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Spatial navigation and place imageability in sense of place☆

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A B S T R A C T

This study aimed to increase understanding of sense of place by investigating how spatial navigation and place imageability may associate with it in urban neighborhoods. Questionnaires, protocol analysis, and cognitive sketch maps were used to examine these connections. Participants used more egocentric and allocentric strategies during cognitive map navigation when sense of place was stronger. Cognitive sketch maps revealed that experiencing a strong level of sense of place is associated with recalling more of its physical features, especially paths and landmarks. When sense of place is strong, individuals find it simpler to recall and select memorable places in their cognitive maps and to describe them verbally to others. Social scientists and urban planners may benefit from these results when they respond to human spatial needs while attempting to facilitate residents' sense of attachment to, identity toward, and compatibility with city spaces.

1. Introduction

In parallel to social science research, urban planners are capturing local knowledge and place meanings (Kruger & Hall, 2008). A multidisciplinary body of research has defined sense of place (SOP) as a composition of beliefs, emotions, and behavioral commitments that manifest as a feeling of specialness for a physical setting (Jorgensen & Stedman, 2006). However, more can be learned about SOP, including how physical attributes affect its formation and the ways in which city dwellers experience it. With more people residing in cities worldwide, questions about which attributes in an urban fabric offer people a positive, healthful, and stimulating experience – a 'sense of place' – are timely and prudent.

Humans perceive places not only as spatial locations (Creswell, 2004), but as social zones where meaningful representations of, and emotional connections to, people and settings can be formed (Kearns & Gesler, 1998; Wilson, 2003). Spatial behavior, such as navigation, is more effective in urban environments when particular physical attributes have meaning for the navigator (Ramadier & Moser, 1998). As Kevin Lynch noted in *The Image of the City* (1960), environmental quality can be partially determined by imageability. When a place can be easily mapped in one's mind, one relates to, and uses, that place in positive ways (Ford, 1999). This provides a rationale to deepen understanding of the role of the physical environment in the SOP experience.

Knowing more about the diversity in which individuals perceive SOP in urban places is also theoretically important and practical for decision-making and public policy related to urban planning (Eisenhauer, Krannich, & Blahna, 2000). By considering the construct of SOP from the viewpoints of several disciplines, a better understanding of neighborhood dynamics may emerge. Given the interdisciplinary nature of the present study, it may do as Manzo and Perkins (2006) suggest by offering "a richer understanding—not only of how planning impacts our experience of place, but also how emotions, cognitions, and behaviors can impact community planning and development" (p. 336). For example, planners who learn that residents of a neighborhood with an abundance of imageable built features feel strong levels of SOP may better understand the risks of minimizing particular attributes of that neighborhood. Similarly, urban land and infrastructure management may affect the material landscape that serves as the basis for peoples' place meanings (Stedman, 2003).

More interdisciplinary SOP research may also assist planners and environmental psychologists alike to predict who will become involved in neighborhood change initiatives and why (and why others might resist these efforts) (Manzo & Perkins, 2006; Nanzer, 2004). Residents' willingness to address local problems have been shown to be affected by their emotional connection to local places (Manzo & Perkins, 2006) and these bonds are essential to the wellbeing of neighborhoods because they motivate residents to participate, improve, and protect their communities (Brown, Perkins, & Brown, 2003). Indeed, policies that run counter to residents' attitudes are less likely to gather public support and, in turn, fail in its objectives (Nanzer, 2004).

Arguably, strategies appealing to residents' levels of SOP can be employed by planners to develop or augment particular public attitudes

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or behaviors (Nanzer, 2004). But although numerous environmental psychological studies have offered attitudinal and behavioral insight for planners, decision-makers, and legislators to apply, many others have failed to make place-based psychological links to urban planning (Manzo & Perkins, 2006). Therefore, one aim of the present study is to explore, using protocol analysis methodology, whether a statistical association exists between spatial navigational (SN) strategies and SOP by integrating knowledge about how humans perceive environments with respect to meaning and spatial cognition. Another aim is to further connect the disciplines of environmental psychology and urban planning by examining how the elements of Lynch's (1960) place imageability (PI) framework are related to the experience of SOP using a cognitive mapping technique. Depending on which imageable features associate well with SOP, the proposed conceptual framework may allow planners to conceptualize spaces and places that support how people use egocentric and allocentric strategies. Doing so may better afford the development and experience of SOP in urban settings. The design of this study may also serve as a guide for those doing exploratory research concerning SOP and imageability by working with both quantitative and qualitative data as they consider human psychology and social science methodologies. Indeed, the discipline of urban planning is moving toward participatory decision-making processes; methods, along with the theories, used in the field of environmental psychology may help planners understand and accommodate the needs and preferences of individuals, as well as different groups of people (Churchman, 2002). Because of its mixed-methods approach merging quantitative and qualitative data in its analyses, this study may offer further evidence of the validity of measuring SOP in an urban context.

1.1. The concept of sense of place

SOP is a multidimensional attitude that describes an emotional connection to a physical environment but it also includes values, symbols, and cultural meanings ascribed to the place (Jorgensen & Stedman, 2001, 2006, 2011; Relph, 2008; Shamai, 1991; Stedman, 2003; Tuan, 1980). Developing SOP is an internal, personal experience. First, something about the place is understood to be important via one's association with it, followed by the interpretation of this experience as meaningful when, finally, a ‘sense of place’ is felt (Stokowski, 2008).

Jorgensen and Stedman (2001, 2006) advanced a three-dimensional model of SOP that treats places as attitude objects, differentiating between their cognitive, affective, and conative aspects: place attachment, place identity, and place dependence. Although these three dimensions appear to describe the complex psychological construct, Jorgensen and Stedman (2006) include only one aspect of the physical environment (i.e., level of property development) in their model. Acknowledging this, they state that adding more physical predictors to the model may “account for variation in … the specific environmental features that individuals and groups identify with, are attached to, and hold a behavioral preference for” (p. 326).

Although navigational strategies and meaningful physical attributes may inform SOP (Williams & Stewart, 1998), potential spatial and physical components of SOP have not been fully explored (Cuba & Hummon, 1993; Jorgensen & Stedman, 2006; Stedman, 2003; Syme, Nancarrow, & Jorgensen, 2002). Urban settings contain stimulating areas for human movement that can engage the spatial perceptions of users (Hopsch, Cesario, & McCann, 2014) and research has begun to connect self-reported place-bonding with landscape attributes using survey and map-based methodologies (e.g., Brown, 2005). For example, quantitative and qualitative spatial mapping approaches have been used to investigate which landscape elements best predict place identity and place dependence (e.g., Brown & Raymond, 2007; Lowry & Morse, 2013). Indeed, Jorgensen and Stedman (2011) have recently proposed an attitude-based evaluative mapping technique to research SOP in regions of personal importance. While these studies support augmenting a conceptual model of SOP to include physical factors, none examine the variables of SN and PI specifically.

1.2. Sense of place and spatial cognition

The human brain is capable of using spatial information to encode and interpret emotional reactions to meaningful places – places toward which persons have formed a SOP. Because particular aspects of a physical environment (e.g., landmarks) seem to influence one's construction of cognitive maps, studying the experience of SOP, as it relates to spatial cognition, is practical.

The three dimensions of SOP proposed by Jorgensen and Stedman (2001, 2006) are fundamentally based on how a setting relates to one's self and one's body in a physical location. When individuals move between settings, they interact with the natural and architectural features of each place, along with the people and nearby social contexts. This interface involves the flow of information from physical places to the cognitive representational apparatus in the brain (Gifford, 2014). The resulting sensory engagement can allow people to bond with places and deepen their sense of orientation (Hopsch et al., 2014).

A meta-analysis by Lengen and Kistemann (2012) found that studies of SOP published during the 40 years before their work revealed associations with place memory, perception, orientation, attention, emotion, and behavior at the neuronal, structural, and regional levels of the brain, as well as at the neural network level. These associations suggest that spatial cognition is involved in the development and experience of SOP (Lengen & Kistemann, 2012; see also Nadel, 2013; Tolman, 1948). Indeed, both cognitive maps and SOP appear to be outcomes of spatial learning — each develops during physical movement through an environment and incorporates spatial memories and meaning (Hay, 1998; Hoffman, 2012; Johnson, 2007; Nadel, 2013; Tolman, 1948).

1.2.1. Sense of place and spatial navigational strategy

Two cognitive processes that underlie SN are egocentric and allocentric strategies (Livingstone-Lee et al., 2011; McNamara, 2013; Zhong & Kozhevnikov, 2016). Research on spatial behavior (Burgess, 2006; Mou, McNamara, Valiquette, & Rump, 2004; Sholl, 2001; Wang & Spelke, 2002; Xiao, Mou, & McNamara, 2009) and neurophysiology (Andersen, Snyder, Bradley, & Xing, 1997; Matsumura et al., 1999; Snyder, Grieve, Brotchie, & Andersen, 1998) indicate that both egocentric and allocentric reference systems are utilized to understand an environment's spatial structure (Burgess, Becker, King, & O'Keefe, 2001; Mou et al., 2004; Sholl & Nolin, 1997; Waller & Hodgson, 2006; Zhong & Kozhevnikov, 2016).

The egocentric navigational strategy employs a self-to-object representational system to encode spatial information whereas the allocentric navigational strategy involves an object-to-object system (Kozhevnikov, 2013; Zhong & Kozhevnikov, 2016). The egocentric strategy executes associations between proximal landmarks and body-based responses (Iaria, Petrides, Dagher, Pike, & Bohbot, 2003; Jeffery, 2003; Livingstone-Lee et al., 2011; Zhong & Kozhevnikov, 2016). Put another way, the egocentric strategy specifies location by using an individual's eye-, head-, or body-based coordinates (McNamara, 2013). For example, individuals who employ an egocentric strategy might describe the location of their residence relative to their current (or remembered) position in space.

In contrast, the allocentric navigational strategy relies on distal cues and involves moving in a particular direction for a certain distance, depending on vectors understood to be between an individual's current position and the destination (Iaria et al., 2003; Jacobs & Schenk, 2003; Klatzky, 1998; Livingstone-Lee et al., 2011; McGregor, Good, & Pearce, 2004; Zhong & Kozhevnikov, 2016). This strategy allows individuals to understand the location of one object relative to another object. For example, someone using an allocentric strategy might recall that “the bicycle is behind a fire hydrant” whereas someone using an egocentric strategy may remember the location of the bicycle relative to their own location in space (e.g., “the bike is to my right”) (Waller & Nadel,

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