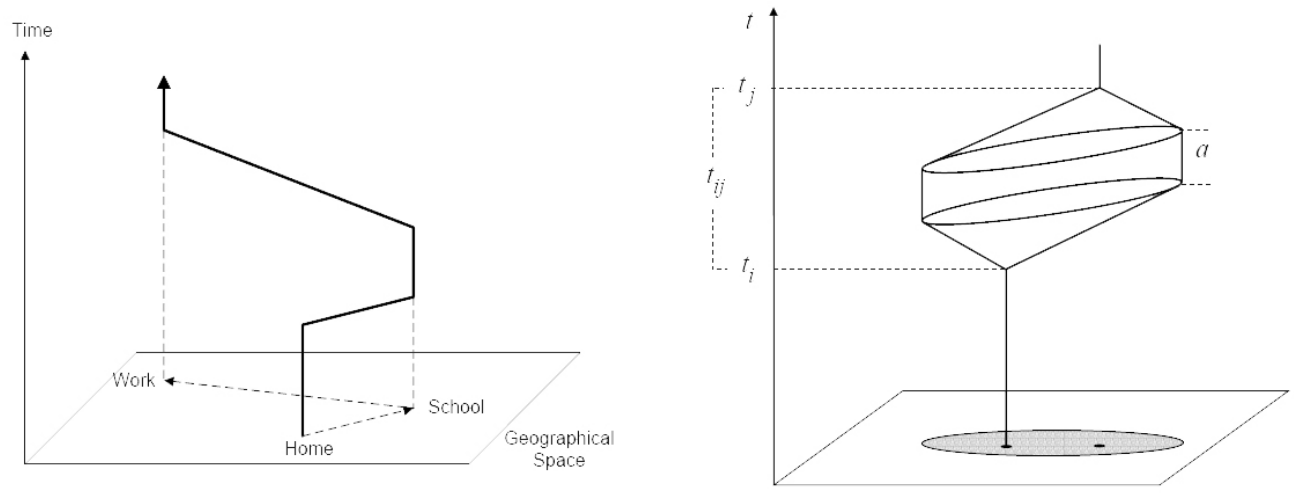

Figure 1. A space-time path and a space-time prism

Such a STP is easy to construct for one person. However, it becomes more difficult when the activity pattern of several persons must be analyzed. Most studies, therefore, focus on constraints that influence time-space paths and prisms. It is assumed that when these constraints are identified, it becomes possible to explain as to why an individual follows one specific path rather than another one. These constraints are (i) capability constraints, (ii) coupling constraints, and (iii) authority constraints. Capability constraints refer to limitations because of physiological necessities such as sleeping, eating and personal care. Coupling constraints define where, when and for how long an individual must interact with other individuals in order to finish a task. Authority constraints limit access to either space locations or time locations (e.g., business hours of a shop).

Time geography may come across as physicalist, as considering only the observable travel patterns of individuals and not the individual's motivations and intentions. However, that does not mean that time geographers were not aware of these underlying factors. Motivations and intentions were considered as being elusive and, therefore, difficult to handle (Golledge and Stimson, 1997).

Activity-Based Approach

The activity-based approach can be considered as an extension of the *utility-maximizing* theory. McFadden (1974) introduced the concept of "utility-maximizing behavior" from economics and psychology into travel behavior research. He focused on choice-behavior of individuals and stated that individuals will choose the alternative (e.g., car, bus or bike as travel modes) which offers the largest utility. Utility is defined as a linear function of the alternative's attributes. Thus, the utility-maximizing framework conceptualizes travel behavior as a choice. Furthermore, relationships may occur between short-term and long-term decisions. Daily travel behavior may depend on long-term decisions such as car ownership and residential location choice. The latter provides a theoretically sound basis for conceptualizing the residential self-selection mechanism.

The utility-maximizing theory has been extended in order to fully understand travel behavior. The concept of utility can also be applied to places and locations. An individual perceives the objective spatial structure of the environment in a specific way. Based on this perception, the individual will ascribe utilities to various places. These place utilities determine the delimitation of those places with which the individual interacts, defined as the *action space*. Interactions occur directly and indirectly. Consequently, action spaces consist of two parts: (i) the activity space, and (ii) the communicating over space. The *activity space* includes all locations within which an individual has direct contact as a result of his or her activity pattern. Communicating over space refer to the indirect interactions using interpersonal communication channels, such as the internet and the telephone (Golledge and Stimson, 1997).

The notion of activity spaces refers to an important assumption in travel behavior research, namely that travel demand is derived from the demand for activities. This assumption extends the action-space and activity-space approaches to what is referred to as an *activity-based approach* to the analysis of individual and household activities and travel behavior. Travel behavior is considered as derived from the activities in which the individual wants to participate. Because living, working, shopping and recreating are spatially separated, people have to travel. Consequently, activity patterns must be studied first in order to understand travel behavior. It seems logically to analyze activity patterns by describing where and when individuals perform different activities. Such an approach has been adopted by Chapin (1974). He was one of the first to stress the importance of analyzing an individual's activity pattern and suggested that different socio-economic groups adopt different activity patterns. This fact clearly justifies the incorporation of a socio-economic component in empirical studies on travel behavior. Other researchers (e.g., Cullen, 1978) argued that activity patterns can be studied by only focusing on habits or recurrent routine activities.

Although individual perceptions and preferences are recognized, utility-maximizing studies and activity-based studies do not incorporate these factors. Both approaches argue that perceptions and preferences are difficult to measure and, therefore, cannot be taken into account.

THEORIES IN SOCIAL PSYCHOLOGY

Theories in transport geography justify the relationships between travel behavior and a spatiotemporal component and a socio-economic component. The existence of underlying factors such as motivations, intentions, perceptions and preferences – factors referring to a personality component – is mentioned as well. Nevertheless, it is difficult to put these factors into practice. Insights from theories in social psychology can help to overcome this problem. After all, social psychology focuses on how people think, feel and behave towards other people, and how these thoughts, feelings and behaviors may be influenced by other people (Brehn *et al*., 2005). For this reason, combining insights from social psychology and transport geography seems auspicious.

Social psychology includes two theoretical mainstreams: (i) attitude theory, and (ii) social cognitive theory. Social psychologist remained interested in applied research, with contributions to ecological psychology and environmental psychology among others.

Attitude Theory

The study of attitudes is a core topic in social psychology. An attitude refers to a positive, negative or mixed evaluative response to some stimuli (issues, objects or persons) which influences the individual's behavior (Gärling *et al*., 1998; Brehn *et al*., 2005). Attitudes have always been an important research subject in social psychology. Since the late 1920's, researchers have tried to measure attitudes (e.g., Thurnstone, 1928), which resulted in more than five hundred published measurement methods (Fishbein and Ajzen, 1972). Nevertheless, research indicates that the relationship between attitudes and behavior is not perfectly at all (e.g., LaPierre, 1934; Ajzen and Fishbein, 1977). Attitudes are not the only decisive factors of behavior and, therefore, attitudes and behavior must be treated within a broader context. This basic assumption is elaborated by Fishbein and Ajzen (1975) and Fishbein (1980) in the Theory of Reasoned Action. Ajzen (1991) has specified this theory into the Theory of Planned Behavior.

In the *Theory of Reasoned Action* behavior is considered as the result of rational choices. People are considered as rational human beings. Based on a systemically utilization of available information, an individual forms a number of beliefs about a stimulus (issue, object or person). Several beliefs are associated with one specific stimulus, because several attributes of this stimulus are evaluated. The sum of all related beliefs determines the attitude towards that stimulus. For example, an individual may have many beliefs about cycling, such as "Cycling is healthy", "Cycling is environment-friendly", etc. Because of these beliefs, the individual adopts a positive attitude towards cycling. However, this does not automatically results in a travel pattern characterized by more cycling trips. Attitudes do not directly influence behavior. Intentions intervene in the relationship between attitudes and behavior. The attitude towards a stimulus is considered as related to various intentions to behave with respect to that stimulus. For example, the individual's positive attitude towards cycling results in a set of intentions which, in their totality, are positive as well. The person may intend to commute by bicycle, to spend a cycling holiday, etc. Each of these intentions is related to a corresponding behavior. Beliefs are key-variables within this conceptual framework, specifically beliefs about the consequences of the behavior and normative beliefs. Beliefs about the consequences of the behavior denote the assumption that people consider the implications of their actions before they perform particular behaviors. Normative beliefs refer to the perceived social pressure to perform or not perform a particular behavior. The sum of

these normative pressures is denominated as subjective norm. Comparable to attitudes, the subjective norm is considered as a factor influencing the intention to behave in a particular way.

Fishbein and Ajzen (1975) stress that the Theory of Reasoned Action is suitable for behaviors that are under a person's volitional control. Control factors include both internal (e.g., skills, information, emotions such as stress) and external factors (e.g., institutions, environmental factors). However, the theory is inappropriate to explain and predict uncontrollable behaviors. In order to overcome this problem, Ajzen (1991) developed the *Theory of Planned Behavior* (see Figure 2). This theory adds a third determinant of intention, namely perceived behavioral control which refers to the perceived ability to perform a behavior. For example, despite a positive attitude towards cycling, an individual considers himself or herself physically unable to commute by bicycle. Therefore, this individual might intend to commute by car. Perceived behavioral control directly influences behavior as well. For example, someone commutes by car because he or she thinks that no public transport services are available on the route towards work. However, perceived behavioral control might be inaccurate. Consequently, the theory distinguishes perceived behavioral control and actual behavioral control.

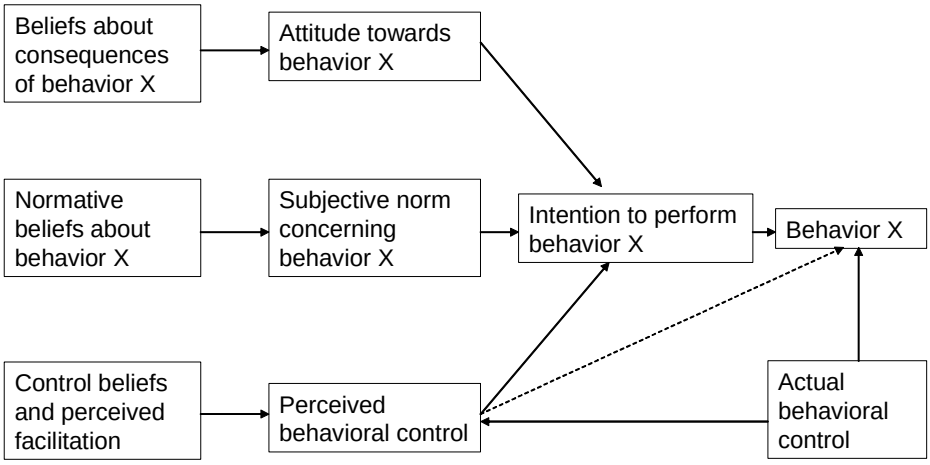

Figure 2. The Theory of Planned Behavior (Ajzen, 1991)

Nevertheless, the Theory of Reasoned Action and the Theory of Planned Behavior remain subject to criticism. Both theories assume that behavior results from rational decisions. However, individuals are not constantly conscious of their behavior. Triandis (1980) mentions the influence of habits. Ronis *et al.* (1989) formulated the *Theory of Repeated Behavior* (see Figure 3). Initial behavior remains the result of relevant attitudes and beliefs. But once the behavior is repeated, it becomes a habit and decision-making is no longer based on attitudes and behavior. Repeated behavior is, therefore, assumed to be mainly influenced by habits rather than by attitudes. Three main categories of variables directly influence behavior: (i) unreasoned influences, (ii) resources or enabling variables, and (iii) reasoned influences. Attitudes are only one of the various reasoned influences. On the other hand, behavior itself influences many of these variables. For example, the first time a person has to commute, his or her modal choice might be formed on a rational basis ("Which mode is fastest, cheapest, safest, etc. ?"). If this modal choice was positively experienced, the behavior will be repeated.

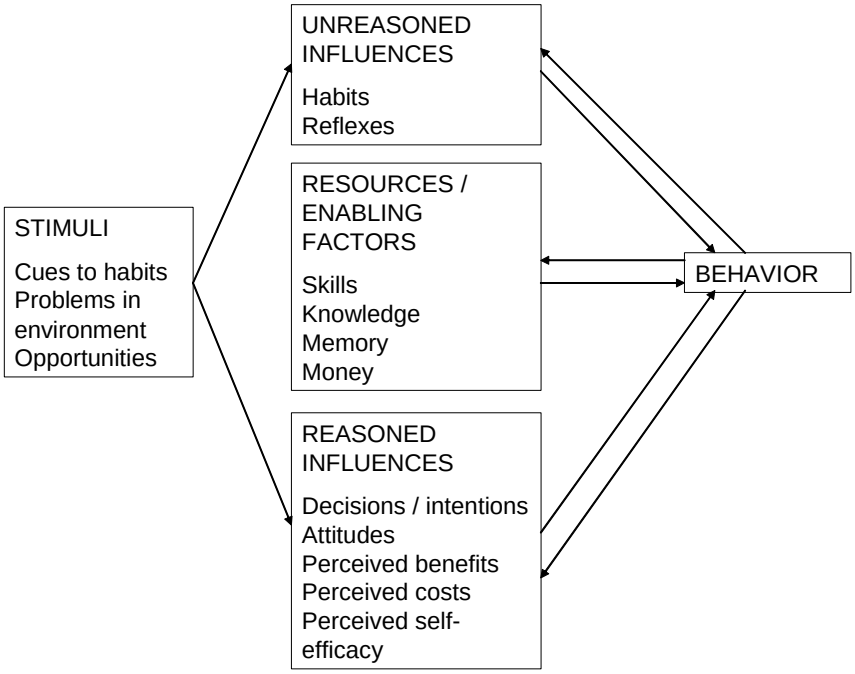

Figure 3. The Theory of Repeated Behavior (Ronis et al., 1989)

The Theory of Reasoned Action, the Theory of Planned Behavior, as well as the Theory of Repeated Behavior stress the importance of intrapersonal factors such as beliefs, attitudes and habits. External factors, such as the built environment, are not explicitly taken into account. However, particular spatial characteristics can be considered as factors facilitating or constraining behavior (e.g., the presence of bikeways will facilitate cycling trips).

Social Cognitive Theory

Social cognitive theory (Bandura, 1986) considers reciprocal relationships between behavior, personal characteristics, and the environment. Within this theory, the environment mainly refers to the social environment of an individual. These three factors all operate as interacting determinants of each other. These reciprocal relationships are not perfect symmetrical: relationships may differ in strength and may occur on different points in time. Because of this aspect, it is possible to decompose the triadic reciprocity. Thus, studies are able to focus on some (segments of) bidirectional relationships without having to consider the whole model.

Bandura (1977) distinguished several cognitive and personal characteristics of which self-efficacy is the most fundamental. Self-efficacy refers to the self-confidence of a person to overcome constraining factors and to perform a particular behavior. This resembles the concept of perceived behavioral control defined by Fishbein and Ajzen (1975).

Comparable to the Theory of Planned Behavior, a distinction is made between objective and subjective factors. The social cognitive theory distinguishes environments and situations. Environments are characterized by objective quantifiable factors that are external to the individual, whereas situations refer to the person's perception of these objective environments.

As mentioned before, the term “environment” only includes the social environment of a person. Although the built environment offers opportunities and constraints to perform a particular behavior, the social cognitive theory does not take into account the physical environment. Ecological psychology and environmental psychology emphasize the role of the physical environment, besides the social environment.

Environment and Behavior

Experimental psychologists explore the relationships between dimensions of the environment and behavior. Two main fields of research include (i) ecological psychology and (ii) environmental psychology. Whereas social cognitive theory focuses on the social environment, ecological psychology and environmental psychology stress the influence of the physical environment. However, ecological psychology and environmental psychology have another scope. Ecological psychology studies collective processes by which groups adapt themselves to physical and social characteristics of the environment, whereas environmental psychology analyzes the micro level, namely intrapersonal processes such as perception, cognition and learning behavior, which influence the relationship between environment and behavior (Stokols, 1977). Since this paper reviews theories with a disaggregate approach, only insights from environmental psychology may contribute to our discussion.

Environmental psychology questions the role of basic psychological intrapersonal processes, such as perception and cognition, in mediating the relationship between human behavior and the environment. Intrapersonal processes such as perception indicate that behavior is not only influenced by objective characteristics of the environment, but by the subjective evaluation of these characteristics as well (Stokols, 1977).

Although ecological psychology and environmental psychology have different scopes, they converged towards each other. Behavior is, thus, considered as the result of internal (personal) and external (situational) characteristics. This was already remarked by Lewin (1936):

$$Behavior = f\{intrapersonal\ processes \quad X \quad environmental\ dimensions\} \qquad (1)$$

where:

intrapersonal processes = physiological and psychological processes
environmental dimensions = physical, social and cultural dimensions of the environment

Consequently, current environmental-behavioral research examines various categories of antecedents of behavior. Moreover, environmental-behavioral research must deal with multiple levels of analysis, ranging from micro, intermediate to macro levels. The micro level refers to the individual and intrapersonal processes which affect the influence of the direct environment on the individual behavior. The intermediate level refers to the social environment and interpersonal processes, i.e. individual and small-group behaviors, in a specific behavior setting and institutional environment. Finally, the macro level refers to the community level of influence in the context of large-scale environmental units such as neighborhoods and cities (Stokols, 1977; Handy, 2005).

LIFESTYLE THEORY

A distinct definition of lifestyle is hard to find. A lifestyle manifests itself in patterns of behavior, which indicate the individual's position in social contacts (Gombrich, 1979; Ganzeboom, 1988). This aspect refers to the communicative character of lifestyle (Bourdieu, 1984). However, lifestyle includes more than observable patterns of behavior. Lifestyle refers also to the outlook of life and motivations, including beliefs, interests and attitudes (Ganzeboom, 1988). This aspect of lifestyle illustrates the connection with theories from social psychology.

Weber (1972 [1921]), Bourdieu (1984) and Ganzeboom (1988) made major contributions to the theorization of the relationship between lifestyle and behavior. Weber (1972) is one of the first sociologists that contributed to the debate on lifestyles. He criticized Marx' class theory, in which behavior is determined by the economic position of the individual (i.e., the possession of means of production). Weber (1972) concluded that behavior cannot be explained by social class exclusively. Therefore, he added the concept of status, which refers to a group of people that shares the same prestige and obtain a similar lifestyle. Lifestyle is considered as a pattern of observable and expressive behaviors. Consequently, people with the same status, and thus the same lifestyle, will behave similarly.

Since Weber's theory, no comprehensive theoretical debate on lifestyle has been developed. Lifestyle is elaborated pragmatically, rather than theoretically. Especially marketing studies (e.g., Mitchell, 1983) use the concept of lifestyle in order to retrieve market sectors. These studies generally analyze numerous data by using explorative statistics, such as cluster analysis. Each cluster is then referred to as another lifestyle. Because a sound theoretical basis is lacking and results are data-dependent, each study "finds" new lifestyles. This pragmatic approach is criticized by Sobel (1983) among others. Various data types, ranging from stable socio-economic variables (e.g., income, age) to attitudes and preferences, are combined into clusters to determine lifestyles. However, lifestyles refer to patterns of behaviors which elucidate an individual's social position. For that reason, lifestyle characteristics should not include social-economic variables which merely indicate statistical socio-economic categories.

Bourdieu (1984) presented an alternative representation of lifestyle. Following Weber (1972), Bourdieu (1984) considered lifestyle as a pattern of behaviors indicating the social position of the individual. Each individual occupies a position in a two-dimensional social space which is defined by the amount and the composition of capital. The amount of capital ranges from little capital to much capital, the composition of capital ranges from economic capital to socio-cultural capital. Thus, capital not only refers to economic capital such as money and real estates, but to cultural capital (i.e., education, knowledge, skills) and social capital (i.e., relations, networks) as well. In his further work, Bourdieu added other forms of capital like symbolical and linguistic capital. Within this two-dimensional space, traditionally used socio-economic variables define the "space of social position", whereas specific patterns of behavior define the "space of lifestyles". Based on this, two hierarchies can be distinguished. One category reaches from the traditional lower status groups to the economic elites. Another category reaches from the same lower status groups to the cultural elites. Thus, various lifestyles only appear among social groups with high capital levels. The economic elites pursue material welfare and obtain rather traditional aesthetic and moral beliefs. The cultural elites display their knowledge, for example on contemporary art.

Ganzeboom (1988) elaborates further on the work of Bourdieu (1984) in order to analyze lifestyles in the Netherlands. Like Bourdieu (1984), Ganzeboom (1988) assumes that people symbolize and clarify their social position through a pattern of behaviors. This behavior is determined by lifestyle. However, lifestyle indirectly influences behavior through preferences. Based on their lifestyle, people have preferences on how to present themselves socially. These preferences are balanced against available opportunities and constraints, which results in the actual behavior. In order to obtain a more precise definition, Ganzeboom (1988) discusses the origins and function of lifestyles. Lifestyle is related to the individual's socio-economic characteristics. However, this relationship is influenced by intermediate variables. These variables refer to opportunities and constraints offered by time budget, income, cognitive skills (i.e., knowledge, skills) and status considerations (i.e., the influence of the social environment, the aim to obtain social appreciation). Time budget and income can be measured objectively, whereas cognitive skills and status considerations are rather subjective. These four intermediate variables are internal to the individual. An additional, but external, intermediate variable consists of institutions (i.e., rules, regulations). Lifestyles must not be considered as unambiguous types. Ganzeboom (1988) stresses the existence of a continuum between lifestyle types rather than the occurrence of unambiguous lifestyle types. This continuum is determined by three dimensions: (i) an economic dimension, (ii) a cultural dimension, and (iii) a stage in life-dimension. The first two dimensions are inspired by Bourdieu (1984). However, Ganzeboom (1988) considers economic and cultural capital as two separate dimensions instead of the extremes of one dimension. The third dimension originates from Bourdieu's "space of social positions", which is based on traditionally used socio-economic variables. Ganzeboom (1988) distinguishes stable socio-economic background variables (e.g., gender) from changeable characteristics of stage in life (e.g., household composition, profession). He argues that some socio-economic variables have a dynamic nature and must, therefore, be treated differentiate. What resembles to be a free choice on a particular moment, may restrict long-term choices. For example, educational choice may restrict further professional choices. As a result, an additional dimension, referring to stage in life, is added. This dimension operates in another way than the economic and cultural dimensions. No arguments can be put forward to consider one particular stage in life more important than another. In other words, no hierarchy can be found based on stage of life. Nevertheless, stage in life influences behavior and preferences (see Figure 4).

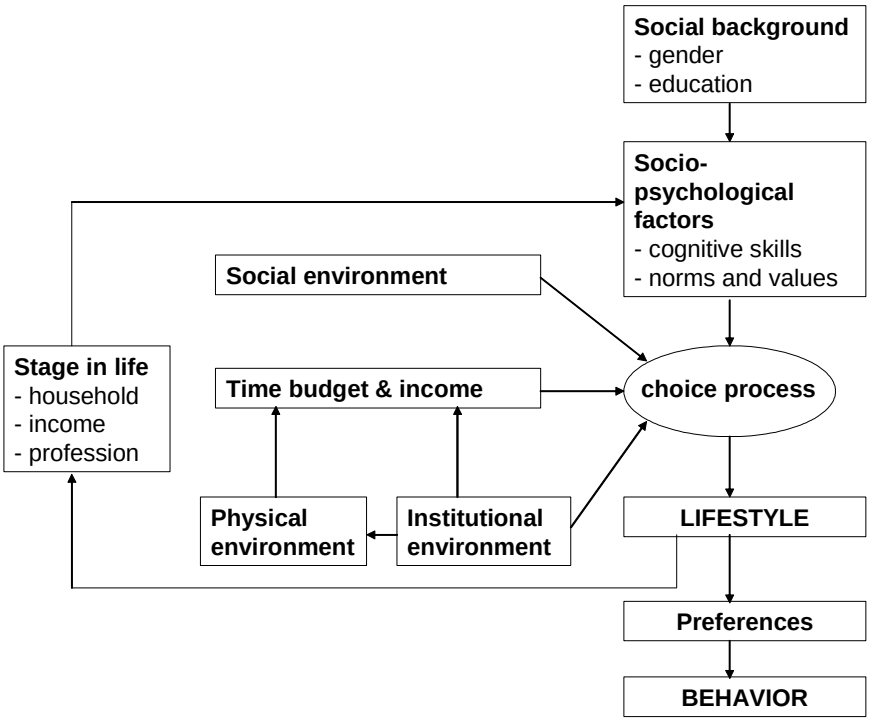

Figure 4. The concept of lifestyle (Regterschot (2002)

Variables such as age, education, profession and income are commonly used in empirical studies on travel behavior. These socio-economic variables refer to opportunities as well as constraints for travel behavior. For example, a person with a demanding job will commute by car because of its flexibility. However, research indicates that people within social-economic homogenous groups may still behave differently. This is due to personal lifestyles (van Wee, 2002). The impact of lifestyle on travel behavior has certainly increased. During the last decennia, prosperity increased, resulting in more available possibilities to choose from. Moreover, the social burden to behave uniformly disappeared because of increasing individualization and decreasing social control. These processes allow people to lead a personal lifestyle (Ferge, 1972; Bootsma *et al*., 1993). Consequently, taking lifestyles into account besides the traditionally used variables may provide us with interesting insights in travel behavior.

TOWARDS A NEW CONCEPTUAL MODEL OF TRAVEL BEHAVIOR

Key-variables in empirical studies on travel behavior refer to three components: (i) a spatial component, (ii) a socio-economic component, and (iii) a personality component. Theories in transport geography justify the incorporation of a spatial component (and even a spatiotemporal component) and a socio-economic component, whereas theories in social psychology and lifestyle theory validate the incorporation of a personality component. This personality component mainly refers to factors such as perceptions, attitudes, preferences and lifestyles. Various concepts and findings from the reviewed theories are included within our conceptual model of travel behavior (see Figure 5).

The individual's *lifestyle* is considered as a key-variable that determines travel behavior. Following Ganzeboom (1988), we consider lifestyle as a continuum determined by three dimensions: (i) an economic dimension, (ii) a cultural dimension, and (iii) a stage in life-dimension.

Lifestyle influences *habits*. Triandis (1980) considered habits as "situation-specific sequences that are or have become automatic, so that they occur without self-instruction" (Triandis, 1980, p. 204). We argue that some lifestyle will be associated with more habitual behavior than other lifestyles. For example, an adventurous lifestyle permits less habitual behavior and more impulsive behavior than a cocooning lifestyle.

Spatial, activity and travel *perceptions*, *attitudes* and *preferences* are affected by the individual's lifestyle. Perceptions refer to the way various aspects of the built environment, activities and travel are considered by an individual, whereas attitudes include an evaluation of these characteristics. Preferences are then formulated, based on these attitudes. This includes a ranking of different spatial, activity and travel opportunities. This argumentation is derived from theories in social psychology (Theory of Reasoned Action and Theory of Planned Behavior). Furthermore, lifestyle theory (Ganzeboom, 1988) states that lifestyle influences behavior through preferences. Taken into account theories in social psychology as well as lifestyle theory, we reason that lifestyle not only influences preferences, but also the underlying factors of preferences, namely perceptions and attitudes.

Spatial behavior, *activity behavior* and *travel behavior* are the result of an assessment between preferences and habits, or in other words an assessment of reasoned influences and unreasoned influences. Following the Theory of Repeated Behavior (Ronis *et al*., 1989), initial behavior depends more on reasoned influences, whereas habits will influence repeated behavior. Spatial behavior refers to all kinds of location-decisions (e.g., residential location, job location, trip destination location). Location-decisions are not only influenced by spatial preferences, but also by activity and travel preferences. This refers to the self-selection mechanism which has been noted by the utility-maximizing theory. For example, a household with public transport preferences will likely choice a residential neighborhood with good public transport services. Activity behavior includes the spatial and temporal activity pattern. Travel behavior consists of travel-related decisions, such as modal choice, travel distances and times, and combining trips into chains. Travel behavior is considered as derived from location-decisions and activity patterns. A theoretical justification for this is given by theories in transport geography.

The model in its totality is influenced by characteristics of available opportunities that are objectively quantifiable. Available opportunities include: (i) objective spatial, travel and activity opportunities, (ii) objective socio-economic and demographic variables of the individual and the household, and (iii) cognitive and physical skills of the individual. So far, empirical studies included these objective variables as control variables. For example, spatial opportunities are defined in terms of density, diversity and design. However, these objective variables are perceived and evaluated by individuals with specific lifestyles. It would be interesting to assess these objective variables with more subjective variables. For example, a neighborhood is objectively evaluated as pedestrian friendly (e.g., low motorized traffic levels, availability of sidewalks). But an individual with a specific lifestyle might still consider this neighborhood as unsafe (Handy, 1996).

The dotted arrows refer to feedback mechanisms: individuals can learn from previous experiences. Consequently, habits, perceptions, attitudes and preferences are not fixed in time.

We expect that an analysis of the relationships outlined in our model will enrich the research debate on travel behavior with constructive insights.

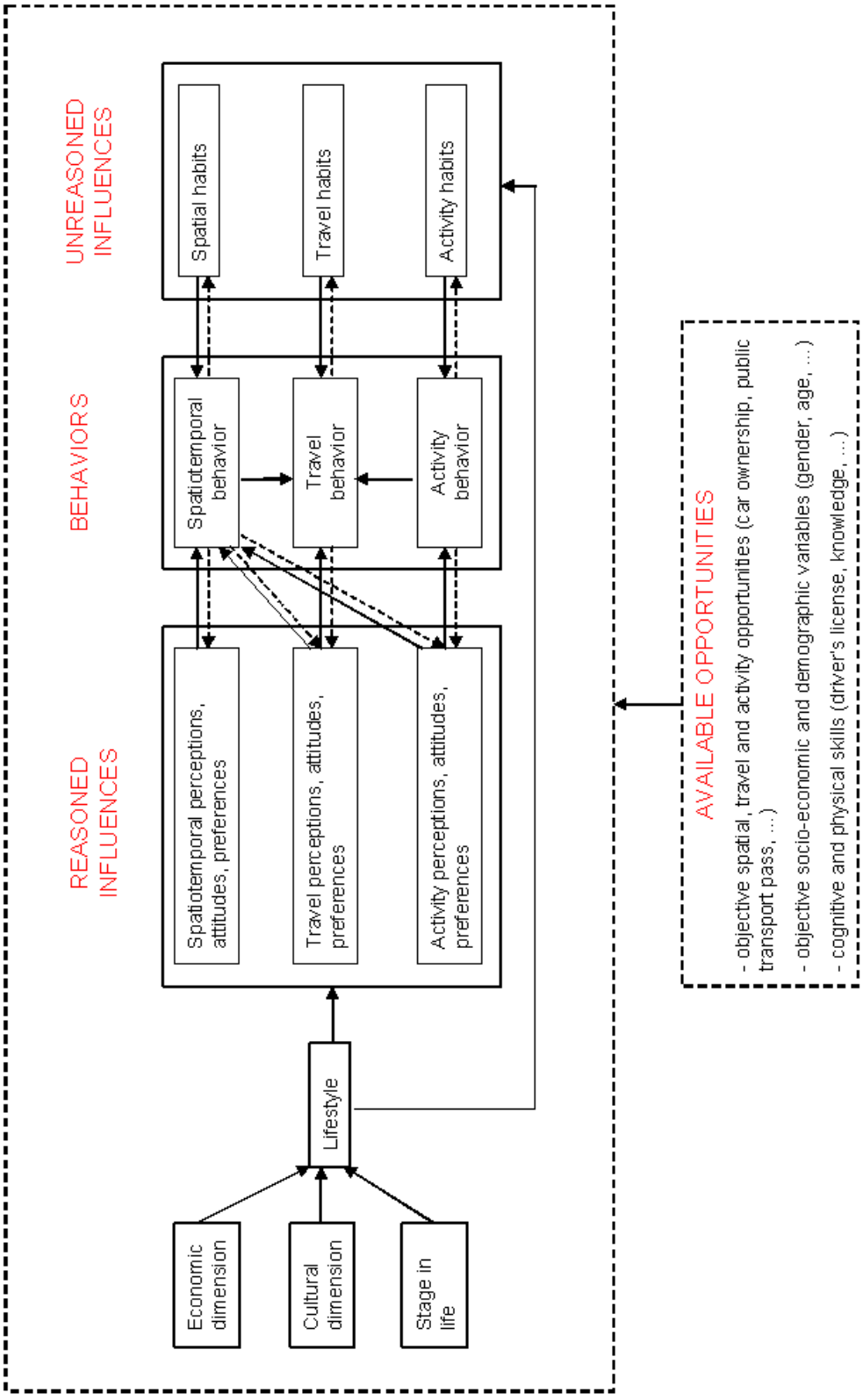

Figure 5. A new conceptual model of travel behavior

CONCLUSION

For several decades researchers try to measure the influence of the built environment on travel behavior. Empirical studies use three kinds of variables referring to a spatial component (e.g., density, diversity, design), a socio-economic component (e.g., age, gender, education, income) and a personality component (e.g., lifestyle, attitudes). However, these studies lack a theoretical justification of why travel behavior should be influenced by these three components after all. Such theoretical justification can, however, be found when theories from transport geography are combined with theories in social psychology and lifestyle theory.

Theories in transport geography justify the influence of factors external to the individual on travel behavior. In other words, it describes the context in which travel behavior is performed. More specifically, time geography stresses a spatiotemporal component of travel and the activity-based approach considers travel behavior as derived from activity patterns.

The influence of factors internal to the individual is validated by theories in social psychology and lifestyle theory. These theories describe the influence of internal processes including lifestyle, reasoned influences such as perceptions, attitudes and preferences, and unreasoned influences such as habits.

In our conceptual model, travel behavior is directly determined by spatial behavior and activity behavior. This reasoning is derived from theories in transport geography. However, these behaviors are all influenced by underlying factors such as lifestyle, perceptions, attitudes, preferences and habits. Putting the conceptual model into practice involves collecting appropriate data on lifestyles, attitudes, habits, spatiotemporal behavior, activity behavior and travel behavior. Furthermore, since our conceptual model includes numerous relationships resulting in indirect effects on travel behavior, a suitable modeling technique is needed. Within this framework, the estimation of a Structural Equation Model (SEM) seems appropriate. Some early analyses (Van Acker *et al*., 2007; Van Acker and Witlox, 2008) show promising results. Empirical studies that combine the relationships of our conceptual model could make a major contribution to the research debate on travel behavior.

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