PERCEPTIONS OF THERMAL COMFORT: LANDSCAPE DESIGN ATTRIBUTES BASED ON THE SHOPS AT LA CANTERA IN SAN ANTONIO, TEXAS

by

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ABSTRACT

PERCEPTIONS OF THERMAL COMFORT: LANDSCAPE DESIGN ATTRIBUTES BASED ON THE SHOPS AT LA CANTERA IN SAN ANTONIO, TEXAS

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The focus of this thesis was to understand people's perceptions of thermal comfort by looking closely at a single case study site, The Shops at La Cantera in San Antonio, Texas. Understanding design attributes that affect thermal comfort in outdoor spaces is necessary, as it will have a major influence on the design of urban outdoor spaces (Nikolopoulou and Steemers, 2003). The research will have great implications on the field of landscape architecture, architecture, urban design, and planning,

Indoor shopping malls are no longer being built. The trend is moving towards outdoor shopping centers known as "lifestyle centers" (Jost, 2010). Lifestyle centers offer an experience that can't be replicated by indoor malls. Lifestyle centers are open to the sky and as a result, they are exposed to climatic factors, such as air temperature, humidity, wind, and solar radiation. The Shops at La Cantera is an open-air outdoor shopping mall in a humid subtropical climate zone. The designers incorporated many elements that provide spaces that are thermally comfortable for its visitors. Some of these design factors were based on adaptive human behaviors that gave the perception of thermal comfort. How psychological adaptations influence thermal comfort has become an important aspect of landscape architecture. This research addresses how

thermal comfort, is perceived. The incorporation of landscape elements that help hold people in a space for a longer period determines the success of outdoor urban open spaces.

The research study has found that certain attributes that were implemented at The Shops at La Cantera were effective. The findings suggest that perceived control, shading, water features, and plantings were important attributes that affected the perception of a user's thermal comfort.

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Chapter 1

Introduction

1.1 Background

While indoor shopping malls were once an endemic part of the American landscape, construction of enclosed malls has all but ceased. “The indoor shopping mall also appears to be an idea that has run its course” (Badger, 2013). According to the International Council of Shopping Centers, there has not been a new enclosed mall built since 2006 (Jost, 2010). In the post World War II decades when the first enclose shopping malls were built, climate control was once an exciting appeal that drew people to indoor malls. Today, however, people are gravitating toward outdoor malls or lifestyle centers. Lifestyle centers is a term coined by the Memphis-based developer Poag & McEwen. They are privatized developments typically built in affluent locations aimed to feed the consumer culture (Blum, 2005; Beam & Dickinson, 2015). Lifestyle center were designed to replicate pre World War II city streets (Blum, 2005). They offer nostalgic images of small town Main Streets and energetic downtowns devoid of the dangers associate in a city. By replicating downtowns, lifestyle centers are creating an identity, unlike the placeless indoor shopping mall (Beam & Dickinson, 2015). “The lifestyle center returns shoppers to a premall time and place. The lifestyle center looks to leapfrog over the mall back (geographically and temporally) to the urban centers and small towns that malls were instrumental in destroying” (Beam & Dickinson, 2015 p 160). The trend is moving toward lifestyle centers (Fig.1.1–1.3) for their “open to the sky” rather than enclosed sterile feel (Jost, 2010).

“The experience factor” is likely to be the main driving force for malls in the coming years (Hurley, 2015). The real estate and retail industry is embracing outdoor lifestyle centers and indoor/outdoor hybrids instead of the traditional enclosed malls.

Lifestyle centers reflect the upscale consumers' natural inclination toward these new, open- air facilities, which attempt to provide a more urban feel (Hurley 2015). Lifestyle centers, like malls before them, feature anchors or big box stores that are complemented by small boutique shops and landscaping with courtyards, parks, and seating (Sodoma, 2009). Malls are being converted to "lifestyle centers, with condos above or offices next door" (Badger, 2013).Some lifestyle centers have a central open-air pedestrian mall with on-street parking. The street parking inside the lifestyle center is only a fraction of the total available parking and is sometimes surrounded by a sea of parking lots or parking garages. Other lifestyle centers also include offices and apartments, developing a live, play, and work environment (Jost, 2010).

Figure 1.1 Southlake Town Square established 1999 (Southlake Town Square; Southlake Historical Society)

Figure 1.2 Fashion Island, Newport Beach, CA. (O.C. Style)

Figure 1.3 Highland Park Village established 1931 (Calvin, 2013; “Legacy”)

This research focuses on La Cantera, an open-air shopping mall located in a humid subtropical climatic zone. In this type of zone, it is critical to understand the factors that affect the perception of thermal comfort in outdoor public and commercial spaces. Weather can greatly affect a shopper’s mood and behavior. Optimal pleasant

weather can improve mood and enhance cognition. People need leisure and recreation, and they are often directly exposed to the climate when visiting outdoor urban spaces. Therefore, a thermally comfortable environment is critical to the enjoyment and occupancy of public spaces (Lin, 2009). Studies have examined thermal comfort in outdoor environments. Indoor thermal comfort compared with outdoor thermal comfort and thermal acceptable range should differ due to thermal adaptation. Thermal adaption has become a vital issue in the understanding of indoor and outdoor thermal environments. Physiological adaptation to a climate is generally minimal versus the effects of psychological adaption and behavioral adjustments on thermal comfort (Lin, 2009). "An awareness of these issues would be valuable to architects, planners, and urban designers, not by the way of limiting possible solutions, rather by enriching the design possibilities" (Nikolopoulou & Steemers, 2003, p. 95). The Shops at La Cantera is a unique lifestyle center located in a humid subtropical climate in the city of San Antonio, Texas. Many tourists and locals go there to shop and dine. In addition, many people work at this center. This research study seeks to identify the design attributes that influence the perception of thermal comfort in this particular location and crate generalization that may apply more broadly to outdoor urban spaces in similar climates.

1.2 Problem Statement

The Shops at La Cantera is a popular shopping destination for high-end retail and luxury goods. "La Cantera has a luxurious aura, with elaborate water fountains, lush gardening and swanky, modern architecture" (Webner, 2015). The Shops has been successful at attracting visitors outdoors and at keeping them for a long periods despite the heat of the summer months. San Antonio's average temperature exceeds 90 degrees between July and September (National Weather Service). Temperatures reaching over 90 degrees Fahrenheit can be unbearable. Without sufficient relief or engagement from

the external climate, outdoor spaces are underutilized. The Shops at La Cantera design team, composed of J. Robert Anderson Landscape Architects and Alamo Architects, created spaces that were not only bearable but also pleasant (Jost, 2010). This research aims to analyze response to La Cantera to uncover the landscape design attributes that affect a person's perception of thermal comfort in hot climates. Even though microclimatic factors influence thermal comfort, quantitative research is inadequate in describing the comfort conditions outdoors. Thermal comfort is not only influenced by physiological factors but also by psychological factors best understood using qualitative research methods.

1.3 Purpose of the Study

The study's purpose is to clarify the landscape design attributes that influence a user's perception of thermal comfort in a hot climate using the case study of The Shops at La Cantera. By identifying these attributes and perceptions, landscape architects, architects, planners, and urban designers can incorporate them into outdoor retail centers and urban spaces. This study investigates the landscape features that are vital to a successful outdoor public spaces in hot climates to be perceived as comfortable by users.

1.4 Research Questions

What design attributes affect the perception of thermal comfort of outdoor spaces in hot, humid climates?

What specific kinds of spaces do users gravitate to most to be thermally comfortable?

How do perceptions of thermal comfort affect the success of urban spaces?

1.5 Definition of Terms

Adaptation: The progressive reduction of an organism's response to repeated environmental stimulation such that an organism acclimates to survive in a given environment (Lin, 2009).

Albedo: The ability of an object to reflect solar radiation (Brown, 2010, p 66).

Color: "The sensation resulting from stimulating of the retina of the eye by light waves of certain lengths" (Clark, 1978 p 43).

Domain analysis: Using common relationships between words to discover common themes (Spradley, 1979, p 107).

Humid subtropical climate: Climate type that has relatively high temperatures and that evenly distributes precipitation throughout the year (humid subtropical climate, 2015).

Imageability: That quality in a physical object that give it a high probability of evoking a strong mental image in any given observer (Lynch, 1960, pg. 9).

Landscape Aesthetics: A positive reaction that occurs in the mental dialogue between the viewer and the landscape.(Wang & Yu, 2012, p. 305).

Lifestyle center: Any open-air shopping mall with at least 50,000 square feet of high-end, or upscale retail space (Gillem, 2009).

Microclimate: Climate created by solar and terrestrial radiation, wind air temperature, humidity, and precipitation in a small outdoor space (Brown & Gillespie, 1995, p. 1).

Open-ended interviews: "In which the response is shaped by the subjects and their interaction with the researcher" (Deming & Swaffield, 2011 p. 72).

Perception: Awareness of sensory stimulation based on environmental experiences (Fisher, 1984).

Perceived control: Having knowledge or choice of alternative control strategies to manipulate one's thermal environment (Pacuik, 1990)

Qualitative method: Research involving concepts or themes associated from descriptive data (Taylor & Bogdan, 1998 p. 7).

Snowball Sampling: Technique in which informants recruit future informants to the study (Taylor & Bogdan, 1998 p. 93)

Thermal adaptation: Psychological and behavioral factors that affect thermal comfort (Lin, 2009).

Thermal sensation: "A conscious experience resulting from exposure to a group of variables making up thermal environment" (Pacuik, 1990)

Thermal comfort: A combination of outdoor elements that psychologically produce acceptable environmental conditions (Nikolopoulou and Steemers, 2003).

1.6 Research Methods

This research uses qualitative research methods (Taylor & Bogdan, 1998). For this research, in-depth interviews were conducted to identify design attributes that contribute to perceptions of thermal comfort. Two groups of informants were chosen. The first group comprised people who work at The Shops at La Cantera. The second group included design professionals who were involved with or have knowledge of the project. Open-ended interviews were conducted with both groups of informants. The Institutional Review Board (IRB) at the University of Texas at Arlington approved interview questions and methods. The interviews were collected and analyzed using the domain analysis method to search for common themes.

1.7 Significance and Limitations

The research has further implications on the success of urban spaces. According to Lin, "The success of a public space can be based on the number of people who use that space" (2009). The findings of thermal comfort design attributes enable design professionals to make informed decisions on future outdoor public space projects.

As with all research studies, limitations exist. Some informants may not have much knowledge of The Shops at La Cantera or have not acclimated to the climatic conditions of San Antonio. Particular jargon can be misunderstood. Responses can be nondescript due to time constraints of mall employees. Finally, perceptions may vary depending on age, gender, culture, time, and so on.

1.8 Summary

This research's purpose is to identify the landscape design attributes that affect a user's perception of thermal comfort in a hot or humid subtropical climatic zone. The study was delimited to the summer season. The area of study was The Shops at La Cantera located in San Antonio, Texas. The aim was to determine what design attributes contributed to perceptions of thermal comfort. Through qualitative research methods, interviews with two groups of participants yielded data that helped identify common themes of users' perceptions of their environments.

The Shops at La Cantera was chosen because it is an outdoor mall situated in a humid subtropical climate and has won awards from the International Council of Shopping Centers for marketing excellence, *Retail Traffic Magazine*'s grand award for Superior Achievement in Design & Imaging, and a Readers' Choice award in 2015. Furthermore, because the mall is a lifestyle center, designers and planners can learn effective strategies to increase the usage of outdoor spaces. For example, incorporating water features and plants brings tranquility to a space, and distinct spaces and various degrees of shade have been effective at bringing about outdoor thermal comfort.

Chapter 2

Literature Review

2.1 Introduction

This chapter addresses the representative literature that identifies factors that influence the perceptions of thermal comfort in outdoor public spaces. A physiological approach is incomplete in establishing criteria for outdoor thermal comfort. This review provides a broader explanation of the design attributes that affect outdoor thermal comfort. The literature review is categorized by design attributes and landscape aesthetics and by their role in the perception of thermal comfort.

"Research in environmental aesthetics suggests that the natural environment affects human emotional functioning. Views of nature have been associated with relaxation and restorative powers" (Heerwagen & Heerwagen, 1984)

2.2 Design Elements

2.2.1 Light

Individuals have a propensity toward natural sunlight. Sunlight has many positive health effects and can elevate a person's mood (Fisher, 1984). Subconsciously, the enjoyment of basking in the sun is innate to all creatures. The effects of light from natural sources such as the sun and artificial sources such as lamps and heat radiation cause the stimulation of cell metabolism and elimination of waste through the sweat glands and induces an increased flow of blood favoring nutrition and elimination (Clark, 1978). As a result, sunlight has a cleansing and soothing effect.

2.2.3 Color

"Sunlight is the combination of all the colors of the spectrum, visible and invisible" (Clark, 1978, p. 20). Color is an essential part of people lives and affects mood, behavior, and cognition. Color can arouse the human mind and ultimately influence

one's perceptions of environmental stimuli, such as thermal comfort. Seven basic colors exist. They are red, orange, yellow, green, blue, indigo, and violet. There are three primary colors, and they are: red, blue, and yellow (Grimley & Love, 2007).

> "Colors of the spectrum are to be associated with two moods, the warm, active, and exciting qualities of red and its analogous hues, and the cool, passive, and calming qualities of blue, violet, and green. Likewise, light colors are active, while deep colors are likely to be passive" (Birren, 1961, p. 141).

The proposed colors influence the perception of temperature (Eiseman, 2006). In outdoor spaces, color tends to excite or induce solemnity.

1. Red is exciting and arousing (Carlo, 2002). All hues of red are very stimulating (Clark, 1978). It is considered hot, lively, and restless (Sharpe, 1974). Physiologically, it activates the body and senses and psychologically signals attention, fight, or flight (Eiseman, 2006).
2. Blue represents rest and relaxation (Sharpe, 1974). It has been long associated with a clear blue sky "reflected over a calm sea" (Eiseman, 2006, p. 31). It is known to have a sedative effect (Clark, 1978). The color blue causes the body to release tranquilizing hormones that lower blood pressure and reduce pulse rate and decrease body temperature (O'Connor, 2009).
3. Green represents nature and has a calming effect. Studies of patients placed in green rooms have shown a significant decrease in blood pressure (Birren, 1961).

   > "Physiologically, green affects the nervous system, causing us to breathe slowly and deeply, helping the heart to relax by slowing the production of stress hormones" (Eiseman, 2006, p. 37).

   Outdoor environments dominated by vegetation are "less complex and have patterns that reduce arousal, and therefore, reduce our feelings of stress." Research studies have found that green has the ability to improve reading ability (Almusaed, 2010, p. 173).

4. “Yellow is associated with the sun, warmth, and summer” (Carlo, 2002).
5. Purple is the color of admiration and solemnity (Sharpe, 1974). When purple moves closer to red, it is perceived as hotter; by contrast, as it moves closer to blue, it is indentified as cooler (Eiseman, 2006).
6. Brown is earthy and represents the outdoors (Sharpe, 1974). People see it as “benign and non-threatening” (Eiseman, 2006, p. 26).
7. Black is the mysterious and somber and embodies the night sky (Sharpe, 1974).

2.2.3.1 Effects of color

Color has been known to have effects on health, comfort, happiness, and safety. Color has the power to stimulate or depress, relax and be cheerful, or irritate and cause discomfort. The psychology of color was originally developed to increase efficiency in industry. Color adds character to a space and influences human behavior and decision-making. In a factory in London, blue lighting caused the workers to feel ill; therefore, there was an increase in absenteeism. In another factory, gray machines were painted a light orange. This boosted worker morale, accidents decreased, and former “disgruntled employees began to sing while they worked.” In a factory cafeteria that had light blue walls, workers complained of feeling cold even though the temperature was 72 degrees. Later the temperature was raised to 75 degrees, and the workers still complained of feeling cold. A color consultant advised that the walls be painted orange. “The employees then complained that the 75 degrees temperature was too warm. Finally, it was reduced to the original 72 degrees and everyone was happy again” (Clark, 1978, p. 55). “Leading hotels have utilized color dynamic to impart an atmosphere of friendliness, comfort and good cheer” (Clark, 1978, p. 54). Color can potentially influence the overall mood and can induce a cooling perception in a hot climate.

Color has been shown to reduce eye fatigue, lift spirits, and improve quality and quantity in production. In hospitals, colors improve physical well-being and effectiveness of the medical staff. In schools, color has been shown to increase concentration, stimulate energy, and reduce eye fatigue among students and teachers (Clark, 1978). Color influences outdoor thermal comfort due to its ability to engage and improve the quality of spaces.

2.2.3.2 Time

People have a tendency to overestimate the passage of time in a red room and underestimate it in a green room (Birren, 1961). Two groups of salesmen whose watches were removed were asked to estimate how long they had spent in a meeting. In the red room, they estimated 6 hours when in reality, it had been only 3 hours. In the green room, they estimated less time than what it actually had been (Clark, 1978). Color can engage and distract individuals from thermal discomfort, thereby increasing productivity.

2.2.3 Water

Water in it is many forms produces feelings of refreshment, enjoyment, and tranquility to outdoor spaces. Just the sound of moving water can bring refreshment on a hot day (Symmes, 1998). Even though evaporation leads to a reduction of the ambient air temperature, just hearing the sound of water brings a cooling relief well before it is felt. "Water is an invaluable resource in dry climates" (Koch-Nielsen, 2007).

> "A psychological case can be made that the very sound of water has a cooling effect upon people in a hot climate. Even if the source is not apparent, the sound creates a sense of anticipation and is an attracting force" (Campbell, 1978, p. 9).

Water produces many types of sounds and "flows over and around obstructions," sprays and splashes into the air, captures it into its folds and produces "whitewater and waves" (Campbell, 1978, p. 9). The sound of flowing water (Fig. 2.1) has been associated with

meditation. “Moving water is ‘white noise,’ in which you can hear many things” (Schiff, & Kline, 2001).

Effect	Visuality	Sound Level	Water Flow Velocity / Intensity	Splashing	Perceptual Effect / Function	Design Objective in Urban Open Spaces
Refreshment	Good	Average	Average / High	High	Climatic Comfort Relaxation / Relief	Balance of Microclimate, Spatial Comfort
Entertainment & Pleasure	Good	High	Average / High	High	Excitement, Dynamism and Pleasure	Attracting the users, Concentration, Providing the contact with water
Prestige& Spectacle	Very Good	High	High	High	Glory, Admiration and Dynamism	Showing the power, Affecting the user, Orientation
Urban Oases	Good	Average / High	Average / High	Average	Relaxation, Breathing, Having a Rest	Improving the Spatial Quality, Attracting the users
Commemoration	Very Good	Average / High	High	High	Memorability, Commenting, Admiration	Expressiveness, reminding the history, attractiveness
Metaphor	Very Good	High	High	High	Thinking, Commenting, Meaning Attribution	Making users think, comment and imagine through symbols
Information	Good	Average	Average	Average	Being Informed, Orientation	Giving information about time and date

Figure 2.1: Effects of moving water (Symmes, 1998)

In ponds, lakes and lagoons the water remains still (Campbell, 1978). This is entirely different because it brings about a mood of serenity, meditation, and contemplation (Koch-Nielsen, 2007).

Effect	Depth	Inner Surface Color	Water Surface	Visuality	Sound Level	Perceptual Effect / Function	Design Objective in Urban Open Spaces
Reflector	Deep	Dark	Plain	Good	-	Perception of depth & size, concentration, mental renewal	Emphasis on elements, Spatial Perception Enrichment
Window	Shallow	Light	Plain	Average	-	Concentration	Presentation & Exhibition
Texture	Deep	Dark	Rough	Good	Low	Focal point, Recognizability	Bringing the water element forward in space
Activator	Shallow	Light	Rough	Average	Low	Dynamism & Briskness	Adding life, spirit and briskness to the space

Figure 2.2: Effect of still water (Symmes, 1998)

Visually undisturbed water bodies, whether it be a small pond or a lake has a pacifying effect. Settings of still water act to enhance a space by providing visual and reflective characteristics such as a reflector, a window, texture, and activator effects (Fig. 2.2). Those elements provide “opportunities for uninterrupted thinking (concentration) and for balancing microclimate creating coolness and moisture” (Kürkçüoğlu & Akin, 2013, p. 163). Whether it’s a roar, a whisper, or in repose, the sound of water delivers a feeling of coolness, refreshment, and serenity.

Aesthetically, water is sculptural and can bring cohesion to outdoor spaces (Fig. 2.3). “The use of water generates attention and activity, may provide a major feature of sculptural art in a public area, and in some ways fulfills the function of an urban oasis” (Campbell, 1978, p. 51).

Figure 2.3 Water as a sculptural piece.

As a design element, water becomes a focal point (Fig. 2.4), a symbol, and a backdrop. Water is unique in that it delivers a particular perception depending on the size and shape of the space (Kürkçüoğlu & Akin, 2013).

Figure 2.4: Water as a focal point

Water has been used as a frame for composition, a spine, and the heart of a composition. For example, in large lakes, lagoons, or bays, it provides a focal point or activity area. Street mall water features mimic rivers and channels, delineating the backbone or spine of a space. Like rivers creating artificial channels, canals, and even some modern street mall features, water can be the backbone or spine. This linearity provides unity and "organizational continuity." It separates one design element from another and leads people from one point to the next. Water creates a center for activity because of its active and auditory element. It creates immediate interest and attracts pedestrians. Water acts as a linkage from one space to another (Campbell, 1978). It produces spaces for activities such as observing, analyzing, and resting (Kürkçüoğlu & Akin, 2013)

Water engages all five senses, including the visual, auditory, and psychological. Water elements that are dynamic such as jets and fountains can bring feelings of refreshment and excitement or peace and tranquility. Apart from its soothing and

dynamic qualities, water also brings pleasure and establishes an urban oasis (Kürkçüoğlu & Akin, 2013).

2.2.4 Plants

Environments that contain naturalistic elements are more favorable to social interactions than are spaces devoid of such factors. The addition of trees, shrubs, and groundcover make public spaces more desirable. Time spent in spaces in close proximity to, or accompanied by, a number of trees have been shown to draw large groups of people (Ghavampour, Vale, & Aguila, 2015)

Views that include vegetation brought about less frustration, more patience, and increased enthusiasm and life satisfaction along with overall health (Kaplan, 1993). Naturalistic scenes dominated by vegetation and forests with varying degrees of openness produced greater tranquility and a reduced feeling of danger (Valarde, Fry, & Tveit, 2007). Artwork depicting natural scenes such as “distant mountains, a sunset, clustered trees and open grassy areas, path (mystery) caused a reduction in stress. The reported health affects for patients in waiting rooms brought feelings of peace and tranquility. In contrast, patients watching a white wall experienced an increased heart rate during waiting periods and were “feeling less calm and more tense that patients watching a landscape painting” (Heerwagen, 1990, p .204). Individuals immersed in greenery experienced relaxation; however, individuals viewing a concrete block fence experienced feelings of stress (Nakamura & Fujii, 1992). Greenery is essential in reducing discomfort caused by the external climate.

Exposure to vegetation in the outdoor environment, as opposed to built structures, promotes an overall sense of well-being. “The terms ‘healing’ or ‘therapeutic’ generally refer to a beneficial process that promotes overall well-being. According to Cooper-Marcus and Barnes (1995), these words are used to describe either one or a

mixture of the three following processes: relief from physical symptoms illness or trauma, 2) stress reduction and increased levels of comfort for individuals dealing with emotionally and/or physically tiring experiences, and an improvement in the overall sense of well-being" (Valarde, et. al., 2007, p. 200).

Outdoor environments can be restorative. Research in environmental psychology has found that healing gardens provide a calm and solemn environment to hospital patients. Moreover, "Psychologists have determined that tunnel corridors, the clutter of equipment, frightening medical machinery, blank walls, dreary views, noise, and harsh lighting that characterize modern hospitals are all environmental factors that increase blood pressure, heart rate, and the endocrine responses that accompany anxiety, fear, and anger. By contrast views of trees, lawn, flowers, and water promote healing by encouraging and attentive state that reduce tension and fatigue" (Warner & Baron, 1993, p. 1080). Outdoor thermal comfort is therefore dependent on greenery. Vegetation delivers a feeling of relaxation and comfort.

2.3 Thermal Comfort

It is important to understand how landscape design affects the perception of thermal comfort rather than just focus on the affects of microclimate. Microclimatic factors such as ambient air temperature, humidity, solar radiation, wind, and precipitation may influence outdoor thermal comfort (Brown & Gillespie, 1995). However, thermal adaptation, according to thermal comfort theory, suggests that psychological and behavioral factors significantly influence how people evaluate thermal environments (Lin, 2009).

"The main function of built environments is to provide protection from the stresses imposed by the climate" (Koch-Nielsen, 2007, p. 32). The general definition of thermal comfort is the sensation of well-being of an individual in a given environment.

Outdoor thermal comfort is affected beyond just physiological, but psychological factors, too. "The limits for thermal comfort vary depending on the degree of adaptation to the climate and the psych-social environment" (Koch-Nielsen, 2007, p. 32). Individual levels of adaptation to a particular environment are constituted by their experiences, which gives a strong predictive correlation to how they will respond to an environment (Wohlwill, 1973).

Factors that influence psychological adaptation to the thermal environment include experience, expectations, and perceived control (Lin, 2009). People who have control or choice of their thermal conditions have been shown to have better satisfaction in outdoor environments. For example, a study on naturally ventilated indoor environments (no air-conditioning) involving personal control over conditions found that employees who have the choice of operable windows, stack ventilation, and ceiling fans were able to tolerate and thermally adapt to their environment (Brager, Paliaga, & Dear, 2004). "Adaptive theory states that the temperature at which people are most comfortable is related to the temperature they are used to experiencing" as a result of behavioral and psychological adaptations (Pacuik, 1990, p. 29). Perceived control is similar to what people experience in outdoor environments—such as having the choice to sit in the sun or in shade (Lin 2009). Freedom to choose which space to occupy allows individuals to be in control of their own thermal comfort (Fig. 2.5).

Figure 2.5 Variable outdoor seating

People are more comfortable with temperatures close to what they are used to experiencing. Their thermal expectations change from cold to hot seasons. A study in Taiwan, where the hot season is longer (March to November) than the cold season is, found that people adapt to thermal conditions and adjust their thermal perception based on the season (Lin 2009).

In hot and humid climates, shade and air circulation are required to cool the body as well as surrounding surfaces. For warm humid zones, there should be an aim to maximize shade and minimize heat gain and to increase the potential for any air-movement to produce natural ventilation. Urban design should promote openness with widely spaced buildings that promote air movement between and through all of them. Buildings should also be oriented perpendicularly to the prevailing winds (Koch-Nielsen, 2007).

Landscape and architectural elements should provide comfortable conditions at a pedestrian level. Projecting roofs and shading devices and planting can provide shade without restricting airflow (Fig. 2.6). However, varying degrees of shade is contingent on the time of day and the season. Therefore, varying levels of shade should be

implemented by the use of trees or shade devices (Hwang, Lin, & Matzarakis, 2010). People who inhabit warm, humid regions spend a great deal of time outdoors; therefore, provisions should be made to facilitate air movement and shade (Koch-Nielsen, 2007).

Figure 2.6 Projected roofs line store fronts

In hot dry zones, shade can be produced with walled gardens, enclosed courtyards, loggias, pergolas, and landscaping to cut out direct sunlight and the glare of reflective surfaces. Enclosed outdoor spaces can also protect against hot winds and provide a physical boundary between the external climate and the interior spaces (Koch-Nielsen, 2007).

Courtyard design reduces an increase in heat in spaces that are surrounded by buildings. For example, the floors of a courtyard are shaded for most of the day and open to the night sky (Koch-Nielsen, 2007, p. 61).

Trees, shrubs, and grasses have a cooling effect due to evapotranspiration from their surfaces—which cool the ambient air—a shading effect, and a low reflectivity of

heat. Vegetation relaxes the eye from the bright sunlight hitting the ground (Koch-Nielsen, 2007). Deciduous trees provide shade during the summer but allow solar radiation in the winter (Hwang et. al., 2010).

Although microclimatic factors do influence thermal comfort, psychological adaptation to outdoor climate is becoming increasingly important. Psychological adaptation is based on the following factors: expectations, experience, time of exposure, perceived control, and environmental stimulation (Nikolopoulou & Steemers, 2003). Psychological factors influence thermal perception of a space. Psychological adaptation increases tolerance to repeated environmental stimuli, thereby decreasing the physiological response resulting from repeated exposure. Over time, adaptation gradually decreases an organism's aversion to repeated exposure to environmental stimuli, allowing the organism to survive in its environment (Brager & de Dear, 1998). As a result, it is difficult to quantify these kinds of data because the magnitude of perceptions of thermal comfort varies from person to person (Nikolopoulou & Steemers, 2003). Public open spaces should be enclosed, inward looking, well landscaped, shaded, and cooled by water (Koch-Nielsen, 2007).

2.5 Landscape Aesthetics

"Experience is a complex amalgam of perceptions supplied by the different senses" (Bourassa, 1991, p. 23). Prospect refuge theory states that savanna or park-like biomes have been the habitats of human beings. Savanna landscapes that contain groups of trees, views of water, and vantage points form a cliff would ensure the best chances of survival. "The ability to see without being seen" (Fig. 2.7). Environmental perception is not restricted to vision but is evidently a multisensory experience. However, vision is the most important sense that is critical in drawing substantial information about outdoor environments (Velarde et al., 2007). Habitat theory is the aesthetic pleasure of a

landscape that is environmentally favorable to one's biological needs. Landscape aesthetics to certain natural features lead to an increased possibility of achieving safety, sustenance, and security. Aesthetically, people favor landscapes composed of water bodies because they enhance sight and mobility and provide a greater chance of perceiving danger and locating shelter (Kibert, 1999). Outdoor spaces that present groupings of plants, views of water bodies, and different vantage points are essentially secure and comfortable as opposed to spaces that do not present these elements.

Figure 2.7 Prospect refuge

The information processing approach focuses on an individual's innate need to gather information about his or her environment (Bourassa, 1991, pp. 75–85). People can easily extract information from their environment. Understanding and exploration are vital components that feed an individual's curiosity. There exists the need to explore one's surroundings. People tend to prefer three-dimensional aspects as opposed to two-

dimensional aspects to their visual environment. A three-dimensional scene provides a greater degree of inference and depth and therefore adds to the person's curiosity. "There is a greater emphasis on what might be seen from a different vantage point as opposed to what is immediately apparent" (Kaplan & Kaplan, 1989, p. 52). Outdoor environments that provide plants with varied heights and textures, rockwork, and an assortment of water features engage the user. Thus drawing making it interesting to explore their surroundings.

Mystery offers the promise of learning something new. It draws people in and encourages them toward further exploration. A mystery can be a "bend in the path and a brightly lit area that is partially obscured by foreground vegetation" [Fig. 2.8] (Kaplan & Kaplan, 1989, p. 56). A mystery offers the promise of further information in a given space. A change in vantage point that continually provides information feeds the sense of exploration (Kaplan & Kaplan, 1989). Twists, turns, and corridors engage the users of outdoor spaces.

Figure 2.8 Curving pathway accented with vegetation

"Green things too have their special claim on human attention." Gardens, parks, wilderness, even house plants reflect this area of fascination" (Kaplan & Kaplan, 1978, p .88). The case of uncertainty is compelling to individuals. This is the innate drive of survival in information-oriented organisms. As such, it is instinctive to make sense and be involved within one's environment. People are naturally stimulated to gather information to comprehend and understand their environments. Additionally, they are curious creatures wanting to be involved as part of their experience (Kaplan & Kaplan, 1978). "Aesthetic preference for natural diversity also fosters interest and curiosity. These, in turn, encourage wonder and mystery, which enrich our capacities for exploration, creativity, and discovery." Ultimately, natural aesthetics can be associated

with physical and mental healing. When distressed, anxious, or depressed, “people seek the restorative power of beautiful flowers, gardens, seashores, mountains, and other aesthetically pleasing features of the natural world” (Kaplan & Kaplan, 1978, p. 157). Aesthetics landscaping alleviates stress and provides comfort and solace from external the climate.

Legibility is the sense that an object or space can be experienced with the senses. A series of images creating one unified solid image by the observer produces a heightened sense of the object’s location and its ability to be seen but are presented strongly to the senses (Lynch, 1960).

Environments that stimulate and facilitate exploration are much more favored than are those that do not. What is readily seen is the right level of uniqueness and complexity in a given environment to spur curiosity and exploration (Fig. 2.9). These spaces should have the right amount of openness and connectedness granting accessibility to new locales and experiences. “Exploration can satisfy what may be a basic human need for new experience. Increase the perceptual accessibility of city form.” Environmental elements and settings should be easily visible and recognized (Kaplan and Kaplan, 1978, p. 157). Stimulating spaces encourage exploration, interest, and wonder; as a result, a user’s senses are constantly engaged and distracted from thermal discomfort.

Figure 2.9 Plants mask destination

2.6 Sound

"Sound plays a crucial role in the anticipation, experience, and remembering of places" (Pocock, p. 193). Sounds are intrinsically part of all landscapes. The sound of running water and rustling wind manifests from natural landscapes. It is an integral part of the experience of nature. Sound can be captivating and therefore part of what makes any environment enjoyable (Fisher, 1999). Conducted experiments show that sound brings life and a temporal sense of reality; it commands attention and involvement and imparts anticipation. "The general presence of sound contributes to the process whereby environments become places, places with particular atmosphere, feeling, ambience" (Fisher, 1999, p. 194). As shown in Fig. 2.10, sound reverberating from plants such as trees is like and music to the ear. Like music, sound can liven up or calm outdoor spaces.

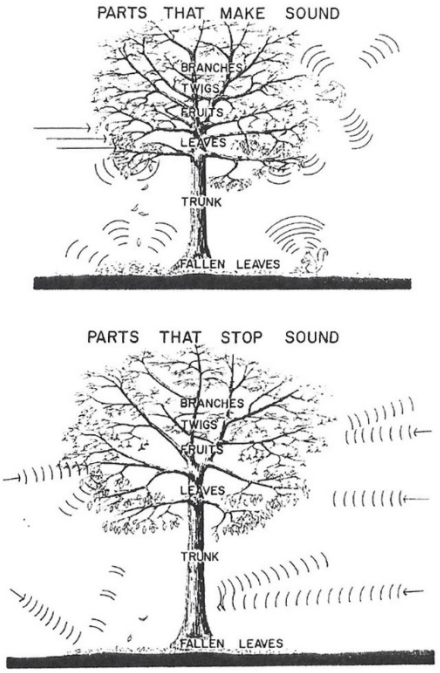

Figure 2.10 Acoustical Control (Robinette, 1972)

2.7 Summary

Design attribute that influences thermal comfort includes light and color, water, perceived control, plants, and landscape aesthetics. Visually, color can induce psychological effects of arousal and excitation or calmness and relaxation. People who have greater choice over their thermal comfort can tolerate and adapt to a given environment. Colorless spaces and blank walls induce a state of boredom; in contrast, natural vegetation and aesthetics spur interest and curiosity. According to Alexander von Humbolt, one of the fathers of modern geography, people have an awareness of the effect of beautiful landscapes on their imagination. He suggests, “scenes of nature,” which are perceived through the senses, thereby supply enjoyment and imagination. Landscapes present different qualities of enjoyment and perceptions. Other than vision, meanings of landscape vary according to social, cultural, historical, and personal values

(Kennedy, Sell, & Zube 1988, p. 33). Landscapes that present coherence, legibility, complexity, and mystery provide engagement and distraction from thermal discomfort

Chapter 3

Research Methods

3.1 Introduction

This chapter focuses on the methods used in this research to study the landscape design attributes of The Shops at La Cantera and how they educate and influence the future designs of outdoor spaces. Outdoor qualitative methods were utilized to determine the users' perception of spaces and factors that affect the their' thermal comfort. This method was advantageous because an individual's description of thermal comfort can be extrapolated and turned into qualitative data.

3.2 Open-Ended Interviews

> The interview is a form of social interaction. It involves a face-to-face encounter between two—and sometimes more—persons, each of whom is sizing up the other and constructing the meanings of the other's words, expressions, and gestures. An understanding of the interview as a form of social interaction can help you to be a better interview and to make sense out of the data you collect" (Taylor & Bogdan, 1998, p. 98).

Qualitative interviews were conducted for this research. The interviews were in depth, open ended, and face to face because "Descriptive landscape questions cannot always be answered by direct observation of the phenomena in question or from recorded secondary sources" (Deming & Swaffield, 2011, p. 72). They may depend on other people's accounts or experiences. Interviews require active interpretation. The proposed questions were designed to receive straightforward answers from informants who were encouraged to speak form their minds. No words were given to them that might influence their responses. Qualitative interviews allowed descriptive responses to open-ended questions.

Interviews were conducted on site and voice recorded using an iPhone 6 device. Tape recording allowed the researcher to capture the informants' and respondents' exact words without relying on memory. "Unlike informant observers, interviewers cannot sit

back for a while and observe during lapses in conversations. It is possible that many of the most important life histories in the social sciences would never have been written without the use of electronic recording devices" (Taylor & Bogdan, 1998, p. 112).

3.2.1 Selecting the interviewees

Interviews were conducted following strict Institutional Regulatory Board (IRB) standards. All interview questions follow the guidelines provided by Taylor and Bogdan (1998). Internet queries and snowball sampling methods were used to recruit interviewees. To gain a clear understanding of the design attributes, as discussed in Chapter 1, interviewees were classified into two groups: non-designers and designers.

Non-designers included mall employees, managers, and store owners. The reason this pool of interviewees were chosen was that its members were most likely to understand the mall and climatic conditions of the area, as opposed to a visitor who may or may not be familiar with the site's climatic conditions.

a. Interviewees were found via the mall website directory and snowball sampling.

Designers were selected from those who were directly involved or had knowledge of the The Shops at La Cantera project and were chosen to respond to design attributes of the area of study.

b. This group of interviewees were contacted through professional networks such as ASLA, professors, employers, and Internet searches of local designers in San Antonio, TX.

3.3 Research Design and Analysis

The non-designers were asked to participate in a study about their perceptions of thermal comfort. They were selected because they met the criteria of being a frequent user, a resident, or employee at The Shops at La Cantera. Each of the interviewees

were informed that he or she would be asked a series of questions and that participation was voluntary. Their refusal to continue participating at any time did not involve any penalty or loss of benefits to which they were otherwise entitled. They could ask questions at any point during the interview if there is anything they did not understand. In addition, interviewees were shown a satellite and street view aerial map (Fig. 3.1 & 3.2) for referral purposes, if needed.

Figure 3.1 Satellite view (Google Maps, 2015)

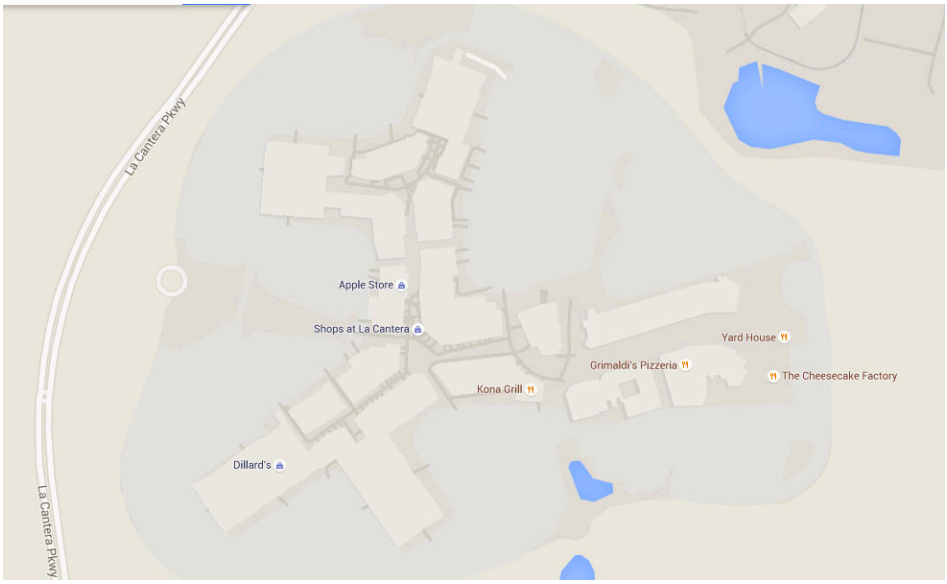

Figure 3.2 Street view (Google Maps, 2015)

Recorded data from every interview were treated with strict confidentiality and care. Interviews were transcribed verbatim into text. A domain analysis was then conducted to find the common themes that affected the perceptions of thermal comfort.

3.3.1 Case Study Method

A case study method allowed the researcher to set the contextual conditions to understand the principal design elements affecting thermal comfort. "Case studies are particularly well suited to landscape architectural research, as the focus of interest of the discipline is typically complex, multidimensional, and embedded in a wider context, and thus hard to separate into discrete factors (Deeming & Swaffield, 2011, p. 84). In landscape architectural research, performing a case study offered a "complex multifaceted investigation into a particular place, project, or landscape. Yin (2005) defined case studies as *"empirical" inquiries into "contemporary phenomena within a real life context"* and noted that they are particularly useful when there are no clear

boundaries between the focus of research and the context" (Deeming & Swaffield, 2011, p. 80).

3.3.2 Domain Analysis

A domain analysis identifies the common themes emerging from each interview (Fig. 3.3). Every culture has a variety of cover terms and even larger number of included terms. Moreover, it is often difficult to differentiate the informants' folk terms from one class to another. A starting point or more efficient procedure in identifying a domain is establishing a semantic relationship (Spradley, 1979). To complete the domain analysis, the following steps were taken:

- Step one: Researcher selected a single semantic relationship. According to Spradley, the two semantic relationships that are recommended as a starting point in a domain analysis with English-speaking informants are strict inclusion (X is a child of Y) and means-end (X is a way to Y). "The former relation focuses your attention on nouns; the latter one on verbs" (Spradley, 1979, p. 112).
- Step Two: A domain analysis worksheet was prepared. Creating a separate worksheet was beneficial in helping the researcher visualize the structure of each domain: cover term, semantic relationship, included terms, and boundary. Each domain analysis worksheet required the researcher to enter certain information:
    1. The semantic relationship;
    2. A statement of the form in which is expressed;
    3. An example from one's own culture of a sentence that has an included term, the semantic relationship, and a cover term;
    4. The worksheet was divided into empty domains containing blank spaces directly entering the semantic relationship the researcher selected. Next, both cover terms and the included terms were written in as the

researcher identified them from transcripts. "Making systematic use of this kind of worksheet will help to uncover domains embedded in the sentences spoken by your informants" (Spradley, 1979, p. 113).

- Step Three: The researcher selected samples of the informant's statements given. "To begin with, one need only select a few paragraphs from transcribed interviews or notes taken during an interview (Spradley, 1979, p. 114.)
- Step Four: Search for possible cover terms and included terms that appropriately fit the semantic relationship. The researcher read through the transcripts and searched for possible folk terms, instead of focusing on the meaning of sentences. "Read with an eye for folk terms which might fit the semantic relationship. You have to read with a question in mind" (Spradley, 1979, p. 114).

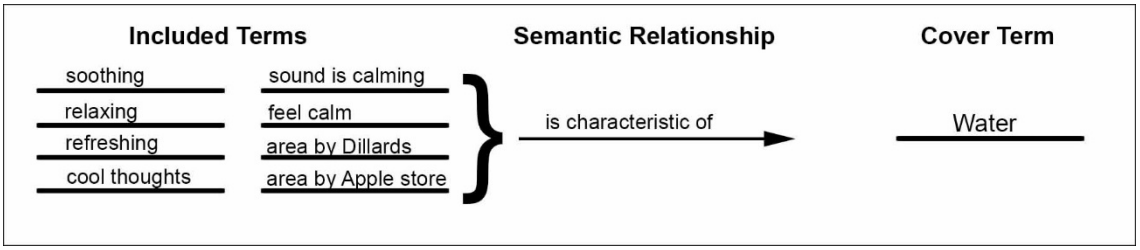

Figure 3.3 Domain analysis worksheet (Spradley, 1979)

Photography was used to illustrate and present the research findings. "Pictures take the place of words or at least convey something that words cannot." Pictures give a sense of being there, seeing the setting and people firsthand" (Taylor & Bogdan, 1998, p. 128). Photographs were taken throughout The Shops at La Cantera, in order to, show the design attributes expressed by the informants.

"Generally, the aesthetic values of existential insiders should have priority, if only because the regular inhabitants of a place must experience their surroundings on a daily basis, while the experience of the tourist or other outsider is only temporary" (Bourassa, 1991, p. 41).

3.4 Interview Questions

Each group of interviewees contained a different set of question. Group 1, the non-designers (respondents), were asked question phrased in layman's terms. Group 2, design professionals (informants), were asked more specific questions based on design jargon. Question range from broad to specific in order to encourage descriptive responses.

Group 1: Interview Questions for non-designers:

1. *Which spaces at The Shops at La Cantera do you gravitate to most in order to be thermally comfortable?*
2. *What factors at these places influence your thermal comfort?*
3. *What naturalistic views such as plants, rockwork, and water at The Shops at La Cantera affect your thermal comfort?*
   If so, how?
   a. *What is your most favorite space?*
   b. *What is your least favorite space?*
4. *What kinds of activities at The Shops at La Cantera affect your perception of thermal comfort?*
5. *How long would it normally take until you feel thermal discomfort?*
6. *What outdoor elements engage you and distract from thermal discomfort when outside in the summer at The Shops at La Cantera?*
7. *How do you control your thermal comfort outside in the summer at The Shops at La Cantera?*
8. *Are there spaces that feel warmer during the summer/winter?*
   And why?
9. *Are there spaces that feel cooler during the summer/winter?*
   And why?
10. *How important is it for you to have a choice for warmer or cooler areas in the landscape at The Shops at La Cantera.*

Group 2: Interview Questions for designers:

1. *Are there senses other than thermoreception that affect a person's thermal comfort?*
2. *What personal experiences regarding thermal comfort have influenced your landscape designs?*
3. *How do perceptions of thermal comfort affect the success of urban spaces?*
4. *What design attributes did you consider for outdoor thermal comfort at The Shops at La Cantera?*
   And why?
5. *What outdoor elements did you include in the design to influence people's thermal comfort at The Shops at La Cantera?*
   And why?

3.5 Summary

In this research, participants were interviewed onsite in July 2015. This is the summer season and is the optimal time of the year during which informants can recollect thermal comfortable spaces and draw on their perceptions, thus yielding precise data for the study. To recognize common themes, a domain analysis was conducted. However, as with all studies, limitations existed, such as the length of time the informants have lived in the climate, familiarity with the site, and the authenticity of responses.

Chapter 4

Findings and Analysis

4.1 Introduction

This chapter discusses the research findings and analysis. Data was collected via in-depth, open-ended interviews. A domain analysis was conducted on two groups of participants. Emergent themes became evident (Appendix C & D). In group 1, the interview questions were designed for researchers to understand which design attributes the respondents were reacting to. In group 2, the questions focused on effective design attributes and senses and experiences that affect the perception of thermal comfort. Group 2 was primarily composed of key informants in the field of design.

4.2 Participant Profiles

To gain knowledge of the perceptions of thermal comfort, participants were selected from two groups: non-designers and designers. Non-designers (respondents) were selected via The Shops at La Cantera website directory. Designers (informants) were selected via Internet searches. In addition, snowball sampling was employed to recruit other participants.

The criteria for selecting these groups of people was that they possess prior knowledge of the research site. There was a total of 13 participants for this study; nine were non-designers, and four had design backgrounds. Of the non-designers, six were retail employees, two were restaurant managers, and one was an attorney. Designers consisted of three licensed landscape architects and an architectural designer.

The time of day for recruitment had to be considered so as to not interrupt business activities. Interviews with both groups were conducted during the weekdays. This was advantageous for recruitment of retail employees because the weekdays

received slower in-store foot traffic. Interviews were held in July for respondents to able to recall experiences and perceptions.

Participants gave descriptive responses to questions about their perceptions of thermal comfort. Their responses were physiological and psychological. The common themes appearing throughout the interviews were perceived control, water, and plants.

4.3 Perceived control

When respondents are aware that they are in control of their thermal comfort, they can better tolerate a wider range of temperatures. A variety of factors were described to allow users to be in control of their thermal comfort.

4.3.1 Climate Control

Climate controlled environments provide immediate relief from the external temperature. Respondents A, B, E, and F all preferred the convenience of moving indoors to be thermally comfortable because it was air-conditioned. When asked what spaces they gravitate to most to be thermally comfortable, these were their responses:

R.A: “Well number one would be my office.” “It’s air conditioned.”

R.B: “Air-conditioned stores.”

R.E: “So inside the store.” “Well, anytime I’m going indoors, they’re going to have the AC.”

R.F: “We used to have a food court that would be for thermal comfort. Now, it’s just the stores. They could relieve yourself from the heat if you walk into the stores.”

Other respondents mentioned in passing that they withdrew indoors to cool down. The indoors was a welcome break from the outdoor temperature.

4.3.2 Restaurants and Kiosks

Availability of restaurants and kiosks was an integral part of The Shops at La Cantera. Food and beverage deliver sustenance, refreshment, and relief on a hot day.

According to Informant C2:

> "The intent was to have people stay longer. We wanted to provide other elements that would make you want to stay longer, so there's not just shopping, but there's a lot of places to eat, and then those places that we have to eat, we encouraged outdoor dining. So we get people out into the plaza. And then, things that make them want to stay longer, the water features, some kiosks."
>
> "Having some areas that are large and open where you can have multi-uses. But just encouraging people to stay longer, make an evening of it, not just come, grab something, and leave, but meet your friends, do some shopping, eat, stroll, get a little exercise, and explore."

Respondents were able to control their thermal comfort because of the available kiosks located throughout the mall (Figure 4.1).

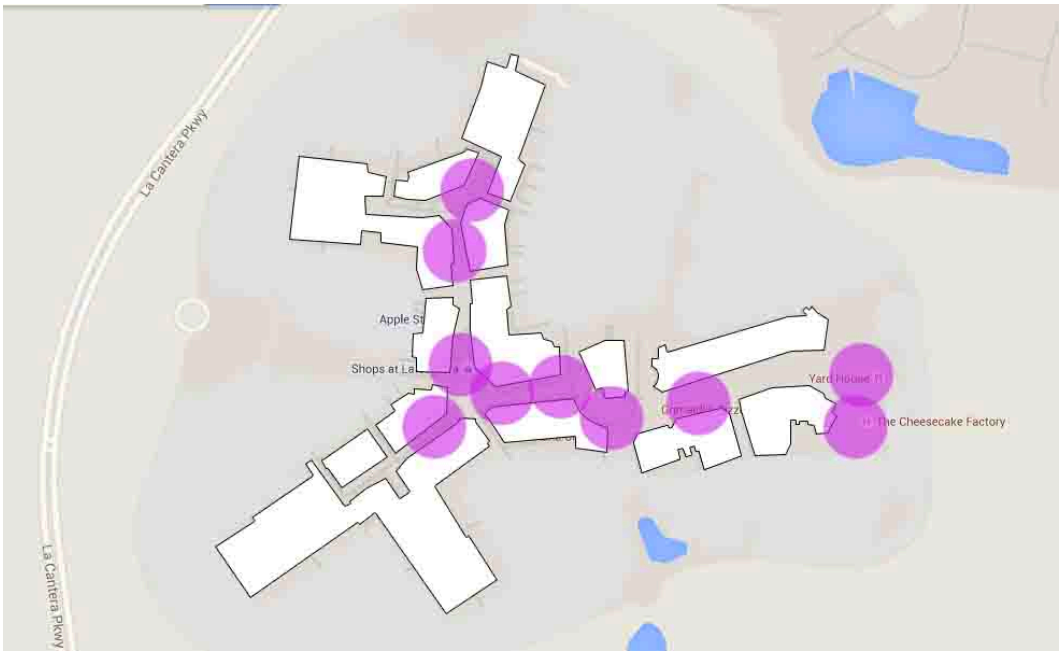

Figure 4.1 Available restaurants and kiosks (Google, 2015)

Some respondents controlled their thermal comfort by purchasing food or drink. They mentioned that it was refreshing and serves as a distraction from the climate. Respondent C stated, "If it's hot, getting a sports drink to sort of cool off a bit."

Respondent E stated:

> "I buy a drink. I like that there's little places out here. We have the Subway (Fig. 4.2), or Chick-Fil-A, or we have that little other kiosk place that sells candy, chips, and drinks (Fig. 4.3). So if I know I'm going to walk from here to Dillard's, then I'll grab myself an ice tea to cool down. Definitely, I feel they've made good selection as to where to place those places. Because if go a little bit further, you have Auntie Ann's (Fig. 4.4). So there's always somewhere to grab a drink."

Respondent G talked about "getting little drinks here and there" from the available kiosks allowed them "little refreshment to cool down" and distracted from thermal discomfort (Fig. 4.5).

Figure 4.2 Subway

Figure 4.3 Mall Mart

Figure 4.4 Auntie Anne's

Figure 4.5 Yogurt Zone

Having the choice of a drink to cool down or a snack made traveling throughout the mall tolerable. If the users feel thermal discomfort, they can walk into a store to cool off. As informant C2 stated, establishing multi-use spaces was crucial to the design.

4.3.3 Shade

All respondents favored shady locations when strolling through the mall. They preferred locations next to mature trees or built structures—ideally, locations that provided seating made them more comfortable. Informant C2 stated that "nearly all the buildings" have overhangs because the seasons change in San Antonio. They continued to state:

> "San Antonio does have a pretty good annual rainfall amount, like 36 inches a year so we did have to account for it being a mall that's not covered. It's open in the center, kind of like a garden oasis, but we wanted people to be able to walk from shop to shop without getting wet. It's not a continual overhanging, but sometimes it's trellis, and sometimes it's solid (Fig. 4.6-4.10), but it allows you to at least get there without getting too awfully wet."

Figure 4.6 Various shade structures

Figure 4.7 Arbor-like shade structure

Figure 4.8 Overhang with fans for air circulation

Figure 4.9 Overhang adjacent to kiosks

Figure 4.10 Curvilinear overhang

Informant C2 also stated the convenience of restroom facilities:

“And you’ll find that this outdoor living area is next to a restroom (Fig. 4.11). So we want to make it convenient. That’s what people are going to need outdoors. You’ll see a lot of outdoor furniture. It encourages them to stop, stay, rest. So there’s kind of, I guess, the perception of it allowing enough protection from the elements—both the sun and the rain—without doing a solid roof.”

Figure 4.11 Outdoor living area in shade and conveniently located next to restrooms

Respondent A favored the area next to Kona Grill (Fig. 4.13) because the pavement was easy on the feet, and there are benches, trees, and overhead shading along with as piped-in music. Additionally, they enjoyed the office courtyard “year round.”

Figure 4.12 Patio area outside in between Kona Grill and Forever 21

Figure 4.13 Patio area next to Kona Grill

Respondent A also stated:

> "I forgot to mention obviously as you look out my window, I'm in a courtyard setting. I have a courtyard with semi-mature vegetation and seating, which is a draw. And I do spend a fair amount of time out there."
>
> Additionally, they favored parking spots by Macy's because of the mature, shady trees.

Respondent H stated:

> "Obviously, you have the area with all the fans where that Subway (Fig. 4.14) is, but here it's wherever shade is for especially, I'd say, living area. We have to have those umbrellas out there on a hot day." Seating was also essential for shaded areas . . . "wherever there's shade, benches to sit on."

Figure 4.14 Subway outdoor seating

Respondent E stated, “I do find that places where it is a little bit more shaded, then you can actually sit down and be underneath the shade.” Furthermore, they also mentioned, “You’d be surprised how many people walk in here on a rainy day. It doesn’t stop them from visiting us.” In addition, they came to expect that the “climate is not going to change much.” However, if shaded areas (Fig. 4.15–4.16) were not available, then they would go indoors. Respondent F mentioned a few canopies for shade, but primarily, the indoors was the only way to be thermally comfortable. Respondent G preferred “little shaded areas, and the restrooms aren’t that far from each another. So you can just easily go in and just get aired really quick and—I don’t know; I think it’s mainly the shade.”

Respondents favored outdoor spaces that were shaded and had some sort of seating or benches as well as vegetation.

Figure 4.15 Vine on arbors provide shade

Figure 4.16. Artificial shade provided by umbrella. Ambiance of vegetation and water features.

Respondents were able to tolerate the heat as long as they had options of walking into the shade, going indoors, fans, misters, air-conditioning, and comfortable seating. They needed to have the choice to regulate their own body temperatures.

4.4 Design Elements

4.4.1 Water

The Shops at La Cantera contains an assortment of water features. Overall, the respondents were markedly affected by water. The mere sight or sound of water produced feelings of relaxation and refreshment.

Informant C2 stated:

> "Well I think that the big issue for us to help with the sensory perception of being cooler in an environment was to bring in water (Fig. 4.17). And so you will see lots of water within the plaza. I think just being near water bodies can give you a sense of comfort and coolness. And it's like, if I did get too hot, I could go into the water, or you'll see kids actually playing in some. We have one that's got a little ball that's a little higher, and it's got water coming out so they can actually touch the water. I think visually just seeing water and hearing water, it gives you a perception of refreshment and solace, stuff like that. Water was big."

Informant B2 stated:

> "They also have water features that may or may not actually provide that much physical difference but, mentally, it's kind of like you hear the water and things like that so you actually feel a little cooler."

When respondents were asked the question, "What naturalistic views such as plants, rockwork, and water at The Shops at La Cantera affect your thermal comfort and how?" all respondents except F replied that the water was relaxing.

R.A.: A water feature with the combination of shade, vegetation, and music makes for a comfortable, soothing setting.
R.B.: Waterfall is more soothing.
R.C.: "Like the water over there, just makes you think cool thoughts, subconsciously."
R.D.: "I don't think that that even affects me at all."
R.E.: Recalled a water feature next to the Cheesecake factory.
R.F.: There is a "lack of" elements that brought about thermal comfort.
R.G.: "I like how the water flows."
R.H.: "I would say the falls. Its area over here. "It just relaxes me."
R.I.: "I like the waterfalls. They have little water cascades.

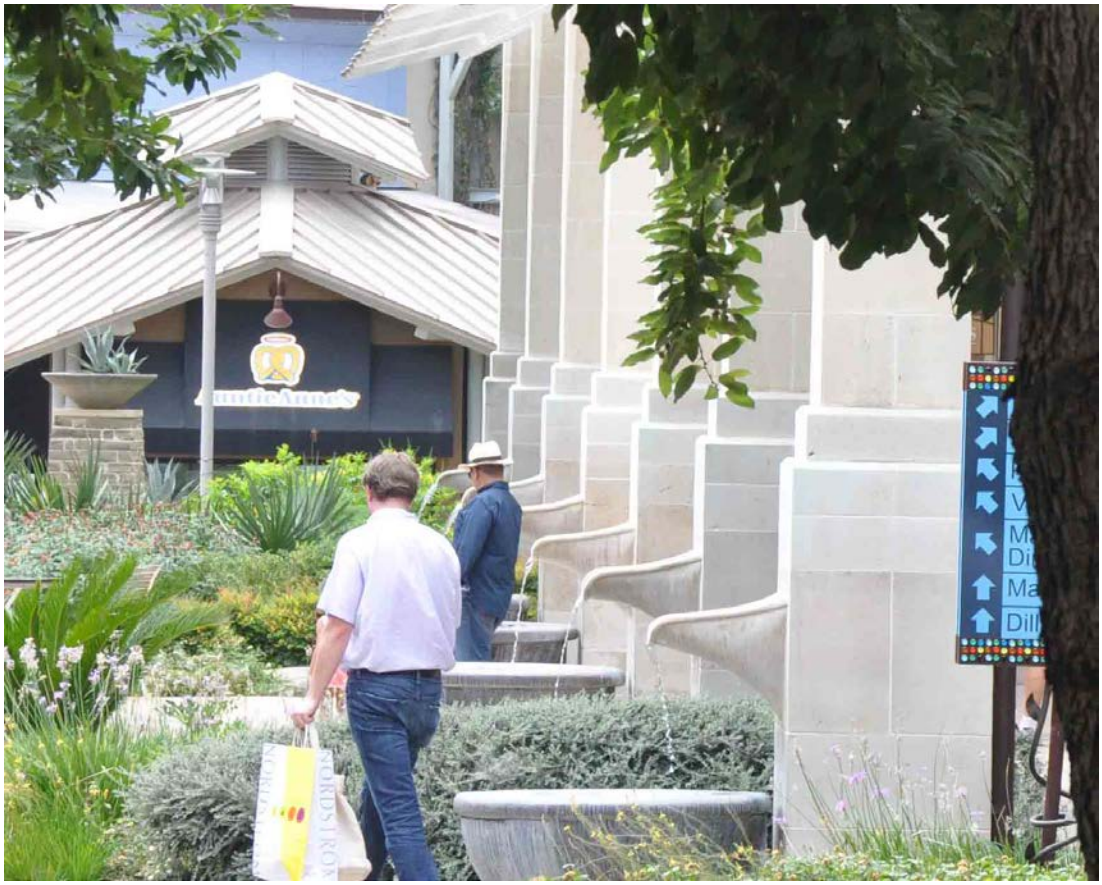

Figure 4.17 Pillar water features

Informant G:

“Around the Apple store, Pink (Fig. 4.18), mainly those areas I feel a lot cooler.”

Figure 4.18 Rock water feature by Pink

Informant I:

“Yeah, basically this area that we’re in and where the Apple Store is up to Dillard’s and Niemen Marcus (Fig. 4.19). That’s exactly probably why they even put the kid’s playground right there.”

Figure 4.19 Naturalistic waterfalls in between anchors Dillard’s and Neiman Marcus

Informant E:

“The waterfalls—you know how there’s one by the Apple store (Fig. 4.20–4.21). I feel like anything like that that’s cool and fresh (Fig. 4.22–4.23) helps out.”

Figure 4.20 Water feature in between Apple and Windows store

Figure 4.21 Water feature prior to installation of bench (Silver)

Figure 4.22 Benches next to water feature

Figure 4.23 Rockwall water feature

4.4.2 Plants

The vegetation helps bring tranquility to the space (Fig. 4.24-4.25). According to Informant C2, "We planted a lot of vines on some of the trellises (Fig. 4.23). And so that gives a really nice oasis of a perception of cooling the environment even more."

Overall, the respondents appreciated the shade cast by mature trees. Respondent H stated,

"I think they do a great job; the grounds are well maintained."

> "So I think you just immerse yourself in the atmosphere of when you're walking around rather than thinking about the—it's almost like—I don't know, less grander scale, like if you're at Disneyland or something like that. And if you're there with your family—and I was just there, so I know how hot it is, but you forget about everything if you have everything that's visually stimulating."

Respondent I stated that the greenery in combination with the comfortable seating helped them relax.

Figure 4.24 Vines add interest to arbor

Figure 4.25 Vegetation softens pathways

Figure 4.26 Contrast in texture adds visual interest

4.4.4 Other design considerations

4.4.4.1 Color

Informant A2 and C2 recommended using cool colors such as blue or green. In observing the research site, it was evident that there were primarily neutrals, shades of

green, and accents of colored blooms. Only respondent I mentioned feeling calm due to the blues, reds, and neutrals.

Informant A2:

> "Provide cool colors. Cool, the blues the greens, materials that would not absorb heat so that would be a good one. And the materials that would not absorb too much heat in the summer, materials that would give off some in the winter, stuff like that."

Respondent I:

> "Colors of the buildings, or even within that calmer piece—you have the blues, you have the reds, so it's within the neutral family. It's nothing really bright." (See Fig. 4.26–4.29)

Figure 4.27 Cool blues and earthy brown represented in the signage

Figure 4.28 Pastels in paving mixed with neutrals

Figure 4.29 Pillars with beige and earth brown tones

Figure 4.30 Cool blues of agave mixed with beige and brown tones of pillars

4.4.4.2 Lighting

Informant C2:

> "And then the lighting is another big one. Doing some really nice intimate light scenarios, like stream lights. Make it kind of a party atmosphere. Lighting the trees. We have incredible up-lights and down-lights on the side of the trees. It's mystifying when you're really focusing on a piece of nature, but lighting it up is just—it gives you that ambiance. It's like going outside and looking at the stars at night but in a different venue of man-made architecture and space. So lighting is I think a big issue, and it helps give you that comfort, and there's something about the glow of lights. Especially in the design world, you can use lighting to be effective."

4.4.4.3 Exploration

Informant C2:

> "One of the things about that shopping center is it's really large. It's broken up somewhat into—I call it kind of different wings. If you looked at the site plan, you've got two big elements almost in a Y shape, and then it comes up, and then it almost Y's again. So breaking up the areas into smaller outdoor rooms. If it was all in one big single line, it would probably be overwhelming to people. They would look down this huge corridor and say, "There's no way I'm going to walk all the way to Neiman Marcus from Dillard's or Macy's." So breaking it up into

smaller rooms—you'll go to one corner and you say, "Oh, I wonder what's down this direction." So you'll turn, and you'll go, and then you'll see another shopping corridor, and you'll think, "Oh, I can walk that. It's not really long." And the next thing you know, you've walked half a mile without even knowing it." (See Fig. 4.30–4.31)

"I think that's the thing that does it is having those short little corridors and a corner where you go, "Hey, what's down here?" Then, when you get down there, there's like a maze. Then you get to another end of a corridor; we tried to have nice focal points at the end of each, so it's kind of a risk reward (Fig. 4.32–4.33), "OK, if you keep going, there's going to be something really nice."

Figure 4.31 Winding pathways

Figure 4.32 Bends in the path

Figure 4.33 Sequence from paving to hidden water feature

Figure 4.34 Discovery of children's playground

4.4.4.4 Orientation

Informant D2:

> "Orientation of the prevailing winds and where and how doors and entries are located on the buildings is a big deal. Because I got to see businesses that have west- or northwest-facing doors and entrances, and around here in the summer, geez, that is uncomfortable as can be. You get that late-day sun coming off of a parking lot. I avoid those types of places, at least at that time of day. So orientation is important like that. Yeah, I think orientation's a big influence on landscape design for both solar and wind."

Respondent A:

> "When the wife says, 'Hey let's go shopping.' And you're deciding where you're going to go, well, if it's a hot day, and I know that she wants to go around to stores that I'm familiar with, that I know have high sun exposure, I ain't going."

Respondent C:

> "Just how hot it is. I guess time of the day too, and where the sun's at as well. If it's—it tends to be I guess like four or five; it's really beaming out—I'm not going to go out. But if the sun's just come down, or even if it's just like nice out, and it's not too glaring."

4.5 Thermal Discomfort

All respondents gave varied responses to thermal discomfort. Many reported that parking was the main cause due to the hot asphalt, inadequate mature trees, and lack of shade cover.

Respondents A:

> "It can take a minute or two. Especially because obviously when you enter no matter where you're entering, you're entering from a parking lot, which is all black asphalt, with no mature trees and, depending upon the time of the day, which is most of the day, it's hot."

Respondent H:

> "It's hot. And also the white cement. The white cement—it's so much glare back—it's not absorbing any of the heat. It's just reflecting it back. That's also a part of it I think. That white cement, it's just kind of blinding sometimes."

4.6 Summary

In summary, the respondents emphasized the following themes of domains, perceived control, water, and plants. Perceive control meant having the choice of comfortable locations, such as escaping to air-conditioned stores, grabbing a drink or snack for refreshment, and resting in built or natural shade with seating. Seeing and hearing water alone was engaging. Because it is an open-air mall, flowing water brought on a cooling and soothing perception. In addition, the plants provided restful and calm scenery. All respondents felt thermal discomfort upon entering from the parking lot.

The respondents did not mention the desire to explore; additionally, they did indicate that they enjoyed shopping or strolling. The respondents' feedback correlated with the designers' statements.

Chapter 5

Conclusion

5.1 Introduction

The objective of this study was to determine the design attributes that influence a user's perception of thermal comfort. This chapter will compare the literature review with findings based on the interviews with designers' (key informants) and users (respondents) of The Shops at La Cantera. Analysis of the interviews with key informants yielded the domains of a combination of color, water, and vegetation along with the addition of misters and natural and artificial shade. This chapter will also discuss the relevance of the study to the profession of landscape architecture. It concludes with recommendations for further research.

5.2 Research Findings

Findings from the in-depth interviews revealed the following themes: perceived control, water, color, orientation and plants. This section analyzes these themes according to the original research questions.

1. What design attributes affect the perception of thermal comfort of outdoor spaces in hot climates?
2. What specific kinds of spaces do users gravitate to most to be thermally comfortable?
3. How do perceptions of thermal comfort affect the success of urban spaces?

5.2.1 Design Attributes

5.2.1.1 Color

According to the literature, thermal comfort can be affected by color. Warm colors such as red, orange, and yellow increase arousal. Cool colors such as, blue, purple, and green induce relaxation. Informant A2 and C2 recommended using cool

colors such as blue or green. In observing the research site, it was evident that there were primarily neutrals, shades of green, and accents of colored blooms. Only respondent I mentioned feeling calmed by blues, reds, and neutrals. However, red is reported to be energetic, so this deviates from the literature. This may be a result of personal preference.

5.2.2.2 Water

Water was reported to bring about feelings of solace and refreshment. All informants agreed that the visual and aural qualities of water are soothing. All respondents except F felt more thermally comfortable by the presence or sound of water. Respondent F was not in close proximity to water features. Respondents did not mention any of the reflective qualities or types of sound that the water produced. The researcher observed that the sound was not obtrusive.

5.2.2.3 Plants

Being immersed in vegetation was found in the literature to create a feeling of security, reduced stress, and improved overall health. Informant C2 mentioned that the greenery sets up a “nice oasis” on a hot day. Respondents reported feeling calm and engaged by the vegetation. Additionally, it helped break up and soften the hard surfaces such as the building facades and pavement.

5.2.2 Spaces users gravitated to most

5.2.2.1 Perceived control

For immediate relief from the climate, all gravitated indoors because it was climate controlled. Respondents mentioned that they would sit and eat lunch in locations that were shaded by mature trees and vines on trellises or built structures. A mature live oak inhabits one of the major juncture points. This location offers varying degrees of shade and was a major meeting point. Some of the most popular locations were the

Apple store, Subway, Chick-fil-A, and patio area next to Kona Grill. All these locations offered seating with varying levels of shade. Subway, Chick-fil-A, and Kona Grill provided moveable table and chairs. Therefore, users had the choice of where they could sit. However, the Apple store was completely shaded and furnished with built-in benches and all-weather couches.

5.2.3 Perceptions that affect the success of outdoor spaces

Based on the research of The Shops at La Cantera, the landscape design attributes that were most effective were the following:

1. Dynamic water features
2. Plants such as mature trees, shrubs, and groundcover.
3. Seating
    a. Proximity to restrooms
    b. Movable table and chairs
    c. Comfortable couches
    d. Benches
4. Shading
    a. Awnings
    b. Umbrellas
    c. Extended roofs
    d. Canopy trees
    e. Arbors covered with vines
5. Orientation
    a. Capture of prevailing winds
    b. Casting of shade during certain times of the day
6. Misters and Fans

7. Restaurants and food kiosks distributed evenly throughout the research site

At The Shops at La Cantera, the large parking lots were the only feature that participants mentioned having a strong aversion to. Another negative was the glare cast off the white paving and walls.

The research site colors are predominantly neutrals, earth tones, blues and greens, and flowering plants. The planting design is a harmony of cool and neutral colors, coalesced with contrasting warm colors. Cools tones were displayed via the shrubs and groundcovers. Earth tones were evident on the signage and tree bark, and building facades and rockwork exhibited neutrals. This in turn provides a soothing atmosphere that many of the respondents described in Chapter 4.

Water alone was engaging and relaxing. Mentally, the sound of flowing water is soothing. The design team incorporated various naturalistic and sculptural water features at every juncture. No two water features were alike. As informant C2 mentioned, there was a surprise around each corner. The Shops at La Cantera contained many bends and curvilinear pathways.

Literature about landscape aesthetics states humans' curious nature. Individuals are driven to explore. The Shops at La Cantera offers many twists and turns. The landscape exhibits varying degrees of planting heights and contrasting textures. This engages and adds interest to the mall.

5.3 Significance to the Profession

The research topic was chosen because of the researcher's interest in the role of environmental psychology of thermal comfort in outdoor spaces. Research conducted in the literature review and case study interviews indicated that design attributes in public spaces will help promote their long-term success. It has significance to landscape architecture and to architecture, planning, and urban design. The significance of this

particular study recognizes relevant design attributes that are crucial when designing for temperate and humid subtropical climates. Lifestyle centers are replacing traditionally enclosed malls. Therefore, there should be an emphasis on the design attributes that influence people's thermal comfort. The most important factors that affect the perception of thermal comfort is having choices for shade, elements of water, and plants. The landscape architecture profession should focus on incorporating a combination of these elements in creating comfortable and enjoyable spaces. The landscape architecture profession should set the example of creating partnerships with thermal consultants and environmental psychologists.

5.4 Future Research

Analysis of the study led the researcher to arrive at the following recommendations for further study.

1. All respondents understood the definition of design attributes but were unclear on the definition of thermal comfort.
2. It would have been advantageous to include data of other stakeholders such as perceptions of developers and the thematic designers to gain a deeper understanding of the reported and other design attributes.
3. Time and location of the study were limitations; therefore, a future study could evaluate perceptions based on age or gender to find commonalities and differences.

A questionnaire or survey could have been developed to answer questions about perceptions and qualities of the following design attributes based on the literature and key informants:

1. Visual
2. Aural

3. Perceived control
    a) Shade
    b) Seating
    c) Climate control
4. Lighting

Further research could be undertaken to address specific qualities of soundscapes, scentscapes, and waterscapes.

Future research could address the design attributes of placemaking and identity on lifestyle centers. In addition, a historical and cultural analysis could be done to understand the origin and implications of lifestyle centers.

Future research could address the design attributes of placemaking and identity on lifestyle centers. In addition, a historical and cultural analysis could be done to understand the origin and implications of lifestyle centers. Assessing the economic value of lifestyle centers such as the Shops at La Cantera. Cost benefit analysis to developers and businesses owners.

Effects of color, water, and plants has markedly impacted environmental behavior. These themes should be thoroughly investigated for some of the following effects:

1. Color
    a. Time
    b. Hearing, smell, taste, and touch
    c. Security
2. Water
    a. Sound
    b. Forms of water

c. Investigation of various types of waterfeatures and their ability to excite or calm.

3. Plants
    a. Density of vegetation
    b. Color and Texture
    c. Height and Shape
4. Perceived control
    a. Optimal density of shade that is required for this particular climate zone.
    b. Required spacing or interval of food and beverage kiosks or restaurants to ensure thermal comfort.

An assessment should be conducted on the various combinations of the discussed design attributes to investigate the quality of outdoor spaces in hot and humid climates. This research can possibly lead to the investigation of its potential application to complete streets, and reduce and prevent crime in surrounding environments.

A comparison study between The Shops at La Cantera and other lifestyle centers that do not meet the same design criteria can further examine its application to other climate zones. In addition, interviews with designers that do not have knowledge of the project will provide greater knowledge of the design attributes affecting outdoor spaces.

Appendix A

IRB Notification and Consent Forms

Institutional Review Board
Notification of Exemption

July 15, 2015

Krishan Patel
Dr. David Hopman
School of Architecture

Protocol Number: 2015-0785

Protocol Title: *Perceptions of Thermal Comfort: Landscape Design Attributes Based On the Shops at La Cantera in San Antonio, TX.*

EXEMPTION DETERMINATION

The UT Arlington Institutional Review Board (IRB) Chair, or designee, has reviewed the above referenced study and found that it qualified for exemption under the federal guidelines for the protection of human subjects as referenced at Title 45CFR Part 46.101(b)(2).

- (2)Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:(i) information obtained is recorded in such a manner that human subjects can be identified, either directly or through identifiers linked to the subject; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

You are therefore authorized to begin the research as of **July 15, 2015**.

Pursuant to Title 45 CFR 46.103(b)(4)(iii), investigators are required to, "promptly report to the IRB ***any*** proposed changes in the research activity, and to ensure that such changes in approved research, during the period for which IRB approval has already been given, are **not initiated without prior IRB review and approval** except when necessary to eliminate apparent immediate hazards to the subject." Please be advised that as the principal investigator, you are required to report local adverse (unanticipated) events to the Office of Research Administration; Regulatory Services within 24 hours of the occurrence or upon acknowledgement of the occurrence. All investigators and key personnel identified in the protocol must have documented Human Subject Protection (HSP) Training on file with this office. Completion certificates are valid for 2 years from completion date.

The UT Arlington Office of Research Administration; Regulatory Services appreciates your continuing commitment to the protection of human subjects in research. Should you have questions, or need to report completion of study procedures, please contact Alyson Stearns at 817-272-9329 or astearns@uta.edu. You may also contact Regulatory Services at 817-272-3723 or regulatoryservices@uta.edu.

August 3, 2015

Krishan Patel
Dr. David Hopman
School of Architecture

IRB No.: 2015-0785.1

Title: *Perceptions of Thermal Comfort: Landscape Design Attributes Based On the Shops at La Cantera in San Antonio, TX*

EXEMPT MINOR MODIFICATION APPROVAL MEMO

The UT Arlington Institutional Review Board (UTA IRB) Chair (or designee) reviewed and approved the modification(s) to this exempt protocol on **August 3, 2015** in accordance with Title 45 CFR 46.101(b). Therefore, you are authorized to conduct your research. The modification(s), indicated below, was/were deemed minor and appropriate for exempt determination/acknowledgment review.

- Modification to add the phone interview and paper interview/survey options to the existing in-person interview. These are additional options in case people cannot make the in-person interview. The consent form was updated to reflect these changes.

Pursuant to Title 45 CFR 46.103(b) (4) (iii), investigators are required to, "promptly report to the IRB ***any*** proposed changes in the research activity, and ensure that such changes in approved research, during the period for which IRB approval has already been given, **are not initiated without IRB review and approval** except when necessary to eliminate apparent immediate hazards to the subject."

The modification approval will additionally be presented to the convened board on August 11, 2015 for full IRB acknowledgment [45 CFR 46.110(c)]. All investigators and key personnel identified in the protocol must have documented Human Subjects Protection (HSP) training on file with the UT Arlington Office of Research Administration; Regulatory Services.

The UT Arlington Office of Research Administration appreciates your continuing commitment to the protection of human research subjects. Should you have questions or require further assistance, please contact Alyson Stearns at astearns@uta.edu or you may contact the Office of Regulatory Services at 817-272-3723.

UT Arlington
Informed Consent Document

PRINCIPAL INVESTIGATOR
Krishan Patel
Program in Landscape Architecture
Email: krishan.patel12@mavs.uta.edu
Phone: 469.744.0109

FACULTY ADVISOR
Professor David Hopman
Program in Landscape Architecture
School of Architecture
Email: dhopman@uta.edu

TITLE OF PROJECT
Perceptions of Thermal Comfort: Landscape Design Attributes Based On the Shops at La Cantera in San Antonio, TX.

INTRODUCTION
You are being asked to participate in a research study about your perception of thermal comfort. **Thermal comfort is a combination of outdoor elements that produce acceptable environmental conditions.** You are being selected because you have used, have knowledge of, live or work at the Shops at La Cantera. Participation is in the form of interview questions, or optional questionnaire. Your participation is voluntary. Refusal to participate or discontinuing your participation at any time will involve no penalty or loss of benefits to which you are otherwise entitled. Please ask questions if there is anything you do not understand. This research will be compiled into a thesis format and is the final step towards earning my degree at the University of Texas at Arlington. Thank you so much for your time and consideration.

PURPOSE
The specific purpose(s) of this research study is to determine the landscape design characteristics that influence a users recognition of their own thermal comfort at the Shops at La Cantera.

DURATION
Participation in this study will last approximately 25 minutes.

NUMBER OF PARTICIPANTS
The number of anticipated participants in this research study is 100 adults.

IRB Approval Date: AUG 0 3 2015

UT Arlington
Informed Consent Document

PROCEDURES
The procedures, which will involve you as a research participant, include:

1. Interview or optional questionnaire
2. Referring to a map of the Shops at La Cantera

The interview will be audio recorded. After the interview, the tape will be transcribed, which means they will be typed exactly as they were recorded, word-for-word. The tape and transcription will not be used for any future research purposes not described here.

POSSIBLE BENEFITS
Participants would not be directly benefitted form this research. This research does have the possibility of benefitting fields such as landscape architecture, retail developers, and professions regarding outdoor commercial and city design. Indirectly, this would benefit the consumer.

POSSIBLE RISKS/DISCOMFORTS
There are no perceived risks or discomforts for participating in this research study. Should you experience any discomfort please inform the researcher, you have the right to quit any study procedures at any time at no consequence.

COMPENSATION
There will be no compensation for participation in this survey.

ALTERNATIVE PROCEDURES
There are no alternative procedures offered for this study. However, you can elect not to participate in the study or quit at any time at no consequence.

VOLUNTARY PARTICIPATION
Participation in this research study is voluntary. You have the right to decline participation in any or all study procedures or quit at any time at no consequence.

CONFIDENTIALITY
Every attempt will be made to see that your study results are kept confidential. A copy of this signed consent form and all data collected including transcriptions/tapes if applicable from this study will be stored in the office of Professor David Hopman (room 428) for at least three (3) years after the end of this research. The results of this study may be published and/or presented at meetings without naming you as a participant. Additional research studies could evolve from the information you have provided, but your information will not be linked to you in anyway; it will be anonymous. Although your rights and privacy will be maintained, the Secretary of the Department of Health and

IRB Approval Date: AUG 0 3 2015

Human Services, the UTA Institutional Review Board (IRB), and personnel particular to this research have access to the study records. Your records will be kept completely confidential according to current legal requirements. They will not be revealed unless required by law, or as noted above. The IRB at UTA has reviewed and approved this study and the information within this consent form. If in the unlikely event it becomes necessary for the Institutional Review Board to review your research records, the University of Texas at Arlington will protect the confidentiality of those records to the extent permitted by law.

CONTACT FOR QUESTIONS

Questions about this research study may be directed to me Krishan Patel or my faculty advisor, David Hopman. Phone numbers and emails are listed below. Any questions you may have about your rights as a research participant or a research-related injury may be directed to the Office of Research Administration; Regulatory Services at 817-272-2105 or regulatoryservices@uta.edu.

Krishan Patel
Phone: 469-744-0109
Email: krishan.patel12@mavs.uta.edu

Professor David Hopman
Phone: 817.272.2801
Email: dhopman@uta.edu

As a representative of this study, I have explained the purpose, the procedures, the benefits, and the risks that are involved in this research study:

_____

Signature and printed name of principal investigator or person obtaining consent **Date**

CONSENT

By signing below, you confirm that you are 18 years of age or older and have read or had this document read to you. You have been informed about this study's purpose, procedures, possible benefits and risks, and you have received a copy of this form. You have been given the opportunity to ask questions before you sign, and you have been told that you can ask other questions at any time.

You voluntarily agree to participate in this study. By signing this form, you are not waiving any of your legal rights. Refusal to participate will involve no penalty or loss of

IRB Approval Date: AUG 0 3 2015

benefits to which you are otherwise entitled. You may discontinue participation at any time without penalty or loss of benefits, to which you are otherwise entitled.

SIGNATURE OF VOLUNTEER **DATE**

IRB Approval Date: AUG 0 3 2015

Appendix B

Recruitment Script

E-mail/Phone/Letter Script Recruitment

Dear Mr. / Ms.:

My name is Krishan Patel, and I am a graduate student in the master's program in Landscape Architecture at the University of Texas at Arlington. I am conducting research for my master's thesis titled "Perceptions of Thermal Comfort: Landscape Design Attributes Based on The Shops at La Cantera in San Antonio, TX."

I would like to request your and your organization's participation in my thesis research via face-to-face or phone interviews or an optional questionnaire. You are being selected because you have used, have knowledge of, or live or operate a business at The Shops at La Cantera. The primary goal of this research study is to determine landscape design characteristics that influence a user's recognition of his or her own thermal comfort at The Shops at La Cantera.

If you would like to participate, please either reply to me via e-mail or the phone number listed below. Before agreeing to participate, you will read an informed Consent Form either through e-mail or in person. This form will explain the study in further detail. Participation in the study is completely voluntary. If you know of anyone who is interested in participating in this interview or optional questionnaire, please do let me know how best to contact him or her.

Thank you very much for your consideration. Your time, support, and participation will be an invaluable part of my research and greatly appreciated.

Sincerely,

Krishan Patel
Graduate Student
Masters Program – Landscape Architecture
The University of Texas at Arlington
Phone: 469-744-0109
Email: krishan.patel12@mavs.uta.edu

Appendix C

Domain Analysis of Non-Designers Responses

1. Which spaces at the Shops at LaCantera do you gravitate to most in order to be thermally comfortable?

Respondent A	office air-conditioned area in front of Kona Grill pavement benches trees overhead shading piped-in music parking lots by Macy's end parking spots mature trees shade courtyard setting semi-mature vegetation seating spend a fair amount of time year round
Respondent B	Air Conditioner Air Conditioner stores
Respondent C	Chick-fil-A eat lunch recreationally sitting outside
Respondent D	no idea
Respondent E	Inside store
Respondent F	No spaces Couple of canopies used to have a food court inside stores Pacsun Love Culture main little stores our area
Respondent G	Area with fans Subway
Respondent H	shade umbrellas shade benches
Respondent I	Apple store those comfy chairs really green scenery

2. What factors at these places influence your thermal comfort?

Respondent A	shade
Respondent B	air conditioning scent
Respondent C	how hot it is time of day where the sun is 4 or 5 beaming out sun has come down
Respondent D	N/A
Respondent E	air-conditioning
Respondent F	easy access mall designed weird chinky in different places parking lot is different entrances are different how convenient it is
Respondent G	shade restrooms are not far
Respondent H	shade uniques sitting spots area with the falls people like to relax cabanas comfortable
Respondent I	comfy chairs the greenery scenery

3. What naturalistic views such as plants, rockwork, and water at the Shops at LaCantera affect your thermal comfort? If so, how?

Respondent A	same area patio area by Kona Grill planter boxes break up hard surfaces make more natural a bit softer pleasing water feature shade vegetation water music comfortable soothing setting
Respondent B	waterfall more soothing
Respondent C	water feel soothed makes you think cool thoughts
Respondent D	irrelevant
Respondent E	trees shade waterfall
Respondent F	Lack of minimum amount of trees here not very covered don't really get any shading no rock face anything that really shades away the sun
Respondent G	water flows Apple Store waterfountain right there a little shaded over there little waterfall right next to the store not shaded like it a little bit every once in awhile makes me feel at ease don't have to worry about he sun beating on me so hard feel calm sound of it is calming
	Full concerts at the falls presentation of it
Respondent H	when cool outside lift these up Looks pretty cause problems
Respondent I	waterfalls water cascades vines growing up the walls gives nature calm

3A. What is your most favorite space?

Respondent A	covered up area Kona Grill Chick-fil-A
Respondent B	new side The Falls like the name
Respondent C	little couches "chill"
Respondent D	upscale part
Respondent E	pizzaria favorite thing to eat good food air-conditioning
Respondent F	indoors
Respondent G	Apple Store and Windows Store
Respondent H	The Falls relaxing
Respondent I	my store more homey feel serene

3B. What is your least favorite space?

Respondent A	parking car gets so hot isn't adequate mature trees artificial shade cover
Respondent B	kids playground
Respondent C	Kids Area loud
Respondent D	none beautiful mall parking frustrating
Respondent E	outdoor kid area
Respondent F	parking lot
Respondent G	new part where Forever 21 is, Barnes and Noble not much shade
Respondent H	other part of mall dead ghost town rarely go there typically dead no restaurants one starbucks high end stores a lot of restaurant here none on the outskirts more expensive stores higher-end
Respondent I	typical space hot shade

4. What kinds of activities at the Shops at LaCantera affect your perception of thermal comfort?

Respondent A	walking around looking around working
Respondent B	won't participate because to hot
Respondent C	depends on brightness and heat clothing
Respondent D	sit outside to eat warmer
Respondent E	space by Subway fans running beautiful trellis with vines growing over it shaded sit eat shopping
Respondent F	walking from store to store fans view The Oasis at Lake Travis sit outside take the heat LaCantera prestige more elegant upscale people prefer to come here Ingram feel harassed followed ask me for my number ask me for my number
Respondent G	jazz fest art festival nothing
Respondent H	work keeps busy keep mind of heat
Respondent I	not anything heat

5. How long would it normally take until you feel thermal discomfort?

Respondent A	minute or two entering from parking lot black asphalt no mature trees hot instantaneously
Respondent B	walking outside into direct sunlight
Respondent C	if exericising doesn't notice 10-15 minutes
Respondent D	immediately
Respondent E	three minutes
Respondent F	once you walk out of the car
Respondent G	20 min 20, 30min
Respondent H	just a few minutes other employess cool off in the cooler hot white cement glare back not absorbing any of the heat reflecting back white cement blinding
Respondent I	couple of hours long hours 4-5 hours

6. What outdoor elements engage you and distract from thermal discomfort when outside in the summer at the Shops at LaCantera?

Respondent A	vegetation trees plantings
Respondent B	fans helps distract shade standing in front of stores
Respondent C	company family and friends overcomes discomfort to spend time with them
Respondent D	atmosphere good fun
Respondent E	scenery landscaping architecture material floor brick looks nice people put with heat and rain people walk in on a rainy day
Respondent F	Lack-of
Respondent G	shopping getting drink here and there Auntie Anne's Starbucks getting a refreshment cool down distracts
Respondent H	landscaping great job at cleaning atmosphere
Respondent I	scenery colors of buildings calmer piece blues reds nothing bright

7. How do you control your thermal comfort outside in the summer at the Shops at LaCantera?

Respondent A	seeking shade crossing the street to catch it around Kona Grill perception of misters mister draw to the area
Respondent B	clothes close fitting loose fitting shorts comfort is key
Respondent C	come in early clothing get a sports drink to cool off
Respondent D	stay indoors if its too hot I don't go out sweater for indoors take sweater off when outside
Respondent E	go inside the store buy a drink little places Subway Chick-Fil-A kiosk candy chips drinks ice-tea cool-down good selection place those places Auntie Ann's somewhere to grab a drink
Respondent F	lots of water hydrate if the had some water fountains even better they are indoors more accessible for guests
Respondent G	going inside the stores
Respondent H	play soccer so heat is not an bad employees go in walk-in cooler
Respondent I	going in stores air conditioning

8. Are there spaces that feel warmer during the summer/winter? And why?

Respondent A	exposed area in winter	 because of sun angle area is cooler
Respondent B	parking lot	
Respondent C	None they can think of	where you can sit down shaded
Respondent D	none notice warm spots instead	
Respondent E	don't think so	
Respondent F	parking lot	 not covered full blown sun awful for everybody that works Would like some canopies would like a parking garage
Respondent G	newer part of mall	 Neimen Marcus Nordstrom warmer during the summer
Respondent H	everywhere sunset	 cooler
Respondent I	Forever 21 down	

9. Are there spaces that feel cooler during the summer/winter? And why?

Respondent A	patio areas shade water features misters more comfortable in the summer
Respondent B	fan circulation
Respondent C	shade
Respondent D	kiosks in winter "I'm surprised they're open." eatery restaurant restaurants eat drink
Respondent D	some places winds concentrate it through a certain area some places very random
Resoondent F	this area cooler shade have air-conditioning lower
Respondent G	Apple store Pink cooler
Respondent H	shade benches
Respondent I	area that we are in Apple store area at Dillard and Neimen Marcus

10. How important is it for you to have a choice for warmer or cooler areas in the landscape at the Shops at LaCantera?

Respondent A	60-%-70% stores with high sun exposure not going
Respondent B	very important
Respondent C	pretty important
Respondent D	pretty important sitting sitting outside entertaining outside shopping beautiful out here why people come stores nowhere else in town has "if you want those things you have to come here"
Respondent E	shaded sit down be underneath the shade plant more trees waterfall Apple Store cool fresh help's out
Respondent F	should have been a factored into design heat lamps should be considered in winter
Respondent G	super important not beated on by sun affected by the coldness add fans people are not discomforted of all their shopping
Respondent H	comfortability a priority
Respondent I	summer- hide in the shade winter- go inside

Appendix D

Domain Analysis of Designers Responses

RESPONDENT A2

1. Are there senses other than thermoreception that affect a person's thermal comfort?

color
materials
warm colors
direction that you're facing

spacing of buildings
    allow less airflow
    going to be stable

2. What personal experiences regarding thermal comfort influenced your landscape designs?
N/A

3. How do perceptions of thermal comfort affect the success of urban spaces?

outside
    freaking hot
        lot of vegetation
Vegetation
    natural shading
        summer
            more green
            shading
Cold
    winter
        less green
        more sunlight
Urban areas
    shading mechanisms

4. What design attributes did you consider for outdoor thermal comfort at the Shops at LaCantera? And why?

More shading
shading
shading

water fountains
Water fountains
    comfort area

RESPONDENT A2

5. What outdoor elements did you include in the design to influence people's thermal comfort at the Shops at LaCantera? And why?

Natural vegetation
natural shading
Cool colors
Cool, the blues and greens

materials that would absorb heat

Heat

Materials that would give off some in the winter

RESPONDENT B2

1. Are there senses other than thermoreception that affect a person's thermal comfort?

breeze factors and things
humidity
other physical forces
    keep you comforted

2. What personal experiences regarding thermal comfort influenced your landscape designs?
shade
shade our buildings
energy use

3. How do perceptions of thermal comfort affect the success of urban spaces?

time of year
keep the sun off

4. What design attributes did you consider for outdoor thermal comfort at the Shops at LaCantera? And why?

Shade
fans
    get a little wind
water features
    mentally
        hear the water and things like that

        actually feel cooler

5. What outdoor elements did you include in the design to influence people's thermal comfort at the Shops at LaCantera? And why?

Can't avoid paving
    paving is hot
Same approach as they do
    actual built structures
    shade trees

    combination of different things

RESPONDENT C2

1. Are there senses other than thermoreception that affect a person's thermal comfort?

Being cooler
bring in water
lots of water
Water bodies
sense of comfort and coolness

Too hot
go into the water
see kids playing in some

One that has a ball
little higher
got water coming out
actually touch the water

Seeing and hearing water

perception of refreshment and solace

Misters
seeing misting
like an oasis

2. What personal experiences resgarding thermal comfort influenced your landscape designs?
Shade from trees
Huge live oak
comfort and shade

3. How do perceptions of thermal comfort affect the success of urban spaces?

Shade
overhangs
Open in center
garden oasis
Perception of shade
enough protection from sun and rain

Vines in trellis
nice oasis
perception of cooling

RESPONDENT C2

4. What design attributes did you consider for outdoor thermal comfort at the Shops at LaCantera? And why?

Broken up
- different wings
- two big elements
  - Y-Shape
- smaller outdoor rooms
- single line
  - overwhelming to people

Orientation
- different times
  - different shadows
    - at diff angles
- people are attracted to shade

Shade
- comfortable when shopping
- not have buildings run in one direction
  - changing them up
- summer
  - south-westerly wind
- winter
  - stiff north wind
    - done in a lot of European cities
  - layout for pedestrians
    - streets aren't wide
    - designed for pedestrians
    - smaller corridors

5. What outdoor elements did you include in the design to influence people's thermal comfort at the Shops at LaCantera? And why?

Restaurants
- encourage outdoor dining
  - get people out into the plaza

waterfeatures
- some kiosk

outdoor music
- live bands

RESPONDENT C2

5. What outdoor elements did you include in the design to influence people's thermal comfort at the Shops at LaCantera? And why? (CONTINUED)

chalk art weekend

large and open spaces
multi-uses
people stay longer
make and evening out of it

Meet your friends
do some shopping
eat
stroll
get a little exercise
explore
short little corridors
corner where you go
maze
Neimen Marcus
incredible waterfeature
get to another end of a corridor

nice focal points at the end

risk, reward
Risk and reward
for shopping centers
walk a quarter mile there's a reward

Restaurants
outdoor furniture

special paving patterns
Places to sit
places to meet
Outdoor living area
next to restrooms
make it convenient
what people need outdoors

outdooor furniture
whole different animal in public areas vs shopping centers

Lighting
nice intimate light scenarios

RESPONDENT C2

5. What outdoor elements did you include in the design to influence people's thermal comfort at the Shops at LaCantera? And why? (CONTINUED)

stream lights
- party atmosphere
- lighting in trees
  - up-lights
  - down-lights
- mystifying
  - focus on a piece of nature

- ambiance
- going outside and looking at stars at night

- helps give comfort

water
- makes you feel cooler

hospitals
- paint interior green
  - light green

light and windows
- prime office space
  - most windows
  - most views

People want to be in front of windows

- just having the light
- feelng the sun
  - better than in the corner
  - better that concrete

Glass
- prime space

views and vistas

- really important

RESPONDENT D2

1. Are there senses other than thermoreception that affect a person's thermal comfort?

Sweat
perspire
feeling of rain
cooling effect
misters
cooling effect
sense of touch or feel

sight
mirages
heat rising through the water vapor

Visual perception
heat waves off ground
think its hot
wind
warm wind
cool wind

2. What personal experiences regarding thermal comfort influenced your landscape designs?
shade
no trees
canopies or awnings
built shade
immediate impact
trees provide a visual cooling effect

think trees
think shade
makes cooler
Trees
urban landscape
calm and cooling
Not comfortable
not go shopping
wind and rain
shade canopies
rain
wind
orientation
prevailing winds
where and how the doors are oriented

West and Northwest facing doors

RESPONDENT D2

2. What personal experiences regarding thermal comfort influenced your landscape designs? (CONTINUED)

summer
uncomfortable
late day sun
uncomfortable

Orientation

3. How do perceptions of thermal comfort affect the success of urban spaces?

Visual stimulation
- seeing water
- hearing water
- nice colors
  - break-up building facades
- nice visual environment
  - take your mind of the thermal environment

Seeing water when its cold
- makes me more cold

Sound
- music
- sound in the background
  - another diversion
  - other stimulus or distractions

4. What design attributes did you consider for outdoor thermal comfort at the Shops at LaCantera?
And why?
N/A

5. What outdoor elements did you include in the design to influence people's thermal comfort at the Shops at LaCantera? And why?

References

Acme Electric | Electrical Contractor | Turnberry Town Square Dry Utilities | Las Vegas. (2010). Retrieved from http://www.nclasvegas.com/Acme/acme-town-square-lighting.aspx

Almusaed, A. (2011). *Biophilic and bioclimatic architecture analytical therapy for the next generation of passive sustainable architecture*. London, UK: Springer.

Badger, E. (2012, July 13). The Shopping Mall Turns 60 (and Prepares to Retire).

Beam, M., & Dickinson, G. (2015). Buying the Good Life. In *Suburban dreams: Imagining and Building the Good Life*. Tuscaloosa: University of Alabama Press.

Berg, A., Koole, S., & Wulp, N. (2003). Environmental preference and restoration: (How) are they related? *Journal of Environmental Psychology, 23(2)*, 135–146.

Birren, F. (1961). *Color psychology and color therapy; a factual study of the influence of color on human life.* New Hyde Park, NY: University Books.

Blum, A. (2005, April 6). The Mall Goes Undercover. Retrieved November 26, 2015, from http://www.slate.com/articles/arts/culturebox/2005/04/the_mall_goes_undercover.html

Bourassa, S. (1991). *The aesthetics of landscape*. London, UK: Belhaven Press.

Brager, G., & Dear, R. (1998). Thermal adaptation in the built environment: A literature review. *Energy and Buildings, 27(1)*, 83–96.

Brager, G., Paliaga, G., & De Dear, R. (2004). Operable Windows, Personal Control, and Occupant Comfort. *American Society of Heating, Refrigerating, and Air-Conditioning Engineers,110(2)*, 17-35.

Brown, R. (2010). *Design with microclimate the secret to comfortable outdoor spaces*. Washington: Island Press.

Brown, R., & Gillespie, T. (1995). *Microclimatic landscape design: Creating thermal comfort and energy efficiency*. New York, NY: J. Wiley & Sons.

Calvin, P. (2013, June 3). Highland Park Village to host summer Sundays concert series featuring local acts. Retrieved from http://askmissa.com/2013/06/03/highland-park-village-to-host-summer-sundays-concert-series/

Campbell, C. (1978). *Water in landscape architecture*. New York, NY: Van Nostrand Reinhold.

Carlo, M. (Ed.). (2002). Colour & psychology—A brief treatise on how color influences the human consciousness.

Clark, L. (1978). *The ancient art of color therapy*. New York, NY: Pocket Books.

Cooper-Marcus, C., & Barnes, M. (1995). Gardens in healthcare Facilities: Uses, therapeutic benefits and design recommendations. Martinez, CA. Center for Health Design

Deming, E., & Swaffield, S. (2011). *Landscape architecture research inquiry, strategy, design.* Chichester: John Wiley & Sons.

Eiseman, L. (2006). *Color: Messages and meanings: A Pantone color resource*. Gloucester, MA: Hand Books Press.

Fisher, J., & Bell, P. (1984). *Environmental psychology* (2nd ed.). New York, NY: Holt, Rinehart, and Winston.

Ghavampour, E., Vale, B., & Del Aguila, M. (2015). Nature as a Design Element in Small Urban Public Spaces. *Future of Places, Stockholm*.

Gillem, M. (2009). Make believe main streets: Hyperreality and the lifestyle center. *Traditional Dwellings and Settlements Review, 20(2)*, 13–25.

Grimley, C., & Love, M. (2007). *Color, space, and style all the details interior designers need to know but can never find*. Beverly, MA: Rockport.

Heerwagen, J. (1990). Psychological Aspects of Windows and Window Design. *Environmental Design Research Association, 21,* 269–280.

Heerwagen, J., & Heerwagen, D. (1984). Designing for a "state of mind." *Journal for Architectural Education, 37(3/4),* 34–37.

Herzog, T., & Chernick, K. (2000). Tranquility and danger In urban and natural settings. *Journal of Environmental Psychology,* 29–39.

Humid subtropical climate. (2015). In *Encyclopædia Britannica*. Retrieved from http://www.britannica.com/science/humid-subtropical-climate

Hurley, A. (2015, March 25). Shopping Malls Aren't Actually Dying. Retrieved September 13, 2015, from http://www.citylab.com/design/2015/03/shopping-malls-arent-actually-dying/387925/

Hwang, R., Lin, T., & Matzarakis, A. (2011). Seasonal effects of urban street shading on long-term outdoor thermal comfort. *Building and Environment, 46(4),* 863–870.

Jost, D. (2010, August 1). Shopping's new clothes. *Landscape Architecture*, 64–81

Kaplan, R. (1993). The role of nature in the context of the workplace. *Landscape and Urban Planning, 26(1-4),* 193–201.

Kaplan, R., & Kaplan, S. (1989). *The experience of nature: A psychological perspective*. Cambridge, MA: Cambridge University Press.

Kaplan, S., & Kaplan, R. (1978). *Humanscape: Environments for people*. North Scituate, MA.: Duxbury Press.

Kennedy, C., Sell, J., &Zube, E. (1988). Landscape Aesthetics and Geography. *Environmental Review, 12*(3), 31–55.

Kibert, C. (1999). *Reshaping the built environment ecology, ethics, and economics*. Washington, D.C.: Island Press.

Koch-Nielsen, H. (2007). *Stay cool: A design guide for the built environment in hot climates*. London, UK.

Kuo, F.E. (2001). Coping With Poverty: Impacts Of Environment And Attention In The Inner City. *Environment and Behavior, 33(1)* 5–34.

Kürkçüoğlu, E., & Akin, O. (2013). The effects of water elements in urban space perception: A case study in Üsküdar Municipality Square. *A | Z ITU Faculty of Architecture Journal 10(1),* 159–175.

Legacy. (2015). Retrieved December 9, 2015, from http://hpvillage.com/legacy

Lin, T. (2009). Thermal perception, adaptation and attendance in a public square in hot and humid regions. *Building and Environment, 44(10),* 2017–2026.

Lin, T., Matzarakis, A., & Hwang, R. (2010). Shading effect on long-term outdoor thermal comfort. *Building and Environment, 45(1),* 213–221.

Lohr, V. (2006). Responses to Scenes with Spreading, Rounded, and Conical Tree Forms. *Environment and Behavior, 38(5),* 667–688.

Lynch, K. (1960). *The image of the city*. Cambridge,MA.: MIT Press.

Nakamura, R., &Fujii, E. (1992). A comparative study on the characteristics of electroencephalogram inspecting a Hedge and a concrete block fence. *Journal of the Japanese Institute of Landscape Architecture Journal of the Japanese Institute of Landscape Architects, 55(5),* 139–144.

National Weather Service - Climate Data. (2015, July 30). Retrieved November 26, 2015, from http://w2.weather.gov/climate/getclimate.php?wfo=ewx

Nikolopoulou, M., & Steemers, K. (2003). Thermal comfort and psychological adaptation as a guide for designing urban spaces. *Energy and Buildings, 35,* 95–101.

Nikolopoulou, M., Baker, N., & Steemers, K. (2001). Thermal comfort In outdoor urban spaces: Understanding the human parameter. *Solar Energy*, *70(3),* 227–235.

O'Connor, Z. (2011). Colour psychology and colour therapy: Caveat emptor. *Color Research and Application, 36(3)*, 229–234.

OC Lifestyle - HW Senior Living. (2014). Retrieved November 18, 2015, from http://hwseniorliving.com/oc-lifestyle/

Pacuik, M. (1990). The role of personal control of the environment in thermal comfort and satisfaction at the workplace. *EDRA, 21* 303–312.

Pocock, D. (1989). Sound and the Geographer. *Geography, 74*(3), 193–200.

Robinette, G. O. (1972). *Plants, people, and environmental quality: a study of plants and their environmental functions.* Washington: U.S. Dept. of the Interior, National Park Service.

Schiff, L., & Kline, H. (2001, September 1). Water's Wonders. Retrieved October 9, 2015, from https://www.psychologytoday.com/articles/200109/waters-wonders

Sharpe, D. (1974). *The psychology of color and design*. Chicago, IL: Nelson-Hall.

Silver Creek 78250: Mall Report: The Shops at La Cantera... (2010, January 25). Retrieved from http://silvercreek78250.blogspot.com/2010/01/mall-report-shops-at-la-cantera.html

Sodoma, B. (2009, June 30). Lifestyle center concept works. *Las Vegas Sun*.

Southlake Historical Society, City of Southlake History | Southlake TX. (2015). Retrieved December 9, 2015, from http://www.southlakehistory.org/town-square.html

Southlake Town Square. (n.d.). Retrieved from http://www.grapevinetxonline.com/southlake-townsquare/

Spradley, J. (1979). *The ethnographic interview*. New York, NY: Wadsworth Group/Thomson Learning.

Symmes, M. (1998). *Fountains: Splash and Spectacle: Water and design from the Renaissance to the present*. New York, NY: Rizzoli International Publication in association with Cooper-Hewitt, National Design Museum, Smithsonian Institution.

Taylor, S., & Bogdan, R. (1998). *Introduction to qualitative research methods: A guidebook and resource* (3rd ed.). New York, NY: Wiley.

Ulrich, R. (1981). Natural versus urban scenes: Some psychophysiological effects. *Environment and Behavior, 13(5),* 523–556.

Van Den Berg, A., Koole, S., & Van Der Wulp, N. (2003). Environmental preference and restoration: (How) are they related? *Journal of Environmental Psychology, 23(2),* 135–146.

Velarde, M., Fry, G., & Tveit, M. (2007). Health Effects Of Viewing Landscapes – Landscape Types In Environmental Psychology. *Urban Forestry & Urban Greening, 6(4),* 199–212.

Wang, M., & Yu, B. (2012). Landscape characteristic aesthetic structure: Construction of urban landscape characteristic time-spatial pattern based on aesthetic subjects☆. *Frontiers of Architectural Research, 1(3),* 305–315.

Warner, S., & Baron, J. (1993). Restorative Gardens: Green thoughts in green shade. *British Medical Journal, 306(6885)*, 1080–1081.

Webner, R. (2015, September 15). Open-air shopping centers changed San Antonio's retail scene. *San Antonio Express-News.*

Wohlwill, J. (1974). Human adaptation to levels of environmental stimulation. *Human Ecology, 2*(2), 127–147.

Biographical Information

Krishan Patel was born and raised in Lusaka, Zambia, a country in southern Africa. As a child he immigrated to the United States with his family and grew up in Rocksprings, Texas, located in the Texas Hill Country. Growing up in such diverse regions of the world he learned to appreciate the natural surroundings.

In 2008, Krishan obtained bachelor's degree in biology with a minor in chemistry from the University of Texas at San Antonio. His passion for science and art sparked his interest in landscape architecture.

Krishan works as a landscape designer and has experience with native plants, residential, commercial, transportation, and civic projects. He is currently employed as a landscape designer at David McCasksill Design Group in Southlake, Texas.