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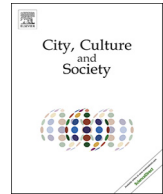
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Exploring perceptions of creativity and walkability in Omaha, NE

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ABSTRACT

It has been suggested that vibrant, walkable urban spaces may contribute to enhanced creativity and innovation by facilitating social interaction and physical activity, and serving as a source of inspiration. Using a survey and participant mapping exercise, this paper examines the potential spatial association between walkability and creativity in Omaha, Nebraska. Randomly selected participants were mailed a survey and map, requesting that they identify either three walkable or three creative locations within the Omaha area. The spatial correlation between the two variables was assessed in part using a newly developed spatial point pattern test. In addition to using perceptions of walkability, an objective measure provided by Walk Score[®] was employed to further evaluate potential associations. The overall correlation between the two variables was strong; with few exceptions, hotspots of walkability and creativity frequently overlapped. Potential differences in resident perceptions by age, income, education, and residential location were also examined.

1. Introduction

Creative, cultural, and knowledge work constitutes a vital and growing sector of the modern, post-industrial economy (Boschma & Fritsch, 2007; Florida, Mellander, & Stolarick, 2008; McGranahan & Wojan, 2007; Stolarick & Currid-Halkett, 2013). With fierce global competition among cities for human and financial capital (Florida, 2005; Peck & Tickell, 2002; Turok, 2004), many local governments have become increasingly pro-active in attracting and retaining these lucrative knowledge-intensive industries and workers (Harvey, 1989; Malecki, 2007; Zimmerman, 2008). There has therefore been growing interest among practitioners and academics alike in the conditions – spatial, economic, and political – that best nurture and support creativity and innovation. It has been suggested that the quality of the built environment, particularly in regard to human-scale development and walkability (core components of urban livability or “quality of place”), may be especially attractive to creative industries and their workers (Clark, 2003; Florida, 2002, 2008; Katz & Wagner, 2014; Landry, 2000; Lewis & Donald, 2010; Thomas, 2016). Urban spatial form and design may even play a key role in facilitating the creative thought, interactions, and activities that are expected to power the creative-cultural economy (Costa & Lopes, 2015; Durmaz, 2015; Spencer, 2015; Wood & Dovey, 2015).

While the driving forces or “pull factors” behind the agglomeration of creative industries and workers between and within cities continues to elicit much academic research and debate (Comunian, Chapain, & Clifton, 2010; Darchen & Tremblay, 2010; Florida, 2012; Peck, 2005;

Scott, 2006), the broader connection between urban form and socio-economic outcomes and quality of life is well documented in the literature. Nearly six decades ago, Jacobs (1961) argued persuasively the economic and social value of dense and diverse urban neighborhoods. At a time of rapid automotive-based suburbanization and large-scale inner-city demolition in the United States, she championed “traditional” neighborhood morphologies with a fine-grained mix of mutually-supportive land uses (such as residential apartments mixed with retail and entertainment amenities), which combined could support greater walkability and economic dynamism. Other pioneering work has demonstrated that the design and composition of the shared urban environment can affect people’s interaction with space as well as one another, having important implications for social and economic vitality (Gehl, 1987; Lynch, 1971; Whyte, 1980, 1988). Elements as simple as benches, store windows, trees, ledges, and drinking fountains, for example, can invite people to slow down, mingle, and contribute to the vibrancy of an area’s socio-spatial milieu.

Recent qualitative analyses of creative/cultural quarters, clusters, and hotspots further support the notion that urban design and morphology can shape and support particular types of social and economic activity. Through observations and photographic surveys of cultural districts in three separate cities, Costa and Lopes (2015) documented several attributes of urban design and morphology conducive to the creative dynamics of these places. Among the key elements they identified were heterogeneity in uses and activities, ample sidewalks and other pedestrian zones, irregular street networks with short blocks, and historical elements that contribute to a unique sense of identity.

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Notably, many of these same features were identified by Jacobs (1961) over five decades ago as generators of neighborhood vitality. Durmaz (2015) similarly investigated the socio-spatial features that attract creative workers in the film industry to two creative clusters: Soho in London and Beyoglu in Istanbul. The author concludes that “many different layers, including physical, socio-cultural, perceptual and visual characteristics of place ... contribute to the complexity and creative atmosphere of Soho and Beyoglu” (p. 102). Interviews of creative workers indicated that proximity, centrality, and accessibility were among the key physical factors drawing them to these locations. Walkability was identified as a particularly strong positive factor in support of clustering and accessibility, as well as a facilitator of chance encounters and inter-company interactions.

Serving as a source of stimuli and facilitator of creative interaction, the built environment may also enhance the creativity of individuals by encouraging outdoor walking and other physical activity. A recent study by Oppezzo and Schwartz (2014) found that participants who walked outside “produced the most novel and highest quality analogies” compared with those who sat outside or walked on a treadmill inside. Even walking inside, however, resulted in a significant boost in “creative output,” leading the authors to conclude that it is primarily the physical act of walking which explains most of the improvement in creativity. Other studies have demonstrated similar positive associations between cognitive ability and physical activity, particularly aerobic exercise (Blanchette, Ramocki, O’del, & Casey, 2005; Kramer, Erickson, & Colcombe, 2006; Kubesch et al., 2003). With shifting sights, sounds, and smells, the environment one passes through while walking may also serve as a source of inspiration and insight, with each encounter and sensorial experience providing new opportunities to forge novel connections or make conceptual leaps (Ingold & Vergunst, 2008; McCoy & Evans, 2002; Shortell & Brown, 2016; Solnit, 2000). Reflecting on the connection between mind and body in her book *Wanderlust: A History of Walking* (2000), Rebecca Solnit makes a detailed and eloquent case for walking as an integral part of the creative process, stating that “imagination has both shaped and been shaped by the spaces it passes through on two feet” (p. 4).

Given the observed and theoretical associations between walking, walkable environments, and creativity it may be expected that the most walkable neighborhoods in the city are also likely to be perceived among the most creative (and *vice versa*). However, this hypothesis has yet to be empirically tested using a spatial analysis of the two variables. This study sets about this task by utilizing a modified version of the methodology employed by Brennan-Horley and Gibson (2009). The authors sought to identify creative epicenters within Darwin, Australia by presenting creative workers with a physical map of the city and asking respondents to identify creative locations. This study will employ a similar participant mapping technique to assess whether there exists a significant spatial correlation between the “walkability” of a neighborhood and its ability to generate a creative milieu. The study relied on input from a randomly selected cohort of residents within the Omaha-Council Bluffs metropolitan area, who were asked to complete a survey (mail or online) to identify randomly either “creative epicenters” or walkable neighborhoods within Omaha. Three primary research questions were addressed: 1) how do perceptions of walkability and creativity vary throughout the Omaha study area, 2) is there a significant spatial correlation between residents’ perceptions of creativity and either their perceptions of walkability or a quantitative measure of walkability (i.e., the popular online “Walk Score” metric), and 3) how might the spatial association between perceptions of creativity and walkability vary by respondent age, education, income, and location?

2. Background

To better place into context the potential relationships between walkability and creativity in the city, it is useful to first consider the meanings of these terms and how they relate to the urban

neighborhood. Creativity may be generally described as the ability to create a product that is “to a significant extent new, original and unique and ... shows a high degree of success in its field” (Pfeiffer, 1979). Csikszentmihalyi (1996) similarly argues that it is not enough that a creative product is new; it must eventually be judged to offer value, even if that value is not immediately apparent. Furthermore, the creative product cannot simply exist within one’s own mind; the act of creation is a “systemic rather than individual phenomenon” that occurs via “the interaction between a person’s thoughts and sociocultural context” (p. 23). Although creativity is usually associated with individuals or groups, many scholars have applied the term to places as well, most notably in an economic context. Creative places, and, indeed, “creative neighborhoods”, are most often described as those with a concentration of businesses and organizations that specialize in the production and/or consumption of creative/cultural products (i.e., the creative/cultural industries). Spencer (2015) found that firms in “creative industries” (e.g., film, music, radio, design, performing arts, and independent arts) tend to cluster in dense, mixed-use neighborhoods near the urban core. “Science-based industries” (e.g., pharmaceutical, software, computers, science research, and medical labs), however, were more likely to locate in suburban areas. The authors propose that “creative industries” (i.e., those involved directly in art and design) may rely more on inter-firm networks and divergent thinking (no single answer to a problem), facilitated by close spatial proximity and the presence of “third places”, such as coffee shops and bars (Oldenburg, 1999), while “science-based industries” (i.e., science, technology, engineering) rely more on intra-firm interactions and convergent thinking (problems have a single best solution).

Other scholars have chosen to focus on the geography of creative workers themselves. Studies of the residential preferences of creative, cultural, and knowledge workers have yielded a variety of [occasionally conflicting] results that nonetheless tend to suggest that life-stage and “classic” factors such as affordability, school quality, and employment opportunities take precedence. Workers in the creative industries, however, also often exhibited a preference for diverse, vibrant urban neighborhoods, particularly those that are younger and employed in the fine arts (Darchen & Tremblay, 2010; Frenkel, Bendit, & Kaplan, 2013; Lawton, Murphy, & Redmond, 2013; Lloyd, 2002; Markusen, 2006). Artists in particular are often viewed as “pioneer” gentrifiers, which may signify to local growth coalitions that a previously struggling inner-city neighborhood or district is ready for new investment (Ley, 1996; Markusen, 2006; Mathews, 2010; Zukin, 1988). Ironically, if a neighborhood becomes too desirable, artists themselves may become marginalized or displaced, diminishing the creative milieu or bohemian vibe that initially attracted the wealthier second or third wave gentrifiers in the first place (Ley, 2003; Ward, 2018). Much of this neighborhood change has occurred in now-fashionable warehouse and light industrial districts that were once ideal spaces for art studios and galleries (Hutton, 2006; Wood & Dovey, 2015). They often feature several of the physical elements identified by Jacobs (1961) as contributing to neighborhood vitality: short blocks, buildings of various ages, and the capacity for moderate density and a variety of mutually-supportive land uses.

These same physical features are generally considered integral to walkability, which may be broadly defined as the degree to which a space is conducive to travel by foot. Speck (2013) suggests that at least four conditions must be met for people to choose walking over other forms of transportation: the walk must be safe, interesting, comfortable, and useful (with a variety of destinations to walk to). Taking a phenomenological approach to studying walking behavior, Wunderlich (2008) characterizes walking as both a purposeful and creative process of which there are three distinguishable modes set within the urban context: the purposive, the discursive and the conceptual. Purposive walking is done to reach a particular destination; it is a “necessary activity” (Gehl, 1987, p. 135). During purposive walking, the individual is often “disengaged” from their environment, focusing primarily on

reaching their intended destination as expeditiously as possible. Discursive walking involves casual engagement with the environment; it is “a participatory mode of walking, during which we half consciously explore the landscape while sensorially experiencing it passing by” (Wunderlich, 2008, p. 132). During the discursive walk, the experience of the immediate environment as one is passing through is of more importance than the eventual destination, and may be casually described as “roaming” (Rendell, 2003, p. 30). Lastly, the primary purpose of “conceptual” walking is to consciously explore and become better acquainted with the local environment. It often reveals details of place that would otherwise be missed. Both discursive and conceptual walking may be characterized as participatory since they involve conscious interaction with the environment, and are more likely than purposive walking to contribute to a locale’s socio-spatial milieu (Wunderlich, 2008).

In addition to these three modes of walking, the terms utilitarian and recreational walking are frequently used to distinguish between walks that are taken primarily to reach a destination (utilitarian) and those where the act of walking itself is the purpose (recreational) (Carmona, Tiesdell, Heath, & Oc, 2010). Utilitarian and purposive walking are often used interchangeably, since in either case the primary goal is often to reach a particular destination. Recreational walking frequently occurs in parks and other green spaces/natural areas (Kaczynski & Henderson, 2008), with exercise as a common objective. In addition to potentially promoting creative thought, walking for recreation may have a restorative effect on the mind by reducing the mental fatigue associated with long periods of directed attention (De Young, 2010; Plambech & Konijnendijk van den Bosch, 2015; Roe & Aspinall, 2011). Letting the mind wander while conducting other activities, such as engaging in physical activity, may allow creative ideas to “simmer below the threshold of consciousness for a time” (Csikszentmihalyi, 1996, p. 98); presumably a key requisite of the “incubation” phase of the creative process (Plambech & Konijnendijk van den Bosch, 2015). It is also worth distinguishing here between walks that *must* be made (i.e. walking purely for transportation) versus those one *chooses* to make. Low-income and other disadvantaged groups without access to private transportation are more likely to have to walk for utilitarian purposes, whether to first reach a transit stop or access a destination directly by foot (Plaut, 2005; Tudor-Locke & Ham, 2008). Although the same physical conditions that encourage voluntary walking should also improve the daily lives and rhythms of those who walk because they must, lower income neighborhoods often feature degraded pedestrian infrastructure and other micro-scale elements of the built environment less conducive to walking (Bereitschaft, 2017).

A variety of methodologies and indices have been developed to assess walkability. Most have been quantitative, incorporating empirical measures of urban form at the macro-scale such as population or housing density, land use mix, street network connectivity, and transit accessibility (e.g., Frank et al., 2010; Freeman et al., 2013; Owen et al., 2007; Van Dyck et al., 2010). The free and publically accessible online Walk Score® (walkscore.com) metric has emerged as one of the most widely utilized quantitative measures of walkability (Duncan, 2013; Meltzer, 2014). Other, primarily qualitative, measures have been formulated at the micro-scale (i.e., streetscape level), and consider such features as building façade continuity and transparency, visual complexity, and enclosure (Ewing & Handy, 2009; Porta & Renne, 2005). Fewer studies, by contrast, have assessed walkability using perceptions of walkability (Carr, Dunsiger, & Marcus, 2010) or measures of actual walking behavior (Brown et al., 2013; Sundquist, Eriksson, Kawakami, & Skog, 2011). Although several studies have indicated that quantitative metrics such as Walk Score® often provide reasonable proxies of walkability at the macro scale (Manauh & El-Geneidy, 2011; Duncan, Aldstadt, Whalen, Melly, & Gortmaker, 2011, 2013), some discontinuity with qualitative measures is expected (Carr, Dunsiger, & Marcus, 2011, 2010; Koohsari et al., 2015). In addition to micro-scale elements of the built environment impacting perceptions and walking behavior, the

socio-cultural context of the individual and local culture mediate how different environments are “read” and thus utilized (Freeman et al., 2013; Kerr, Frank, Sallis, & Chapman, 2007; Riggs, 2011). As Riggs (2017) has argued, “If a space cannot be ‘read’ by a pedestrian as walkable, then perhaps it is not in fact walkable – even if quantitative models show that it should be ...” (p. 3). For this reason, this study considers both resident perceptions of walkability and the quantitative metric provided by Walk Score®.

As suggested, the potential connections between walkability and creativity are multiple and diverse. Given the proposed connections between the built environment, creative thought, and knowledge transfers, one might expect more walkable neighborhoods to exhibit heightened creative productivity. In a recent analysis of a large and diverse sample of U.S. neighborhoods and metropolitan areas, Hamidi and Zandiatashbar (2018) found that innovative firms tend to cluster in areas with higher Walk Scores, transit frequency, and racial diversity. The authors attribute this spatial pattern to preferences among knowledge workers for more walkable neighborhoods and a desire among innovative firms to take advantage of knowledge spillovers. Florida and King (2016) similarly observed a higher concentration of high-tech venture capital investment and startup activity in denser, more walkable, mixed-use neighborhoods, while Malizia and Motoyama (2016) documented the propensity of high-growth firms (most in knowledge-intensive industries) to locate in “vibrant centers” (i.e. neighborhoods with a relatively high level of density, mixed-use, transit accessibility, and destination accessibility), whether in urban or suburban areas. Perceptions of creativity, however, may dwell more on where creative products are *consumed* rather than where they are generated. On the consumption side, the terms arts, culture, and walkability are often woven into broader notions of authenticity and sense of place, and frequently bundled into place branding and marketing materials emphasizing “experiences” (e.g. shopping, dining, entertainment) (Leeman & Modan, 2010; Zimmerman, 2008). This may help reinforce a perceived connection between walkable and creative places while downplaying creativity that might exist in more suburban environments (Collis, Freebody, & Flew, 2015; Gibson & Brennan-Horley, 2006; Gibson et al., 2012). It is the nature and degree of this connection that is of primary interest in this study; how and where local residents perceive of creativity and walkability in their city, and to what degree these two cognitive landscapes may intersect.

3. Methods

3.1. Study area

The study area included much of the central, urbanized area (UA) within the greater Omaha-Council Bluffs, NE-IA metropolitan region. With a 2016 estimated population of 924,129 (U.S. Census Bureau, 2016), the Omaha metro is the most populous urban center in Nebraska. With the focus of the study on the perceptions of urban rather than rural residents, the addresses of potential participants were selected at random from within the Omaha UA boundary. Overall, Omaha is not a particularly walkable city; its Walk Score as of September 2017 was 45, indicating a high level of automotive dependency (Walk Score, 2017). Much of the urban landscape outside the I-80/I-680 beltway consists of low-density suburban development characterized by detached single-family housing, strip-malls, and office parks. Scattered throughout the city’s central east-west axis, however, are several neighborhoods and new infill developments with moderate densities and more pedestrian-friendly mixed-use typologies. Omaha has a diverse economy with approximately 39 percent of workers employed in U.S. Census-defined management, business, science, and arts occupations (the closest single broad category that fits Florida’s (2002) “creative class” definition) (U.S. Census Bureau, 2016). Florida (2012) ranked Omaha 108 out of 361 U.S. metropolitan areas using a composite “creativity index” that considers “creative class” employment,

innovation and clustering in the technology sector, and a composite “tolerance” index based primarily on segregation and diversity.

3.2. Surveys

To assess resident's perceptions of walkability or creativity throughout the Omaha study area, a survey and map were mailed to 6000 randomly selected households in June 2016. Fifty percent of households received the “walkability” survey, which asked respondents to identify the most walkable locations in Omaha, and 50 percent received the “creativity” survey with a similar set of questions, but requested that respondents identify “epicenters of creativity”. The surveys were conducted separately in this manner so that questions regarding walkability would not bias responses to questions about creativity and *vice versa*. Respondents could either complete the survey online or return the paper survey using a pre-paid envelope. The surveys consisted of eight questions, including five intended to collect basic demographic information about the respondent such as age, sex, education, income, and occupation. Respondents were then asked to indicate on a map of the study area the approximate location of their home and work (using different symbols), and to identify three locations (using points on the physical map or drag-and-drop “push pins” on the online version) that they believed represented the most walkable or creative neighborhoods in the Omaha area. Respondents were asked to identify discreet points of walkability/creativity, rather than shaded regions or polygons, to standardize user input and facilitate spatial analyses.

To gain a more nuanced understanding of their choice of locations, question eight on the walkability survey asked respondents to “please explain briefly the specific features of these three locations that make them the most walkable or pedestrian-oriented in the Omaha area.” Similarly, the creativity survey requested that respondents “please explain briefly the specific features of these three locations that make them ‘epicenters of creativity’ within the Omaha area.” This latter question was considered particularly important as the term “creativity” can be interpreted in a variety of ways. In fact, what exactly creativity is and how it should be measured in the context of urban politics, economics, culture, and materiality is a matter of much scholarly debate (Brennan-Horley & Gibson, 2009; Markusen, Wassall, DeNatale, & Cohen, 2008; Peck, 2005; Richards, 2014; Çetindamar & Günsel, 2012). Similar to Brennan-Horley and Gibson (2009), this paper takes a qualitative, *a posteriori* approach to defining creativity in the city by relying on the individual perceptions and testimony of local residents. Using this methodological approach, it is hoped that the less visible forms of creativity may be considered alongside those more commonly explored in the literature such as creative firm clusters and cultural/creative amenities.

For the sake of simplicity, the survey did not request that respondents rank their three chosen locations; each point was treated as a single “vote” of walkability/creativity. Although folded to fit into a standard commercial envelope, the two-sided map (one side for home/work locations, and one for the three most walkable/creative locations) was printed in grayscale and at high resolution (600 dpi) on tabloid paper (11 × 17 in.) to support better locational accuracy. The base map consisted of the standard Google Maps data layer found on the web-based service, as this map design was expected to be the most familiar to respondents. The online version of the survey presented the respondent with five separate maps: one each for home and work, and one for each of the three most walkable/creative locations. Google Maps was again used as the base map, and care was taken to present the study area at the same scale and extent as seen on the paper maps.

The participant mapping exercise employed in this study joins a long line of research using cognitive maps to explore residents' perceptions of the built environment (e.g., Aitken & Prosser, 1990; Halseth & Doddridge, 2000; Lynch, 1960; Vertesi, 2008), how perceptions vary among individuals and groups (Coulton, Jennings, & Chan, 2013; Eng, 1995; Matei, Ball-Rokeach, Sandra, & Qiu, 2001; Orleans, 1973;

Spencer & Weetman, 1981), and how perceptions may change over time (Beguin & Romero, 1996; Evans, Brennan, Skorpanich, & Held, 1984; Walmsley & Jenkins, 1992). The cognitive, or mental, map is a means of translating residents' “imagined world” of space and place into physical form (Tuan, 1975). There is less emphasis here on how people choose to represent space; more crucial to this investigation is where in space particular features can be found. Participants were therefore presented with a labeled base map to provide spatial orientation and ensure a higher degree of standardization than would be expected from freeform hand-drawn maps (Vajjhala, 2005). This method has the benefit of capturing and relaying residents' perceptions of walkability/creativity in a way that is easily aggregated and analyzed using a GIS.

3.3. Walk score

In addition to residents' perceptions, the popular online “Walk Score” (walkscore.com) metric was used to assess walkability across the Omaha study area. Although walkability has been measured using a diverse range of methodologies and variables, Walk Score is one of the most widely utilized walkability metrics both inside and outside academia (Duncan, 2013; Meltzer, 2014). The purpose of including this extra measure of walkability was to 1) further test the strength of association between walkability and creativity using an alternative, quantitative measure of walkability, and 2) assess the efficacy of Walk Score to capture the complex spatial associations between walkability and creativity relative to residents' perceptions. Based on the density of common amenities such as coffee shops, restaurants, drug stores, and schools, as well as local population density, block length, and intersection density (Walk Score®, 2017), Walk Score has been shown to provide a reasonable proxy of walkability across a number of cities and spatial scales (Brown et al., 2013; Carr et al., 2011; Duncan et al., 2011). Walk Score does have limitations, however. Most notably, Walk Score does not take in consideration a variety of micro-scale elements of the built environment such as the condition of the sidewalk, presence of street trees, or building set-backs that might significantly affect walkability. It also does not incorporate crime, transit, or economic statistics that might impact walking (Harvey & Aultman-Hall, 2016). Due to these limitations, it is expected that perceptions of walkability, as obtained through the surveys, will more closely correlate with perceptions of creativity.

To test the potential spatial associations between Walk Score and creative hotspots in Omaha, 1200 Walk Score data points were obtained. The data points were arranged at a regular 1 km interval over the Omaha study area. The 1 km interval was expected to provide sufficient, overlapping coverage of the study area since each Walk Score data point considers amenities within a 1.5 mile (2.4 km) radius, and no location would be more than 500 m from a known Walk Score value. Walk Scores range from 0 to 100 with higher values indicative of more walkable environments.

3.4. Statistical analyses

The spatial correlation between walkability and creativity in Omaha was assessed statistically in two ways. The first method involved counting the number of creative hotspots and most walkable locations within 1.4 km of each the 1200 Walk Score sample points. All walkable/creative points falling within the designated radius would count as a “vote” for that location. Locations with higher Walk Scores and more walkable “votes” were expected to be associated with more creative “votes”. The 1.4 km radius represents the diagonal distance between Walk Score sample points. Spearman's rho correlation analyses were then performed on creative “votes” versus Walk Score and creative “votes” versus walkable “votes”.

The second method, involving only the data collected from the surveys, utilized a spatial point pattern test developed by Andresen (2009; 2016). Run using the freely available graphical user interface

(<https://github.com/nickmalleson/spatialtest>) by Nick Malleson at the University of Leeds, the Andresen spatial point pattern test first involves binning all point data into areal units arranged in a regular grid across the study area. In this case a 1×1 kilometer grid was used along with 0.5×0.5 and 2×2 kilometer grids to assess the sensitivity of the procedure to areal unit size. Next, the percentage of points within each areal unit was calculated for one of the two data sets (termed the “base” data set, in this case the walkable point data), while a Monte Carlo simulation selected at random 85 percent of the “test” data set (the creative point data) 200 times to create a confidence interval for each areal unit. The top and bottom 2.5 percent were then removed, creating a 95 percent confidence interval. As Andersen (2016) explains, “If the percentage of points for an areal unit in the base data set is within the corresponding confidence interval for the test data set, this areal unit is considered similar. This is repeated for each of the individual areal units of analysis” (p. 3). The results are then used to calculate an index of similarity, S , which ranges from 0 (no similarity) to 1 (maximum similarity):

$$S = \left(\sum_{i=1}^n S_i \right) / n$$

where n is the number of areal units, S_i is equal to 1 if the spatial pattern of the two point data sets are considered similar for unit i , and 0 otherwise. The index of similarity therefore indicates the proportion of areal units that contain similar spatial point patterns.

In addition to assessing the overall correlation between walkability and creativity, the S -Index was further used to compare the relative similarity of the creative and walkable point patterns between groups of respondents based on age, distance between home and city hall (a proxy of suburbanization), income, and education. Respondents were divided into two groups for analysis based on those above and below the mean for each characteristic. For age the mean was 54 years; distance was 12 km, income \$94,000, and education was split between those with and without graduate degrees.

4. Results

A total of 293 surveys were completed, including 145 walkability surveys and 148 creativity surveys. Nearly two thirds of surveys were returned via the postal mail; the rest were completed online. Relative to the average resident of the Omaha metropolitan area, survey respondents tended to be older, wealthier, more likely to be female and have a college education than the average resident of the Omaha metropolitan area (Table 1). Surveys were less likely to be returned from poorer neighborhoods and those with a high proportion of minorities, particularly the African American community in north-central Omaha. Altogether, respondents identified a total of 386 most walkable locations and 398 creative hotspots within Omaha; an average of 2.6 locations per respondent. Although survey respondents were asked to identify three locations each, many indicated only one or two.

Survey respondents identified several “hotspots” of walkability and creativity (Figs. 1 and 2). Most of the major hotspots, defined as those

Table 1
Demographics of survey respondents vs. residents of the Omaha metropolitan area.

	Walkability Survey	Creativity Survey	Metro Omaha
% Female	65	61	50
Median age	55	53	35
% Aged 19–49	40	31	41
% Aged 65+	31	27	12
% BA or higher	72	76	23
% Grad degree	37	31	12
Avg. household income	\$90,000	\$104,000	\$79,000

Patterns of Walkability and Creativity.

areas within at least 5 walkable or 5 creative “votes” per square kilometer, fell within Omaha’s “central corridor”. The central corridor is defined here as the area between 72nd Street in the West and the Missouri River in the East, extending 2 km North and South of Dodge Street; Omaha’s primary East-West arterial roadway. Areas of the city in which creative and walkable hotspots overlapped included Downtown, particularly the Old Market district just southeast of the central business district (Fig. 3A), the Midtown area approximately 2 km west of downtown and encompassing the one million square feet Midtown Crossing mixed-use development, the Dundee neighborhood (Fig. 3B), the Benson neighborhood and entertainment district, and the Elmwood Park-Aksarben Village area (another large mixed-use community). Two of the creative hotspots within the central corridor extended well beyond their overlapping walkable hotspots to include the North Downtown (NoDo)/Creighton University area and the north campus of the University of Nebraska at Omaha (the south campus is adjacent to Aksarben Village).

Respondents also identified two creative hotspots outside the central corridor: a small cluster of “votes” in West Omaha corresponds to a large “open-air mall” retail development called Village Pointe, while a cluster in South Omaha near Highway 75 and L Street is in close proximity to the South Campus of Metropolitan Community College (Fig. 3C) and South 24th Street, an historic main street corridor within the heart of Omaha’s Latino community. Interestingly, not a single respondent mentioned Village Pointe by name, though shopping was referred to in regard to creative areas with phrases such as “unique stores” and “local shops” used describe retail establishments in older, central neighborhoods. If anything, one might expect Village Pointe to be described as walkable (rather than “creative”), given its open-air retail format. The development, however, does host one of the few farmers markets in suburban Omaha and is home to the Blue Pomegranate craft art gallery. The one lone cluster of walkability outside the central corridor corresponded to Zorinsky Lake (Fig. 3D), a popular recreational area in West Omaha. With extensive walking and cycling trails, it was not unexpected that several respondents perceived the area as among the most walkable in Omaha. The Lake and surrounding park is also squarely situated in the suburbs of western Omaha with few arts/cultural/entertainment amenities nearby, likely contributing to the paucity of creative “votes” there.

In general, creative and walkable hotspots tended to overlap most extensively in the city’s older, central urban neighborhoods, particularly those undergoing revitalization and gentrification such as Downtown/Old Market, Midtown, Dundee, Benson, and Aksarben Village (Figs. 2, 3A and 3B). These areas represent some of the most densely populated and pedestrian-friendly areas within Omaha. They tend to exhibit relatively high Walk Scores (generally those above 70) due to dense concentrations of businesses and well-connected, street networks. They can each trace their founding and initial growth to the late 19th/early 20th century before Euclidean zoning and private automotive transportation were common. Their fine-grained, historic mix of land uses supports a variety of economic activity, making them ideal for both purposive and recreational walking. Aksarben Village is mostly new construction (the site was home to the Ak-Sar-Ben [horse] Race Track until the early 2000s), but it is modeled on new urbanist principles of density and mixed use (Grant, 2005). It is evident that residents also associate certain recreational areas with high walkability and creativity. This was particularly true of Elmwood Park, one of the city’s largest urban parks, centrally located between Aksarben Village and the University of Nebraska at Omaha. Most parks and recreational areas on the urban periphery, by contrast, tended to have many more walkable votes than creative votes (e.g. Zorinsky Lake Park).

4.1. Spatial correlation

As the hotspot analysis above suggested, walkability and creativity in Omaha exhibited a statistically significant spatial correlation. The

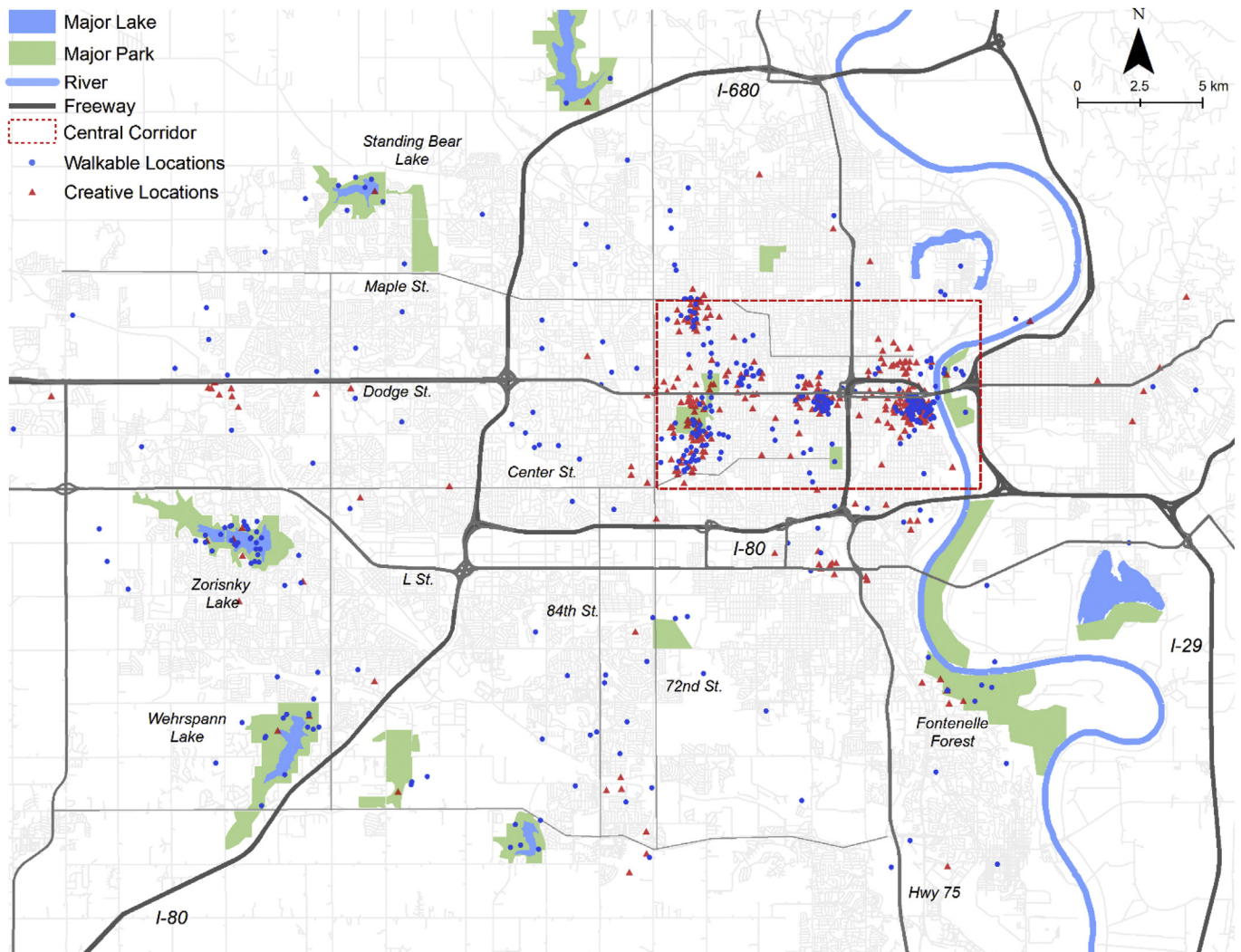


Fig. 1. The Omaha study area with walkable and creative locations as indicated by survey respondents.

Spearman's rho correlation analysis confirmed a highly significant correlation between survey-derived creative “votes” and walkable “votes”, as measured by counting the number of “votes” within 1.4 km of each of the 1200 Walk Score data points ($r = 0.550$, $p < 0.001$). There was also a significant correlation between Walk Score and the number of creative “votes” within 1.4 km ($r = 0.452$, $p < 0.001$), suggesting that the spatial association between walkability and creativity is quite robust. The nature of the correlation between perceptions of creativity and walkability, and between perceptions of creativity and Walk Score, displayed some notable differences, however. Whereas perceptions of creativity increased in a linear fashion along with perceptions of walkability, there were few walkable votes at locations with walk scores less than 40 and a wide range in the number of creative votes at locations with high walk scores. The former is perhaps not surprising since Walk Score describes locations with walk scores less than 50 as “car-dependent”. The wider range in the number of creative votes at the high end of the Walk Score spectrum (particularly beyond 60) might represent in part the inability of the macro-scale Walk Score algorithm to capture nuanced design elements and other characteristics that may contribute to the walkability and potential creativity of place. Furthermore, Walk Score tends to rate parks and recreational areas as having low walkability (due to a low concentration of built amenities, etc.), whereas residents considered a number of these areas to be among the most walkable in Omaha.

The spatial point pattern test developed by [Andresen \(2009\)](#)

similarly suggested a high degree of correlation between perceptions of walkability and creativity. The index of similarity, S , was 0.855 when using a grid of 1 km^2 areal units. [Andresen \(2016\)](#) suggests that an S -Index value of 0.80 or greater should generally indicate similarity, though there is no definitive threshold. Additionally, as the author admits, the test is vulnerable to the modifiable areal unit problem (MAUP) in which the results of an analysis change depending on the areal units considered ([Openshaw, 1984](#)). The S -Index tends to decline when using larger areal units (i.e., larger grid cells), and increase when using smaller units. The difference can be significant. In this analysis, a larger 2 km^2 grid resulted in an S -Index value of 0.688, while a smaller 0.5 km^2 grid results in an S -Index value of 0.944.

The S -Index (using a 1 km^2 grid) did not vary markedly between groups of respondents based on age, residential location (distance from home to city hall), income, or education (graduate degree or not), suggesting limited variability in the strength of association between the two variables by demographic or socio-economic characteristic ([Table 2](#)). The widest gaps were found between those with and without a graduate degree (S -index 0.940 vs. 0.884) and between more and less wealthy (S -index 0.883 vs. 0.929). Overall, younger respondents and those with lower household incomes and more education tended to produce slightly more similar creative/walkable point patterns, although, again, the S -indices of all groups were high enough to suggest similarity.

The high degree of similarity among groups is likely an artefact of

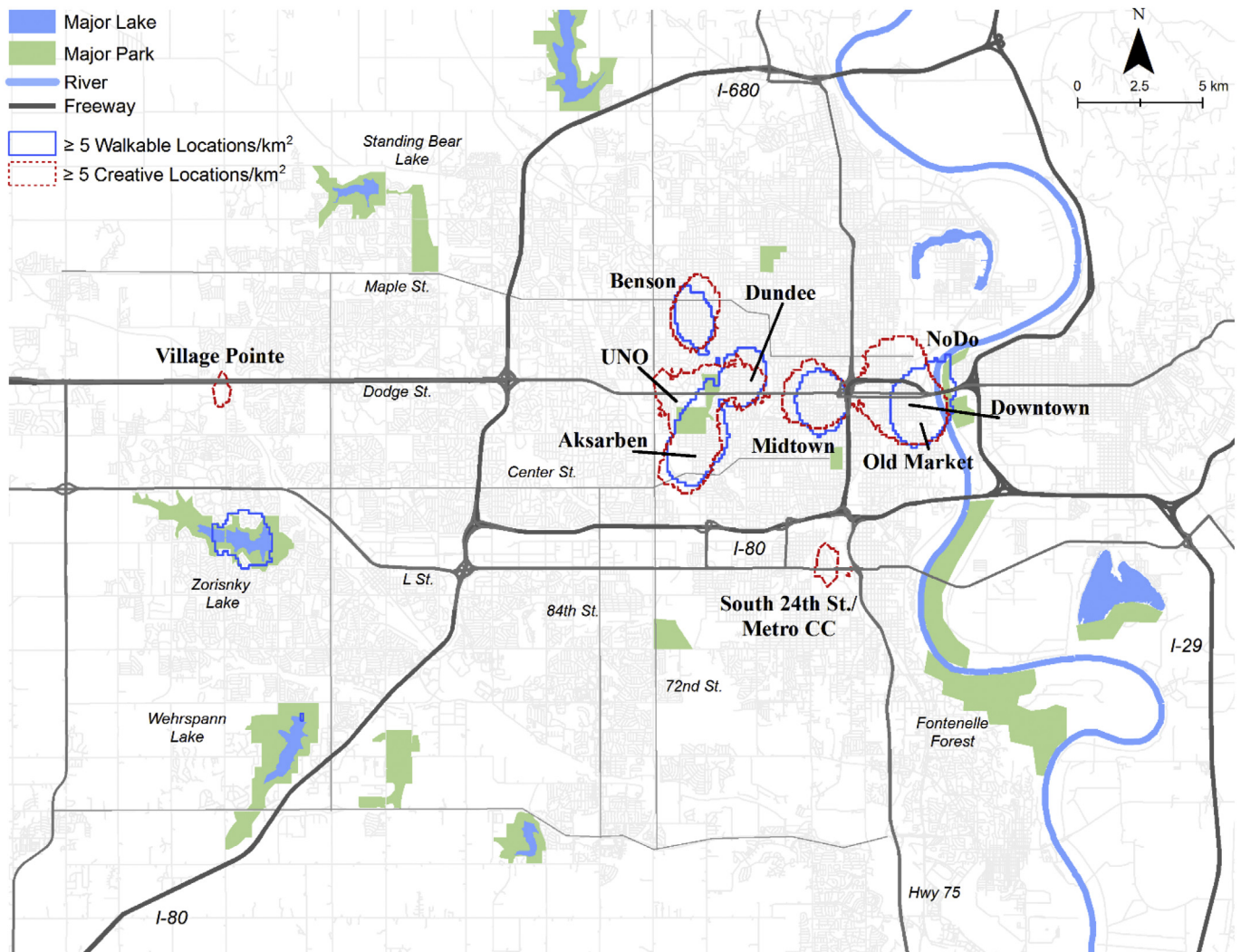


Fig. 2. Clusters or “hotspots” of walkability and creativity within Omaha, defined as those areas with 5 or more walkable or creative “votes” (locations indicated by survey respondents) per square kilometer.

the dataset and the way in which the *S*-Index spatially aggregates data into a regular grid. As the areal units grow in size, there are fewer zero values that align between the creative and walkable datasets (indicating no walkable or creative “votes” within that area), and the units with values of one or greater are not as likely to share the exact same number of “votes.” It may be reasonable to conclude, therefore, that the observed decrease in *S* with increased areal unit size suggests that the two datasets agree more on where there isn’t creativity/walkability than where there is. Even though the study area was limited in such a way as to focus on Omaha’s urbanized landscape, much of the area is still relatively low-density, composed mainly of single-family residential suburban and exurban development with few creative/cultural amenities and low walkability.

Indeed, despite the high degree of similarity suggested by the *S*-Index, it was observed that some groups of respondents were more likely than others to place most or all of their creative or walkable “votes” within the more centralized, urban areas of Omaha, identified previously as the “central corridor”. This urban bias was more consistent for creative “votes”; between 78 and 85 percent of all creative points were placed within the “central corridor” versus 44 to 71 percent of walkable points. The difference in the proportion of walkable points within the central corridor was most pronounced between the younger and older respondents, with the younger cohort (age < 54) having placed 71 percent of their walkable “votes” within the central corridor,

and the older cohort just 44 percent. The widest gap in the proportion of walkable and creative votes within the central corridor was also exhibited by the older group of respondents: 44 percent of walkable “votes” versus 79 percent of creative votes. In general, younger respondents living closer to the city center and with higher educational attainment exhibited a strong tendency to identify walkable locations (and, to a more limited extent, creative areas) within the older, centralized neighborhoods of the “central corridor”.

4.2. What makes a place walkable, creative?

The final question of the survey was open-ended and requested that respondents describe the features that make their chosen locations among the most walkable or creative within Omaha. A list of the fifteen most frequently used descriptive words and their context in response to the two questions are presented in Tables 3 and 4. In describing the features that contribute to a site’s walkability, respondents repeatedly emphasized the importance of pedestrian infrastructure, particularly sidewalks. Many respondents described the attraction of lively urban environments that featured shopping and entertainment amenities, and social spaces such as bars and coffee shops. As one of the city’s most popular entertainment districts and mixed-use neighborhoods (comprised largely of renovated warehouse buildings), the Old Market was frequently identified by name. The importance of mixing various land



Fig. 3. Examples of locations that survey respondents perceived to be both creative and walkable: A) Downtown/Old Market and B) Dundee; creative but not especially walkable: C) South Omaha/Metropolitan Community College (with the historic Livestock Exchange building at rear left); and walkable but not especially creative: D) Zorinsky Lake and Park in Omaha's western suburbs. Satellite imagery ©(2018) Google, photos by author.

Table 2

S-Index indicating the degree of similarity between points of walkability and creativity in Omaha among respondents above and below the mean in regard to age, income, and distance from home to city hall, and the whether they have completed a graduate degree or not.

Respondent Cohort	S-Index
Younger	0.924
Older (54 +)	0.892
Lower income	0.929
Higher income (\$94k +)	0.887
Home < 12 km to city hall	0.916
Home > 12 km to city hall	0.911
Graduate degree	0.940
No graduate degree	0.884

uses was a common theme. A 53 year old female graduate student, for example, commented that both “the Old Market and Dundee have restaurants and businesses and residential areas in easy walking distance.” Other respondents focused more on walking for recreational purposes, and identified features common to parks such as trails, bridges, trees, and “visually pleasing” landscapes. Several respondents

described both types of environments, noting that some areas of the city were walkable because they were interesting and lively with a strong urban character, and others because they featured nature and open spaces. A 36 year old male working in product marketing, for instance, described his chosen locations as having “A high number of things to do. Shopping, parks, art, etc. Also, the last neighborhood has a great walking trail that feels like you are in nature.” Safety was also a common element in support of walkability in parks as well as urban settings.

In regard to creativity, respondents frequently cited the diverse and unique architecture and “dynamic environment” that could be found in the Old Market, Midtown, and other older, centrally-located urban neighborhoods in Omaha. According to respondents, these spaces offer a variety of new and unique artistic/cultural experiences less frequently available in Omaha's more suburban environments. Walkability was explicitly mentioned in about 10 percent of all responses. Several more, however, suggested at the importance of walkability, such as “locations [that have] evolved to incorporate residences and businesses” and “good places to shop while walking and going to unique stores.” Survey respondents were particularly keen to mention art studios and galleries, theaters, and music venues as loci of creativity and creative talent. Much of the emphasis was on the consumption of creative/cultural

Table 3

The top 15 words, and examples of the context in which they were used, employed by survey respondents to describe their chosen most walkable locations.

Walkable Survey	
Words	Context – Examples
Walk(ing)	“Old Market-fun to walk around”, “sites for people to walk”, “great place to walk”, “great walking trail”, “walking distance”, “good walk path”, “walkable sidewalks”
Area	“Old Market area”, “areas where bikes and pedestrians”, “compact areas with a mix”, “areas in easy walking distance”, “large areas, multiple businesses”
Sidewalk	“maintenance of the sidewalks”, “wide sidewalks”, “walkable sidewalks”, “lots of sidewalks”, “large sidewalks”, “broad sidewalks not attached to streets”
Park	“park made for walking”, “scattering of small parks”, “nice park and lake setting”, “shopping, parks, art”, “shopping and parks”
Old(er)	“established, older neighborhoods”, “Old Market”, “Old Market area”
Place	“cool place”, “great place to walk”, “speed controls in place”, “places of employment”, “go easily from place to place”
Market	“Old Market”, “farmers market”
Trail	“parks and walking trails”, “sidewalks and/or walking trails”, “hiking trails”, “great walking trail”, “Keystone trail”, “lakeside walking trails”
Lot	“lots of people”, “a lot of educational activities”, “lots of sidewalks”, “lots to see”, “lots of stores”
Residential	“mix of residential”, “businesses and residential areas”, “mixture of residential”, “low speed residential streets”
Shop(ping)	“outdoor shopping”, “entertainment and shopping”, “multiple shops/restaurants/coffee shops”, “coffee shops”, “eclectic shops”, “HotShops”, “live-shop-dine”, “shops & restaurants”, “shopping, parks, art”, “Old Market shops”
Street	“main streets”, “wider, flatter streets”, “curved streets with parking”, “low-speed residential streets”
Neighborhood	“neighborhood has a great walking trail”, “my neighborhood”, “nice, friendly neighborhoods”, “established, older neighborhoods”
Pedestrian	“bikes and pedestrians”, “pedestrian friendly”, “pedestrian bridge”, “human/pedestrian centered design”, “pedestrian areas”
Traffic	“low vehicle traffic”, “low auto traffic”, “slower traffic”, “pedestrian traffic”

products such as theater or music, however several respondents considered the production side as well. According to a 41 year old stay at home mom, “the artistic and creative missions of the Bemis Center and Kaneko make them epicenters of creativity in Omaha. Creative people live, think, and work there. People come from around the world to these two places.” Employment opportunities and a mix of entertainment, social, and recreational amenities were seen to attract creative workers. As a 32 year old male freelance web developer commented, “I feel like the Old Market, the Blackstone District, and Benson all attract creative people. There are businesses, such as creative agencies and design studios. Yoga studios, unique restaurants and bars, and coffee shops also help draw in a creative crowd.” The impact of the arts on the social life of the community was the primary focus of a 34 year old female artist who stated, “North & South Omaha are the cultural and historical epicenters of Omaha. Those 2 areas are also up-and-coming homes to many new, unique venues that offer opportunities for artists and communities to experience arts in ways never before offered; really creating a unique, sustainable relationship between the arts and the community.” Omaha’s university campuses were also frequently mentioned as centers of creativity where “education, discussion, problem solving and thought are common.”

5. Discussion and conclusions

The strong spatial correlation observed here between perceptions of walkability and creativity in Omaha, Nebraska does indeed suggest that neighborhoods perceived to be walkable are also likely to be perceived as creative neighborhoods and *vice versa*. Admittedly, both walkability and creativity can be challenging to define precisely, and any change in definition may alter the spatial relationships observed between them. By encouraging respondents to define each of these terms themselves, however, we aimed to cast a wide net that considered many different types of walkable and creative potentialities. Thus, despite the broad spectrum of interpretations, with some residents preferring to focus on recreational rather than purposive or utilitarian walking, or conceptualized creativity in terms of cultural venues rather than clusters of creative firms, the study still revealed a strikingly clear spatial correlation. The association between walkability and creativity remained significant even when substituting an objective index of walkability (Walk Score) for resident perceptions, although the degree of correlation was reduced. This was likely due to Walk Score’s inability to consider detailed micro-scale elements of the built environment that may contribute to both a location’s walkability and its creative potential. It is important, however, not to equate correlation with causality;

Table 4

The top 15 words, and examples of the context in which they were used, employed by survey respondents to describe their chosen most creative locations.

Creative Survey	
Words	Context – Examples
Art(ist)	“many creative artists and stores”, “arts, crafts, design and film scenes”, “art galleries”, “museums, art shops”, “activities and art all in walking distance”, “art museum”, “art areas and dynamic shopping”, “art and culture”, “art studios”, “from art to music”
Old(er)	“Old Market”, “older and upcoming areas”
Market	“Old Market”
Omaha	“Omaha to see art, music”, “different than most of Omaha”, “epicenters of creativity in Omaha”, “North & South Omaha”, “film scenes in Omaha”, “Downtown Omaha”
Creative	“creative arts downtown”, “attract creative people”, “artists and creative missions”, “creative artists”, “creative arts and performances”, “creative hub”, “creative people”
Area	“area near the Old Market”, “all 3 areas”, “Papillion area”, “areas where artists congregate”, “downtown area”, “areas are different”, “older and upcoming areas”
Downtown	“old market, downtown”, AKSARBEN (UNO and Businesses), Downtown”, “Downtown has always been a creative hub”, “creative arts downtown”
New	“new and different things”, “something new out of something old”, “unique and open to new ideas”, “corporate newness of West Omaha”, “new, unique venues”
Unique	“unique stores/shops/restaurants”, “unique urban environment”, “unique stores”, “very unique and open”, “unique restaurants and bars”, “unique experiences”
Venue	“outdoor venues”, “music venues”, “venues, nightclubs, studios”, “public venues”
Activity(ies)	“innovative method or activity”, “outdoor, healthy activities”, “various activities”, “cultural activities”, “lots of activities”
Music	“art studios, music, creative people”, “from art to music”, “arts both musically and visually”, “music venues”, “art, music, and theater”, “local music”
Place	“activities take place”, “good places to shop”, “local artists places to work”
(epi)Center	“west Center”, “Holland Arts Center”, “epicenters of creativity”, “historical epicenters”, “Century Link Center”, “centers of creative and cultural production”
Local(ly)	“local artists”, “locally made work”, “local music”, “local shops”

although the two data layers exhibited spatial similarity, and several respondents mentioned attributes of walkability when describing creative spaces, and, conversely, arts/cultural amenities when describing walkable spaces, it is not possible to say that one *causes* the other. The social, psychological, and economic connections that may exist between specific attributes of the physical environment and types of creative potential and productivity are still being resolved.

Both walkable and creative locations, as identified by survey respondents, were disproportionately located within Omaha's central urban neighborhoods, particularly Downtown/The Old Market, Midtown, Benson, Dundee, and Aksarben. Each of these areas has a more urban character than much of the Omaha region, with a mix of land uses, multi-story buildings, sidewalks, local retail stores, and an abundance of entertainment, cultural, and social amenities. In their investigations of creative spaces in the city, Brennan-Horley and Gibson (2009) and Gibson et al. (2012) similarly found central urban spaces in Darwin and Wollongong, Australia to be hotspots of perceived creativity, though other areas with creative/cultural activity were found in a few outlying areas as well, such as beach communities north of Wollongong. Within Omaha's suburban landscape, Zorinsky Lake Park stood out as a significant cluster of walkability but not creativity, suggesting an interesting dichotomy between urban and suburban parks in which the latter is viewed mainly as a space for physical, rather than creative, stimulation or activity. The two main creative hotspots outside the central corridor, Village Pointe shopping center and South Omaha/Metropolitan Community College, were not viewed as particularly walkable, but they each offered some interaction with the arts either through educational programs or retail venues.

The robust spatial correlation between the walkable, urban character of Omaha's central neighborhoods and their perception as epicenters of creativity suggests that the built environment can play a role in shaping a city's creative milieu. Indeed, survey respondents routinely emphasized the importance of mixing land uses and supporting pedestrian-oriented spaces, which, when combined with local arts and cultural facilities and scenes lends to an atmosphere of creativity. This echoes previous research efforts that have highlighted the importance of urban form and design in nurturing creative industry clusters (Costa & Lopes, 2015; Drake, 2003; Durmaz, 2015; Hutton, 2006; Spencer, 2015; Storper & Venables, 2004). The cumulative implication of these investigations is that walkable urban spaces may play a role in attracting and retaining creative employees as well as supporting certain types of innovative creative-cultural firms and activities. From a planning and policy perspective, cities looking to enhance their share of creative-cultural activity (economic and social) may be well served to plan for human-scale spaces conducive to active modes of transportation. This strategy is well-aligned with pro-sustainability movements in urban planning and design such as smart growth and new urbanism (Duany, Speck, & Lydon, 2011; Khattak & Rodriguez, 2005; Knapp & Talen, 2005).

Though fairly minor overall, the differences observed among groups of survey respondents may be telling. The largest discrepancies were observed when comparing the locations of creative epicenters identified by older (54+) versus younger residents. The tendency of younger respondents to associate creativity with Omaha's central urban neighborhoods may reflect a more general preference for urban spaces and lifestyles among younger residents (Karsten, 2003; Lawton et al., 2013). Younger residents may simply have more experience with these spaces and the various arts, cultural, and entertainment amenities that can be found there. There is also some indication that individuals with more education and those that live closer to the city center are more likely to associate creativity with the city's more central, urban spaces. Theories of human and creative capital suggest that well-educated, young professionals may be particularly drawn to urban environments perceived to be vibrant and creative, which are seen to offer interesting and unique social/cultural experiences (Bereitschaft, 2014; Lawton et al., 2013; Tallon & Bromley, 2004; Woldoff, DeCola, & Litchfield, 2011).

There is much opportunity for future work to build upon the present study. Given the difficulty in defining walkability and creativity, it may be useful to incorporate other definitions and datasets into the analysis. The question as to whether walkability, or even urban form more broadly, can enhance creativity was only partially explored. To excavate deeper, it may be necessary to include a wider group of participants while simultaneously asking more detailed questions about the role of place and movement in creative thought, perhaps through semi-structured interviews. As advanced capitalist economies continue to become ever-more reliant on creative- or intellectual-based work, the need to engineer or preserve those aspects of cities, such as walkability and diversity, that may support creative activities and enterprises will become increasingly acute. Crucially, however, the benefits of enhancing pedestrianism in cities reach far beyond the health of the local creative economy, with implications for human health, environmental integrity, and nearly every aspect of sustainability.

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Appendix B. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.ccs.2018.08.002>.

Appendix A. Walkable survey questions with creative survey questions (if different) in parenthesis and in bold.

1. Age [box]
2. Sex [select: male/female]
3. Educational Attainment [select: some schooling completed, HS diploma/GED, some college, associated degree, bachelor's degree, master's degree, doctorate]
4. Income [box]
5. Please briefly describe your occupation. [box] and indicate the degree to which it requires creativity (1 = not at all, 5 = very much) [radio buttons].
6. Please indicate on the map the approximate location of your primary residence and place of employment.
7. Please identify on the map(s) provided the three most walkable or pedestrian-oriented neighborhoods ("**epicenters of creativity**") in Omaha.
8. Please explain briefly the specific features of these three locations that make them the most walkable ("**epicenters of creativity**") within the Omaha area. [box]

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