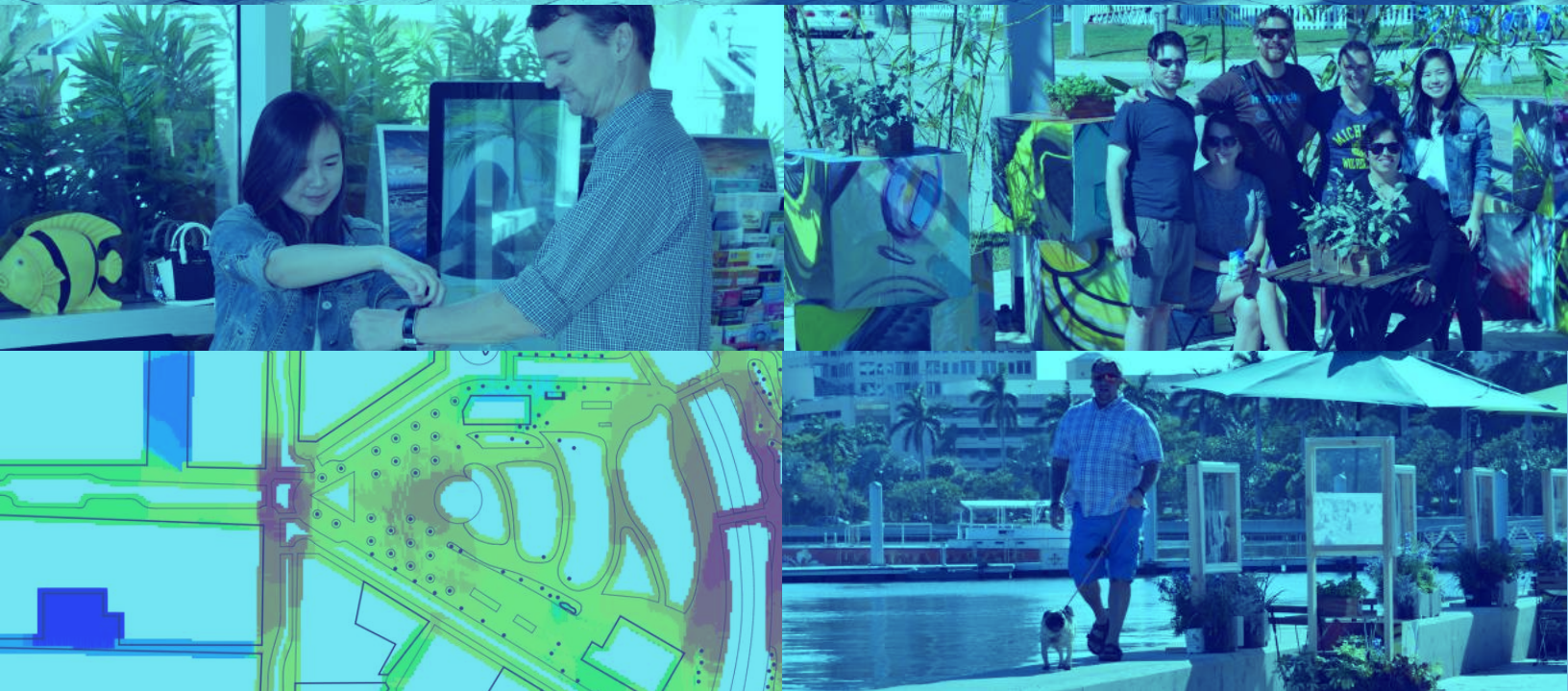


Shore to Core

March 2017

Happier by Design

Research team final report



Research Team + Project Partners

Happier by Design Team

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Contents

Executive summary	4
Introduction: designing cities for wellbeing	8
Research question	11
Pilot project	12
Approach	12
Intervention site	12
The tactical intervention	13
Metrics and study methodology	14
Results and analysis	18
Emotional wellbeing results	18
Physiological wellbeing results	25
Behavior mapping results	28
Spatial analysis results	30
Recommendations	34
Opportunities for future research	37
Limitations	39
References	40
Appendix	
A – Testing methodology and timeline	43
B – Background on the Shore to Core competition	45
C – Surveys	46
D – SPSS subjective wellbeing results	50

Executive summary

Can we boost human health and happiness by creating more fascinating public places? An experiment in West Palm Beach suggests that the answer is yes.

There is no shortage of elegant but stark and bare designs in contemporary cities. Indeed, design journals frequently celebrate aesthetics that are pared down, modern and austere. Yet we are often left with public spaces that fail to attract people or make us happy. In early 2017, an interdisciplinary team conducted a pilot experiment that challenged this austere trend in contemporary design thinking.

This work was a response to challenges set out by *Shore to Core*, a design and research competition launched by Van Alen Institute, along with the City of West Palm Beach and its Community Redevelopment Agency. The *Shore to Core* competition sought to understand how urban spaces influence wellbeing over time. In what may be the first experiment of its kind, the competition winners tested the power of a design intervention on a waterfront location to alter people's emotions, physiology and behavior. Our study site, West Palm Beach's waterfront promenade, offered a unique challenge: The city has made significant investments in creating a pleasant waterfront promenade, offering fine views of the palms and Lake Worth. Yet this public amenity is not meeting its potential to draw and hold pedestrians. How could we improve its performance at engaging people while also improving their wellbeing?

For direction, we turned to what environmental psychologists call restorative environment theory. This theory suggests that places that provoke feelings of soft fascination, curiosity and being away from everyday life can make people feel calmer and happier. We designed our tactical intervention specifically to boost those feelings which, together, we decided to call "restorative fascination." The intervention used art, fragrant flora and visual references to local and natural history to enliven a short section of the waterfront promenade. To this we added movable chairs, tables, and umbrellas for comfort. And then we led volunteers on tours of the site, during which we recorded their emotional and physical states. We also studied the behavior of pedestrians not involved in our tours.

What we found was remarkable. By adding elements of restorative fascination and comfort to a discrete section of the waterfront, we influenced the way people behaved, and we influenced their emotions, as compared to the control tour, with no intervention. The intervention induced more people to stop and linger on the waterfront. It had a clear effect on our participants: Not only did they report liking the waterfront more when the intervention was in place, but the change also improved their mood. They reported feeling less stress, they felt a greater sense of belonging, and perhaps most compelling to us, they felt more trust for strangers, which is a strong correlate of happier and healthier cities.

In all, the intervention promoted aspects of psychological restoration, while achieving West Palm Beach's goal of encouraging more human engagement on the waterfront.

Findings of note:

- The tactical intervention had a strong and positive effect on perceptions of social trust, place belonging, and place quality, as compared to the control. Trends in other dimensions of mood (i.e. happiness and energetic arousal) were also in a positive direction.
- The tactical intervention had a strong and positive effect on people's perception of their own level of stress, despite not having a statistically significant effect on physical wellbeing as measured by heart rate, heart rate variability, skin temperature, and galvanic skin response. (The lack of significant change recorded in physical measures is unsurprising: previous experiments have only produced significant differences in physiological signals when they use extreme variations in environment, i.e. urban grey vs urban green vs urban water settings).
- The intervention caused passers-by to linger on the waterfront. The number of people observed in stationary activity at the site increased more than fivefold during the intervention, despite it not having a strong impact on the number of pedestrians and cyclists that flowed through the site.



An elegant but underperforming public space



A tactical intervention to boost wellbeing on the waterfront

This work identified a link between restorative environment theory and place design. Our results suggest that, by using interventions that boost feelings of restorative fascination and provide more comfort, even seemingly restorative environments such as waterfront or park locations can be improved to more deeply engage people and improve wellbeing.

Lessons for designers

Applying these learnings more broadly, designers interested in creating vibrant, happy urban spaces might consider reducing the amount of blank spaces on their structures and increasing the range of possible activities in their open spaces. Underperforming spaces may be improved by adding elements of restorative fascination. This may involve creating spaces that focus people's attention on natural or unique local features, or that introduce such elements where they don't exist.

Our approach used a variety of elements to transform an environment rather than a single "big idea." Designers should explore using a suite of tools combining unique color treatment, public art, additions of shade and local flora, and interactive elements such as street games and movable furniture.

Considering the challenges of the West Palm Beach waterfront, it's important to remember that no public place exists in isolation. Using spatial analysis, we found that some elements of the surrounding urban context dissuades visitors to the waterfront in ways that can be fixed:

First, most of the waterfront is not clearly visible from the vibrant, pedestrian core of the city. People are less likely to walk to destinations they cannot see. This can be addressed by providing a significant landmark or destination on the waterfront in line with the Clematis Street view corridor.

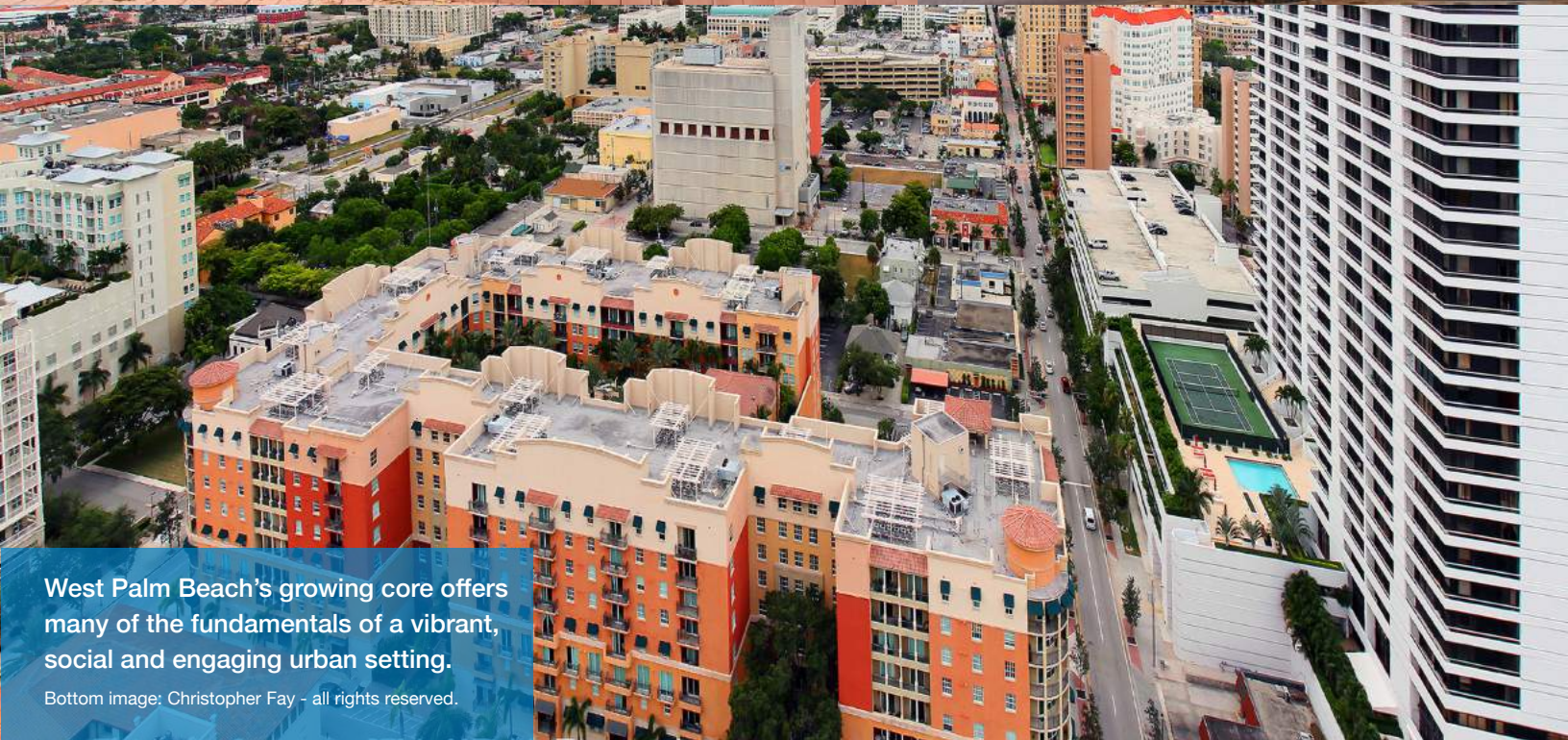
Second, there is a gap in activity opportunities for pedestrians between West Palm Beach's vibrant, pedestrian core and the waterfront. This may be addressed by incentivizing small scale commercial activity along connecting streets and paths. This may include food trucks or retail kiosks. We also encourage landholders to break up existing empty retail space into smaller units to provide more variety per block.

The Shore to Core pilot experiment offered a taste of a research and evidence-based approach to urban design. The strong, positive effects we recorded on mood,

emotional wellbeing and pedestrian behavior suggest that urban designers should pay particular attention to the concept of restorative fascination.

Moreover, this work warrants further exploration of what we might call "restorative urbanism," or the use of restorative environment theory and tactical design approaches to achieve wellbeing goals while enlivening public spaces.

How can we realize this restorative urbanism? We encourage cities to continue measuring the links between design and wellbeing as they work to nurture health, happiness, inclusion and resilience. The following pages offer detailed rationale, methodology, and recommendations from our work.



West Palm Beach's growing core offers many of the fundamentals of a vibrant, social and engaging urban setting.

Bottom image: Christopher Fay - all rights reserved.

Introduction: Designing cities for wellbeing

It's time to redefine success in urban design, putting human health and happiness at the fore.

Cities from Santa Monica to Paris to Bogota are adopting wellbeing as a policy goal, because they are realizing that the happy city, the green city and the economically sound city are the same place. Meanwhile, researchers in environmental psychology, neuroscience, and design practice are discovering that city spaces influence how people move, behave and feel. A new field of evidence-based design is emerging. If we pay attention to the evidence, we can design public places in ways that make people healthier and happier.

Van Alen Institute, along with the City of West Palm Beach and the Community Redevelopment Agency, launched the *Shore to Core* competition in 2016 to better understand how urban places influence wellbeing, and inspire innovation in the field. *Shore to Core* challenged research teams to develop a set of metrics and a framework for studying how physical transformations may affect people's wellbeing, and conduct a pilot study to test this approach and inform future research.

The interdisciplinary team, Happier By Design, won the competition. We set out to apply research from neuroscience, environmental psychology, and urban design in an experiment that would identify a new, evidence-based approach to reviving public space and boosting human happiness.

West Palm Beach is an ideal place to explore an evidence-based approach to designing for wellbeing. With a new rail station and new housing density on the way, West Palm Beach faces tremendous opportunities along with persistent challenges. Its downtown and waterfront should be the heart of civic and social life, yet these areas could improve their performance at drawing residents, businesses, and a diversity of visitors.

Approaches to these challenges must be guided by a clear understanding of the relationship between design and human emotions and behavior.

The Happier by Design team created a unique experiment to see how a public space design intervention can boost key contributors to wellbeing. Before describing our experiment, it's important to clarify what we mean by wellbeing.

A wellbeing model for urban design

Wellbeing is most commonly thought of as a subjective measure of health and happiness.¹ People who think they are healthy, happy, and thriving generally are. People who self-report high levels of meaning and satisfaction in their lives, for example, are generally healthier, more productive at work, and have stronger and more supportive social relationships.²

At the same time, individual wellbeing can affect societal wellbeing. People who report high levels of personal wellbeing have more activity in the pleasure centers of their brains, and lower levels of stress hormones in their blood. They are better able to respond to hard times, to work well with other people, and to innovate solutions to local and societal problems.³

A holistic approach means considering the wellbeing of individuals and society in general. By prioritizing wellbeing, cities also promote physical and mental health, social capital and local economic growth.⁴

There are numerous contributors to wellbeing, many of which can be influenced by environmental conditions. For this experiment we focused on four wellbeing contributors which evidence has shown can be strongly influenced by environment and urban design:

Social trust: Positive social connections are the strongest contributor of human happiness. People with positive social connections enjoy greater resilience, health, and economic success. And populations with higher reported levels of social trust report higher levels of happiness.⁵

Inclusion: Societies that are more inclusive, and that offer broad access to the social, economic and experiential benefits of life, do better on a variety of measures from education to safety to healthy life years.⁶ Design can mediate who enjoys the benefits of city life.

Belonging: People who feel connected to their community report higher trust in others, and higher levels of happiness. Places that inspire strong attachment among residents experience stronger economic growth and are more resilient.⁷

Comfort: People's wellbeing is influenced at any moment by how comfortable they feel. But comfort also influences behavior. People are more likely to walk, bike, and share public spaces together when they feel comfortable.⁸

Previous research on the place/wellbeing connection

A growing body of academic literature suggest that urban environments can have broad effects on people's minds, bodies, and behavior: Particular environments can reduce stress, improve altruism, and increase social activities, or they can do the opposite. Exposure to these spaces improve or damage our health. We drew from a foundation of research in environmental psychology, as well as studies by urban design practitioners.

Learnings from environmental psychology

In recent decades, research in the field of environmental psychology have noted that certain environments have a restorative quality: they can make us happier while mentally reviving us. This is especially true with exposure to nature, which can calm us down while cheering us up. Restoration might therefore be considered a pre-condition for human health and wellbeing, enabling a higher quality of life. There is now a large body of empirical evidence to support the role of urban green space in health and wellbeing, an effect that is commonly referred to as 'green health'. Studies have also found various examples of the restorative effects of water bodies. People are more likely to have good health if they live closer to water.⁹ This corresponds to people's perceptions of water settings. People perceive images of blue urban settings to be more restorative than gray urban settings.¹⁰ Even in cities with few water features, engineered features such as water fountains still induce significant restorative experiences.¹¹

The concept of restorative environment forms the main theoretical framework for this study. Two complementary



Environmental Psychologist, Jennifer Roe et al found that exposure to nature in urban spaces had a restorative and calming effect on people's emotions, as measured by mobile electroencephalogram (EEG).

theories have driven research on restorative environments: Attention Restoration Theory (ART)¹² and Stress Reduction Theory (SRT).¹³

The ART model suggests that people exhibit attention recovery, improved mood and less stress (psychological restoration) when they are in environments with these four main qualities:

Soft fascination: being involuntarily and gently drawn to immediate surroundings. Good examples of this are waterfalls or green spaces like lush gardens and parks.

Being away: feeling psychological and/or geographical distance from tasks that demand direct attention. Such feelings are provoked in immersive nature or other spaces that are cut off from daily urban life.

Extent: being in a setting that is sufficiently rich and detailed to take you to a whole other world.¹⁴ A good example of this are cultural districts and historic buildings that draw one's attention to another period in time.

Compatibility: a good fit between the individual's needs and inclinations and the kinds of activities offered by a place. For example, seniors may be less attracted to spend time on basketball courts than teenagers.

Green and blue spaces are known to be restorative since they contain many of the attributes above. But restorative effects can also be experienced in historical districts, art



Environments that fascinate and take us away from everyday life can restore psychological wellbeing.

galleries and aquariums, or other settings that display several of these qualities.

The Stress Reduction Theory (SRT) model states that our first response to the environment is an aesthetic response.¹⁵ Environments incite an immediate like or dislike response accompanied by a change in psychophysiological state. The initial perception of an environment is via ‘preferenda’, a term that describes the visual stimuli that generate the emotional response. In natural environments, the ‘preferenda’ believed to promote positive mood include moderate depth, moderate complexity, and the presence of focal points.

The two models are complementary perspectives that focus on different aspects of the restorative process: ART is focused on attention, while SRT is focused largely on aesthetic and physiological responses.¹⁵

Both the ART and the SRT models help us understand how environments affect our wellbeing, but also help explain the characteristics of restorative environments. Together these offered a foundation for our studies. In particular, we attempted to foster qualities of the ART model (especially soft fascination and being away), which for the sake of simplicity, we will call restorative fascination.

Experiments on wellbeing in cities

Urban design practitioners and researchers have found more ways that design can influence people’s feelings and behavior. For example, architect Jan Gehl found that urban design elements such as building height, edges and street furniture all affect the speeds at which people

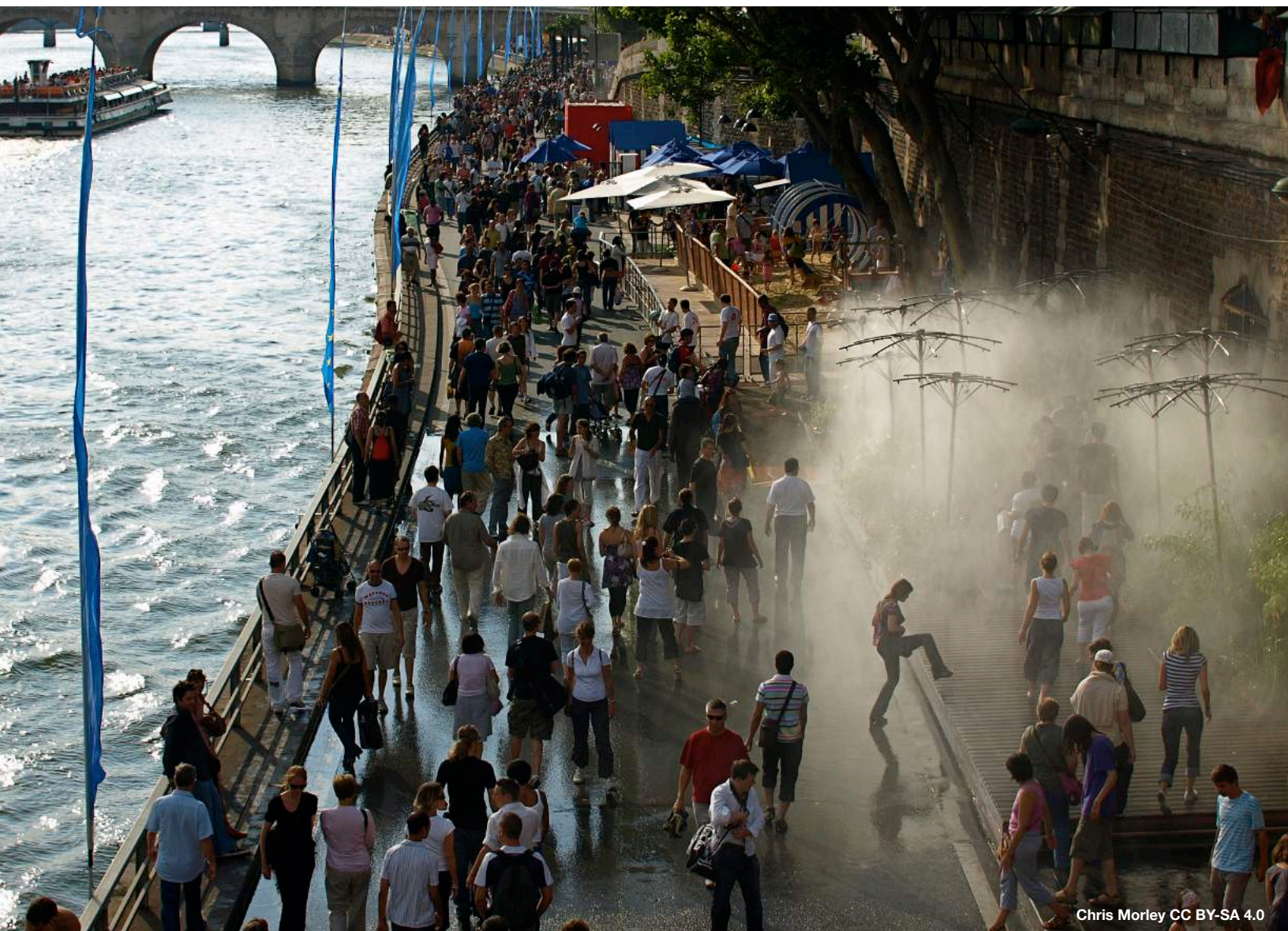
walk and the length of time they linger.¹⁶ Happy City and Urban Realities Lab found that active facades (or building edges with more shops, services and opportunities) had a positive psychophysiological effect on people compared to blank facades. Experiment participants report feeling happier and less stressed in such active environments. In a separate study, Happy City found that people were four times more likely to show altruistic behavior towards strangers in front of active facades than in front of blank facades.¹⁷ Other research indicates that spaces that incite positive emotions of awe and wonder can help people fight autoimmune diseases and depression.¹⁸ In other words, places that fascinate and intrigue us are generally better for us, providing they don’t over stimulate.

There is still much to learn. With its combination of urban and natural elements, West Palm Beach is an ideal place for an experiment that used restorative environment theory to inform design interventions to foster wellbeing. The Van Alen Institute, the City of West Palm Beach and the Community Redevelopment Agency provided this opportunity.

Research question

Can interventions that provoke restorative fascination improve wellbeing on the West Palm Beach waterfront?

We know that restorative environments can both calm us down and cheer us up. And we know that tactical (or low-cost, temporary, and strategically-placed) urban design interventions can be used to draw more people and engage them at key city spaces. But these effects have not been tested in tandem. Typically, restorative environments are tested either in a laboratory, using photographs and/or video, or via controlled exposure to a natural versus an urban setting¹⁹ (i.e. by walking experiments). But few studies have quantified the health benefits of water settings using psychophysiological indicators of wellbeing in the real world. And we are aware of none that have explored the wellbeing effects of a short-term tactical intervention designed to intensify restorative fascination. We set out to explore this uncharted territory.



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Paris and other cities have activated once-moribund waterfronts. How do such interventions alter human wellbeing?

Pilot project

Approach

As directed by the *Shore to Core* competition, the Happier by Design team set out to create a research project that investigates the power of design to improve the performance of one public place by provoking feelings of restorative fascination.

Our challenge was to combine tools from environmental psychology, spatial analytics, and tactical urbanism to test how changes to a public space would influence individuals' bodies (physiology), minds (psychology) and behavior. Therefore, the team pursued an innovative approach:

First, we chose a site that exemplifies many of the public space challenges seen in contemporary cities. Then we created and installed a tactical intervention for that site designed to both attract pedestrians and boost feelings of wellbeing, specifically by provoking feelings of restorative fascination.

Then we tested the effects of that intervention on people's physical state, their emotional state, and their behavior.

Intervention site

We chose our site in part based on what we heard from residents and decision-makers in West Palm Beach. The City aspires to make its downtown and core waterfront more vibrant, friendly, inviting and commercially successful. In 2016, the *Shore to Core* competition kicked off by inviting members of the public to share their thoughts about their city. Participants reported that the waterfront was their favorite place. They visited for enjoyment, but also when they wanted to reduce the stress of daily life. They listed the waterfront as one of the reasons they loved West Palm Beach. Yet, they also bemoaned the lack of amenities and activities provided.

The city has made significant investments in creating a pleasant waterfront park and promenade in order to make the waterfront a magnet that draws people to and through the core of the city. It could be a public amenity that brings people together in ways that provoke joy and civic spirit. Yet, it is not meeting its potential: pedestrian flows on the waterfront promenade on weekdays are only a fifth of those on Clematis Street just a block east.



Figure 1: Study area and intervention location

We situated the intervention on the waterfront promenade, directly east of the intersection of Flagler Drive and Datura Street. (See location in Figure 1.) This site was chosen for the following reasons:

The site offered ample space for an intervention that would not impede pedestrian, bicycle, or Segway tour traffic.

Our observations revealed that the site offered a distillation of the waterfront's challenges: it exhibited minimal stationary activity, lacked comfortable places to sit, and did not offer pedestrians compelling reasons to linger. (See figure 2).

The tactical intervention

Our goal was to transform the waterfront site, for one day, in a way that would invoke feelings of soft fascination, curiosity and being away from everyday life (together we call these restorative fascination). We also needed to ensure that our intervention provided comfort in order to allow people the ease to linger and focus their attention on these restorative elements.

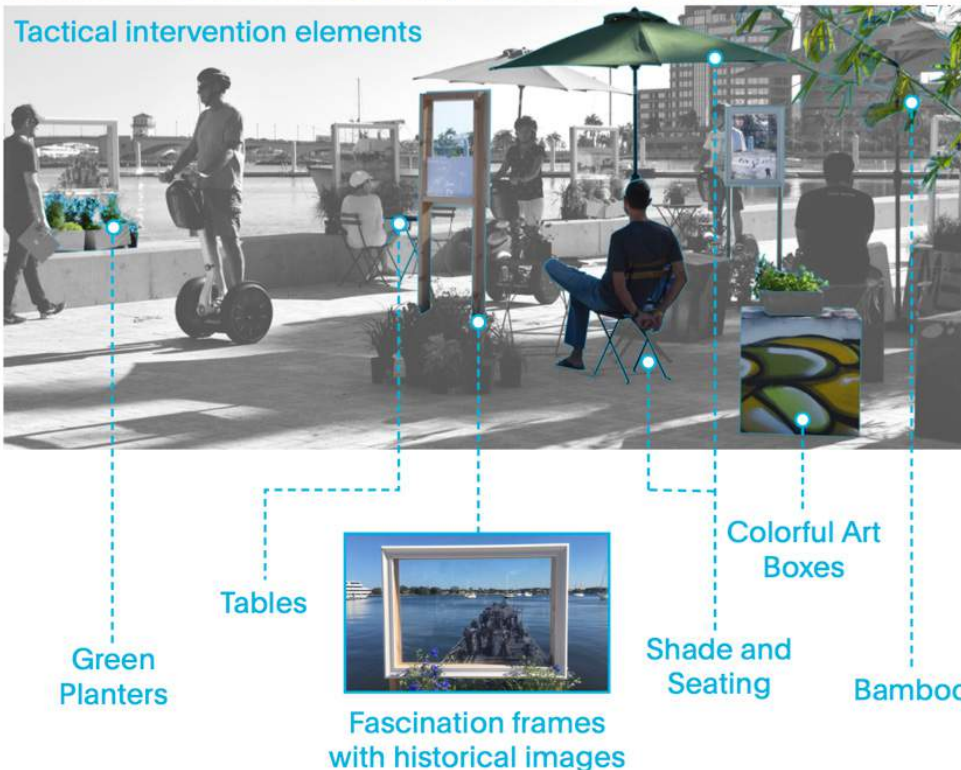
The focus of our one-day intervention was a set of "fascination frames": picture frames fitted with translucent images of waterfront scenes from the early 20th century. These were designed to provoke fascination and curiosity, reminding visitors of the aesthetic and cultural history of the waterfront. The frames were complemented by a series of painted chair-height "building blocks," and stencils of catfish placed along the ground. The frames were accompanied by flowerboxes with fragrant flora such as basil, to provide pleasant stimulation to another of the senses.

To these, we added elements of comfort: movable chairs and tables, shade umbrellas, and bamboo to screen away traffic noise. We bundled these elements together to create a complex but coherent outdoor living room.

The intervention's components are shown in the Figure 4.



Figure 2, Top left: Control site, no tactical intervention
Figure 3, Top right: Intervention site
Figure 4, Bottom: Tactical intervention elements



Metrics and study methodology

In order to reach a holistic understanding of the wellbeing effects of our intervention, we needed to measure the interventions' effects on people's feelings, physical state, and behavior, but we also needed to note key elements of the site context. These elements are interrelated and interconnected. For example, our physical state reflects and influences our emotional state, and vice versa. Views influence our emotional wellbeing, but also our route choices. And the surrounding urban context mediates how likely we are to visit a particular place. So even though our primary interest was the effect of our fascination intervention on wellbeing, we needed to take a broad approach. We chose to focus on four areas of inquiry that consider the place, as well as the psychology and physiology of people. What follows are the four areas and the methodologies we used for collecting data.

1. Site context and spatial analysis

It was crucial to understand our site in relation to the surrounding neighborhood. Every person's experience of place is strongly influenced by that place's relationship with the surrounding environment. The configuration of built form, travel pathways and viewsapes have been

shown to influence pedestrian behavior by revealing or blocking routes, offering or obscuring opportunities, and mediating wayfinding decisions. In order to understand the influence this spatial context may have on people's movement around the site, the team used spatial network analysis software, stationary maps and Google street view to collect the following metrics:

→ Spatial accessibility analysis

Measures the relative accessibility or the through-movement potential of the street network. More accessible spaces are more likely to be used to cross the city or district. Space Syntax has established strong correspondence between this measure and pedestrian-movement patterns.

→ Visibility graph analysis (VGA) Measures visual fields (or views) from different locations and compares these to calculate which locations give users more visual information about their surroundings. When a place is visible, we are generally more likely to visit it.

→ Isovist analysis: A visual field, also referred to as isovist, is the area that is directly visible from any particular point. The larger the isovist,

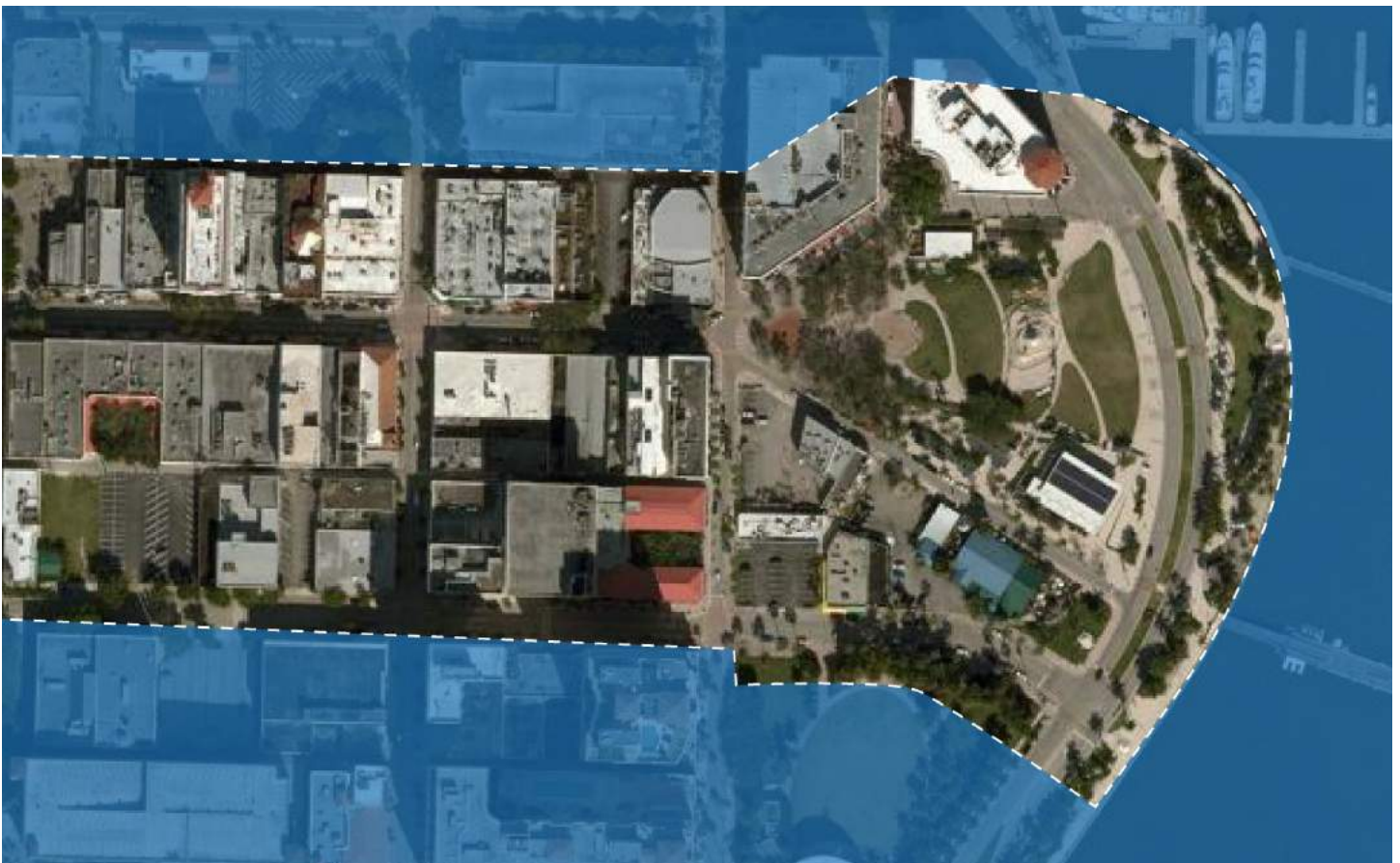


Figure 5: Pedestrian opportunities data collection area

the greater visual information a person will have about the surrounding environment, and the more likely others are able to see that person.

→ **Opportunities per block:** Studies have shown that routes with more opportunities to see and do things generate more pedestrian traffic, whereas blank zones can extinguish pedestrian flows. We used satellite imagery, Google Streetview, and walks around the site to map the number and variety of businesses near the intervention and on the nearby Clematis Street corridor, in order to determine the number of opportunities on a walk to the water. See Figure 5 for opportunities data collection zone.

2. Emotional wellbeing

Key elements of wellbeing described earlier (including sociability, inclusion, belonging and comfort) are influenced by place design. We expected that an intervention designed to boost restorative feelings would make people feel calmer (i.e. less arousal and excitement) and happier. But would a restorative intervention also change their level of trust in other people, attachment to place, and feelings of belonging? To measure emotional wellbeing, we organized walking tours (tour methodology is described below) during which we used pen and paper surveys to obtain tour participants' self-reports (i.e. their own assessments) of their feelings on all these questions. We used the UWIST Mood Adjective Check list (UMACL)²⁰, a standard psychological scale to measure mood tried and tested in the field. We then asked a series of questions about feelings of social trust, inclusion, belonging and comfort. We also asked questions about people's perception of the restorativeness of the site. The surveys are described below:

Mood

We measured participant's mood using the Short version of the UWIST Mood Adjective Checklist²¹, The UMACL measures three aspects of moods:

- Energetic arousal
- Tense arousal (i.e stress)
- Hedonic tone (i.e. happiness)

The UMACL has a total of 12 questions, four questions for each of the three moods; subjects respond to a four-point Likert scale for each question (ranging from 'definitely', 'slightly', 'not much', 'definitely not').

Restorativeness

We used two metrics from a standard perceived restorativeness scale comprising the core components of psychological restoration.²²

- Feelings of 'being away' or escape
- 'Fascination' or the level of interest in the setting

This is ranked on a five-point Likert scale, (5) indicating a high restorative value to (1) a low restorative value. These two items have been identified by Hartig²³ as being most robust for intervention analysis of this kind.

Sociability

We used a standard measure of subjective social trust in place:

- "If you lost a wallet with \$100 in it, how likely are you to have it returned?"

Belonging

We used a standard measure of place attachment:

- "How strongly do you feel you belong to this place?"

Both sociability and belonging metrics are ranked on a five-point Likert scale, with a higher value indicating a greater perception of social trust and place belonging.

Place quality and inclusion

We measured perceived quality of place based on four research-based metrics:

- Perceived attractiveness
- Safety
- Sense of welcome
- Likelihood of recommendation to a friend

These metrics are ranked on a five-point Likert scale with a higher value indicating a greater perception of attractiveness, safety, etc.

Full survey can be found in Appendix D.

3. Physiology

Places and design influence our bodies. A person's heart rate, skin temperature, and even the rate at which their skin conducts electrical currents can all reflect degrees of arousal (or excitement), mood change, and exertion. These measures are interesting when compared to people's self-reports of wellbeing. On the one hand, since people are not infallible judges of their own mental state, these measures can be used to check self-reports. On the other hand, they can provide new insights when combined with self-report data. For example, when we see high levels of physical arousal with self-reports of low happiness, we can assume that the person is feeling stressed.

To measure physiological data we used Microsoft Bands. These bracelets, worn around the wrist, measure four main indicators of physiological wellbeing: Galvanic Skin Response (GSR), Heart Rate Variability (HRV), Heart Rate, and Skin Temperature.

Galvanic Skin Response (GSR)

GSR is a standard indicator of arousal and has been associated with stress.²⁴ GSR is also known as skin conductance, as the skin becomes a better conductor of electricity when the body is stimulated. By running a tiny current through the body, the Microsoft Band measures electrical resistance in ohms, the standard unit for resistance.

Skin Temperature

Skin temperature has been associated with mood change. People experience warmth with affection and prosocial activities and coldness with disaffection.²⁵ Lower skin temperature has also been associated with increased stress.²⁶ The inverse relationship is also true: Warmer temperatures can incite more sociability and pro-social behavior.²⁷

Heart Rate

Heart rate, measured in the number of heart contractions per minute, or beats per minute, is also a measure of arousal²⁸ and stress.²⁹

Heart Rate Variability (HRV)

This metric measures the standard deviation in the time intervals between heartbeats and is also a standard indicator of stress. HRV affects the body's control and functioning of the autonomic nervous system (ANS), which controls subconscious body movements like breathing, but also helps modulate the body's response to stress.³⁰

A high HRV means that the body has more control of the ANS and is associated with better health.³¹ A low one means the body's fight-or-flight side of its nervous system is triggered and is a state more associated with stress.

4. Walking tours

We conducted formal walking tours in order to gather survey and physical data from intervention site visitors. We conducted three pairs of walking tours between January 23–25, 2017. There were 23 participants. Each participant took part in two tours: one with the intervention in place, and one without (i.e. control). Our participants were mostly in the 25–34 age group (44%); 48% were male and 52% were female; despite targeting our message to diverse audiences, the participants were predominantly White Caucasian (61%) with high socioeconomic status (i.e. in paid work, living comfortably on current income, and having attended higher education).

Walking tours began at the West Palm Beach Visitor Information Center, followed the waterfront promenade, and finished at the test site. (See Figure 6 for route.) The tour proceeded at a slow walking pace, and concluded with a five-minute rest at the test site. We fitted participants with the Microsoft Bands at the start of each tour. Mood surveys were conducted both at the visitor's center and at the conclusion of the tours. At the conclusion of tours, we also recorded informal interviews with participants.

Because we were concerned about order effects (the varying psychological effect created by the order in which people experience a change), we created two tour patterns for our experiment. On day one, Group A experienced the site in control condition (with no intervention), and then on day two, experienced the intervention condition. Group B experienced the site in reverse; on day two, they experienced the intervention condition, followed by day three, the control condition. Details on group sizes, procedure and timeline are found in Appendix A.

5. Behavior mapping

We were interested to see how the intervention affected the movement and behavior of people not involved in our tours. We observed pedestrian and cyclist behavior at the site at times when tour participants were not present. We tested both when the intervention was in place and when the site was in control state (days two and three, respectively).

Our method used components of Gehl Architects' Public Life survey, which was being conducted elsewhere in

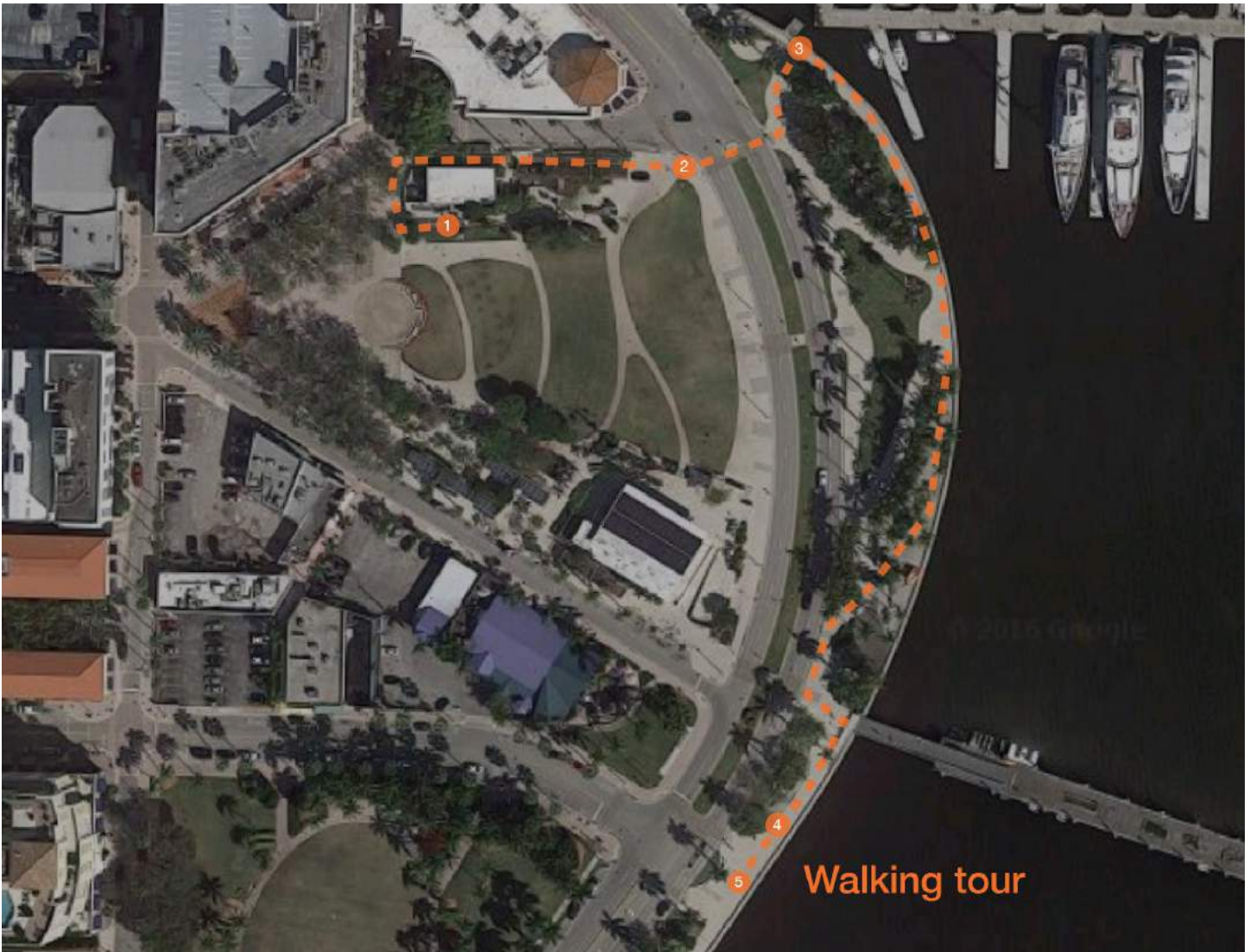


Figure 6: Walking tour and intervention location

West Palm Beach. We looked at the following indicators: The team counted pedestrians, cyclists and stationary activities for ten minutes every hour between 8am and 4pm on the two weekdays. We used a simple paper marking technique and handheld counter.³² Metrics:

- Pedestrian and cyclist volumes
- Stationary activities including standing, waiting for transport, bench seating, secondary seating, movable seating, lying down, children playing, cultural activities, and physical activities.

Results and analysis

The intervention had a remarkable effect on people's feelings and behavior. We found a strong link between visual fascination, restorative environment theory and place design.

Put simply, by adding elements of restorative fascination and comfort to a discrete section of the waterfront, we influenced the way people behaved and their subjective reports of wellbeing. The intervention induced more people to stop and linger on the waterfront, and it had a clear effect on our tour participants. Not only did they report liking the waterfront more when the intervention was in place, it improved their subjective mood. They reported feeling less stress, a greater sense of belonging, and they felt more trust for strangers. In all, the intervention significantly promoted aspects of psychological restoration, while achieving West Palm Beach's goal of encouraging more human presence on the waterfront.

Findings of note:

→ The tactical intervention environment had a statistically significant and positive effect on perceived stress, perceived social trust, perceptions of place belonging and quality perceptions of place, as compared to the control. Trends in other dimensions of mood (i.e. happiness and energetic arousal) were in a positive direction but the change was not statistically significant.

→ The tactical intervention did not cause a noticeable change in the number of pedestrians and cyclists that flowed through the site. However, more than five times as many people stopped to engage in stationary activities (from sitting to stopping for a chat, for example) during the intervention period than did when it was in control state.

→ The intervention did not have a statistically significant effect on people's physical wellbeing when measured by heart rate, heart rate variability, skin temperature, and galvanic skin response. Data from these metrics can correlate with comfort and stress. The results suggest that even though the intervention improved perceived restorativeness, it was not of a magnitude or scale to create a big shift in physiological wellbeing. This is not surprising given

that experiments which gather physiological data tend only to produce significant differences when they use extreme variations in environment (e.g. urban gray vs urban green versus urban water settings).

→ Visibility analysis revealed that much of the waterfront, including our intervention site, is not visible from the Clematis Street business and entertainment zone. This would be considered an impediment to pedestrian flows to the waterfront.

→ Pedestrian opportunities analysis showed a steep drop in pedestrian opportunities between Narcissus Avenue and the waterfront. This is often associated with a drop in pedestrian flows.

Below is a summary of results and analysis from our study of emotional wellbeing, physiology, and behavioral effects of the intervention, followed by results and analysis of behavior mapping and site context.

Note that on all graphs, the test site is labelled "Intervention" or "Control" to indicate whether participants experienced it with the intervention in place, or without it in place.

Emotional wellbeing results³³

Mood scale results (subjective wellbeing)

We found a statistically significant and positive effect of the intervention on perceived stress (i.e. Tense Arousal). The intervention tour reduced perceived stress as compared to the control tour which increased stress.

We found a positive effect of the intervention on energy (Energetic Arousal) and happiness (Hedonic Tone). While this change is not statistically significant there is a trend showing a positive relationship between the intervention and happiness and energy. We believe a larger sample size would indicate a statistically significant and positive change from the intervention.

The patterns are illustrated in Figures 7, 8 and 9. Note that these three graphs show data collected pre and post walk, after a five-minute pause at the test site.



"Fascination frames": picture frames fitted with translucent images of waterfront scenes from the early 20th century. These were designed to provoke fascination and curiosity, reminding visitors of the aesthetic and cultural history of the waterfront.



Participant filling out the subjective wellbeing survey at the site on day two, with the intervention set up in place. Visible in this image are the fascination frames, flora and seating elements.

Perceived change in stress, control site vs intervention

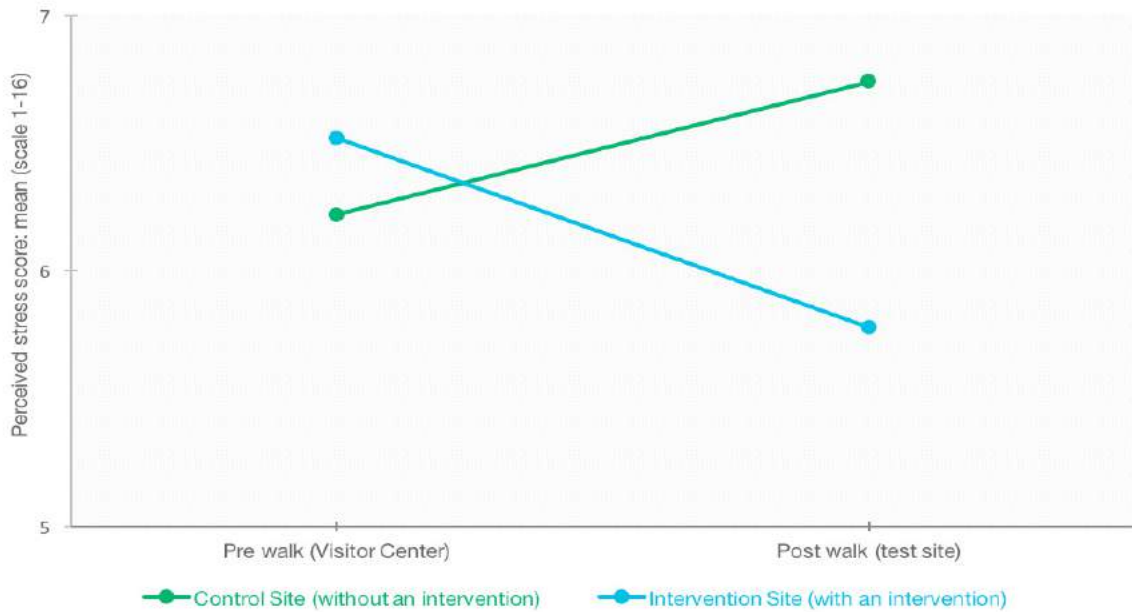


Figure 7: Stress: Higher mean value indicates higher perceived stress. The change in stress is statistically significant: The intervention reduced participant stress, while the control site increased stress.

Perceived change in Arousal, control site vs. intervention

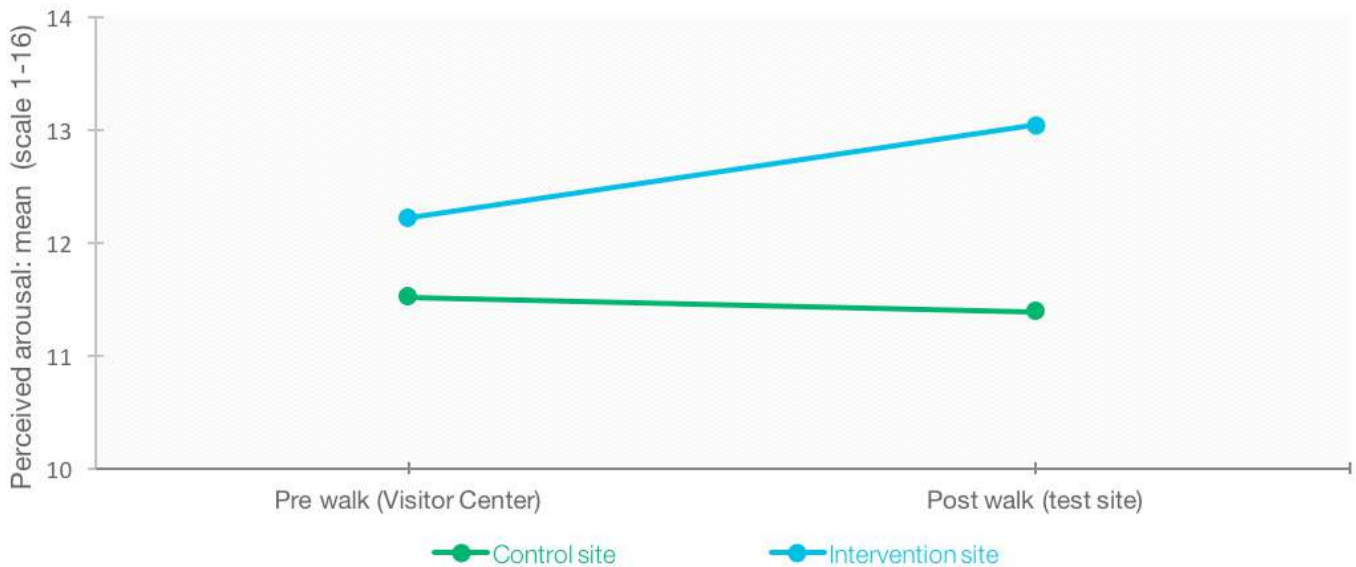


Figure 8: Energetic Arousal: A higher mean value indicates more perceived energy. Perceived arousal decreased with the control tour (green line) but increased with the intervention tour (blue line). This suggests that the intervention had a positive effect on energetic arousal, however the change the data records is not statistically significant.

Perceived change in happiness, control site vs. intervention

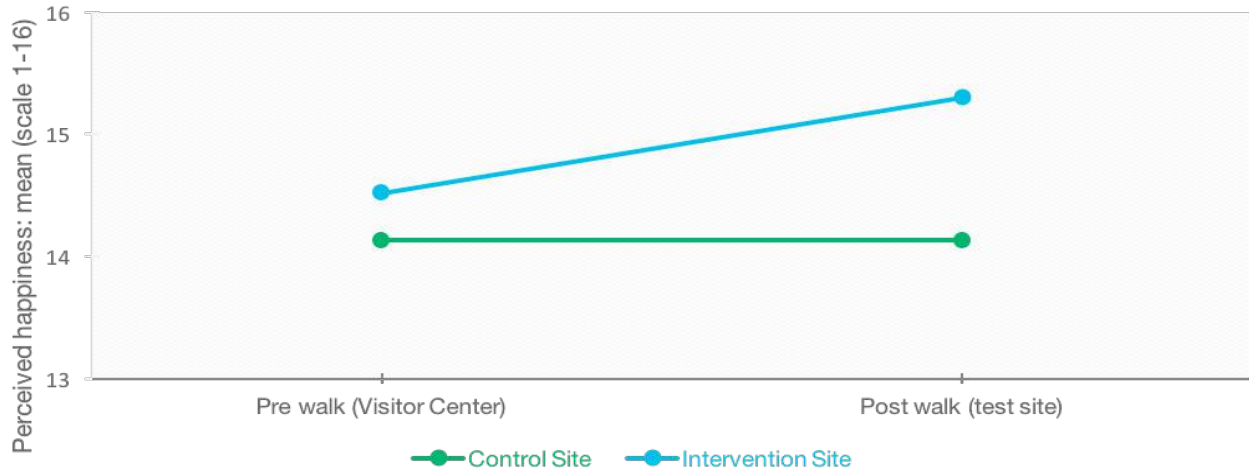


Figure 9: Hedonic tone (happiness): A higher mean value indicates higher perceived happiness. Happiness increased with the intervention tour, but remained constant with the control tour. The intervention had a positive effect on self-reported happiness, but the change is not statistically significant.

Perceived restorativeness

Perceptions of ‘being away’ and ‘fascination’ increased in the intervention walk as compared to the control, and the difference is statistically significant. The intervention therefore promoted two attributes of place strongly related to psychological restoration.

"There is much to explore and discover in this place."

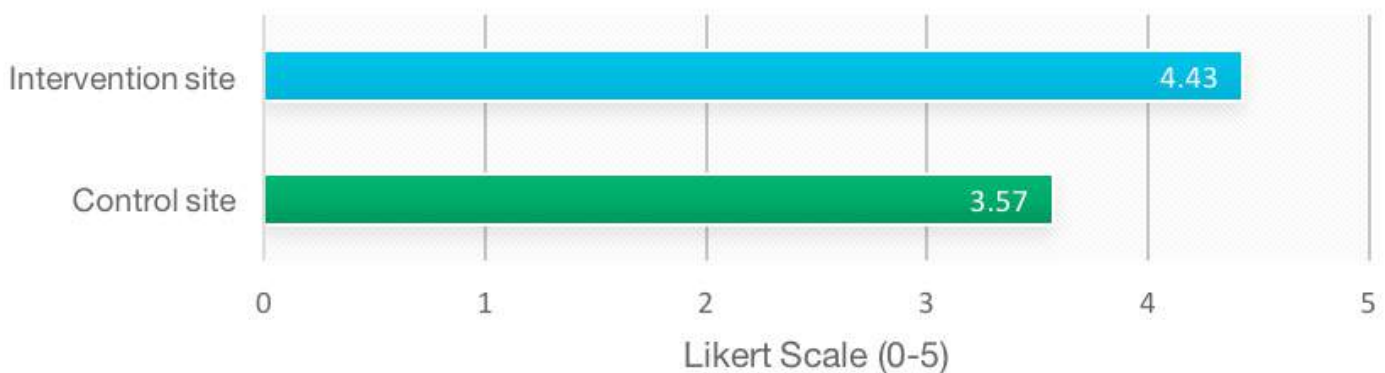


Figure 10: Fascination: A higher mean value indicates higher reported fascination. Participants reported being more fascinated with the intervention site than the control site. The difference is statistically significant.

"This is a place to get away from things that usually demand my attention"

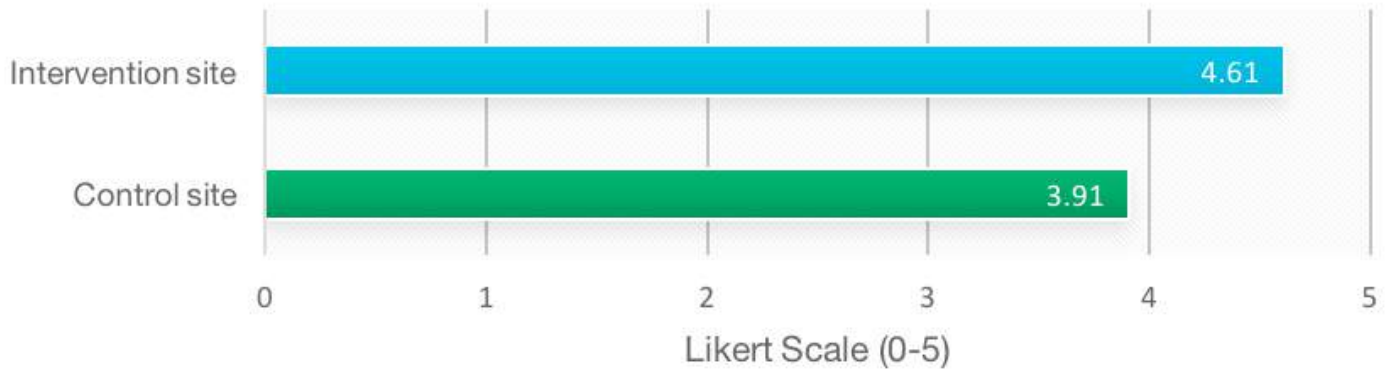


Figure 11: Being away: A Higher mean value indicates better perceived 'escape' from everyday demands. Perceptions of 'being away' increased in the intervention site as compared to the control site. The difference is statistically significant.

Social wellbeing

Perceived place belonging and perceived trust in place (i.e. likelihood of having your wallet returned) both increased in the intervention site, as compared to control, and the difference is statistically significant.

How strongly do you feel you belong to this place?

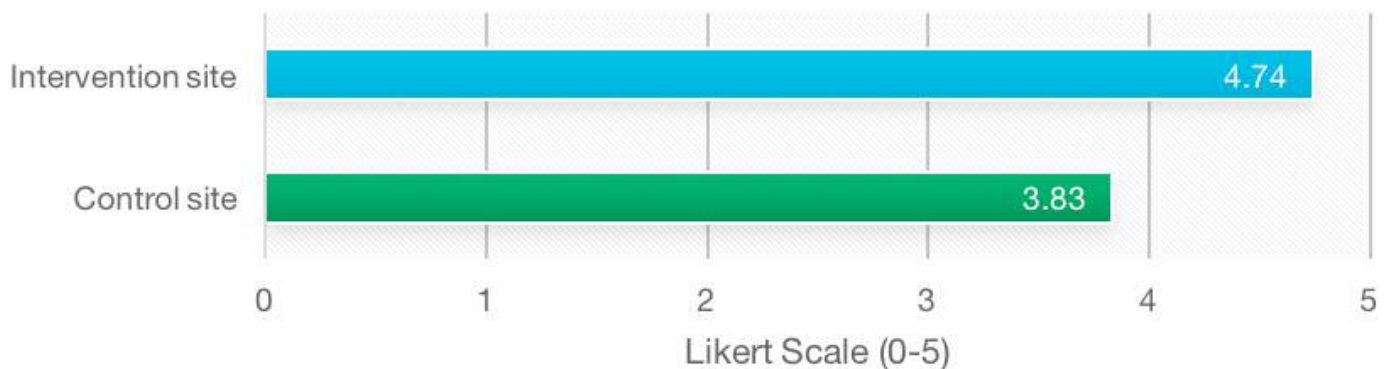


Figure 12: Belonging: A higher mean value indicates more perceived connection to place. Participants reported feeling a greater sense of belonging in the intervention site as compared to the control site, and this was a statistically significant difference.

If you lost a wallet with \$100 in it, how likely do you think your wallet would be returned in this place?



Figure 13: Social trust: A higher value indicates higher trust. Participants reported higher levels of social trust at the intervention site as compared to the control site with a statistically significant difference.

Perceptions of place quality

Perceptions of place quality increased in the intervention site as compared to the control, and the change was statistically significant level. In addition, perceived attractiveness, perceived welcome, perceived safety, and likelihood of recommending place to a friend all significantly increased in the intervention tour.

How strongly do you feel welcomed in this place?

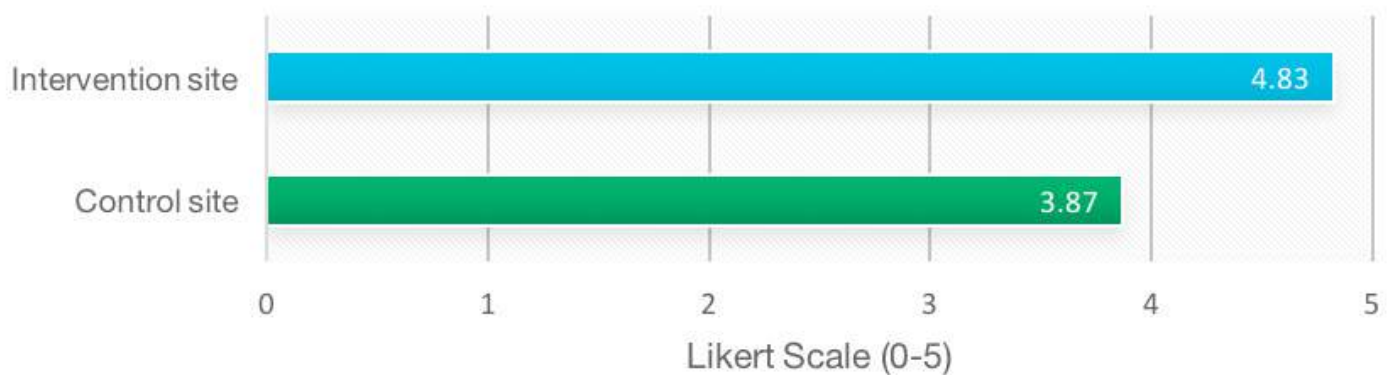


Figure 14: Perceived welcome: A higher mean value indicates greater feelings of being welcome. Participants reported feeling more welcome at the intervention site than the control site. The difference is statistically significant.

How safe do you feel using this place?

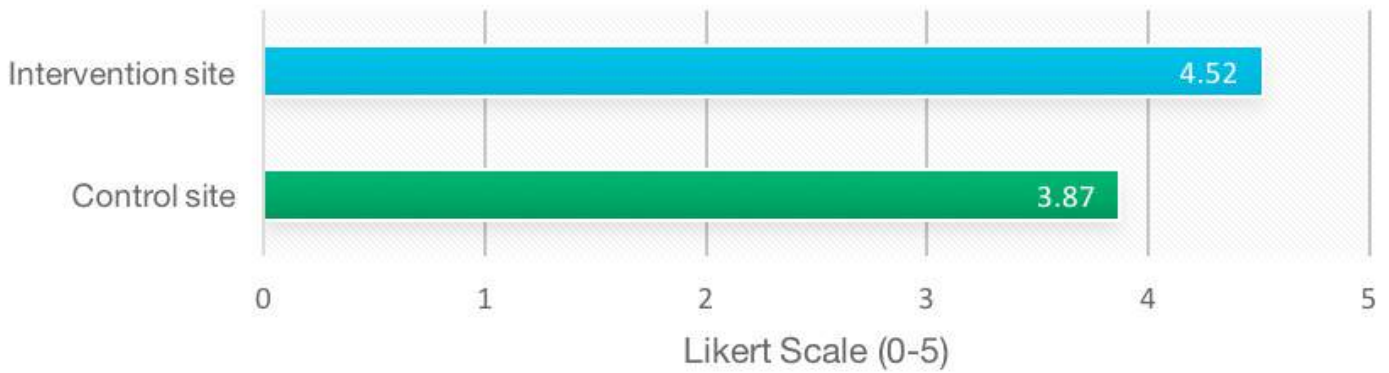


Figure 15: Perceived safety: A higher mean value indicates higher perceived safety. Participants reported feeling safer at the intervention site than the control site. The difference is statistically significant.

How attractive and pleasant is this place?

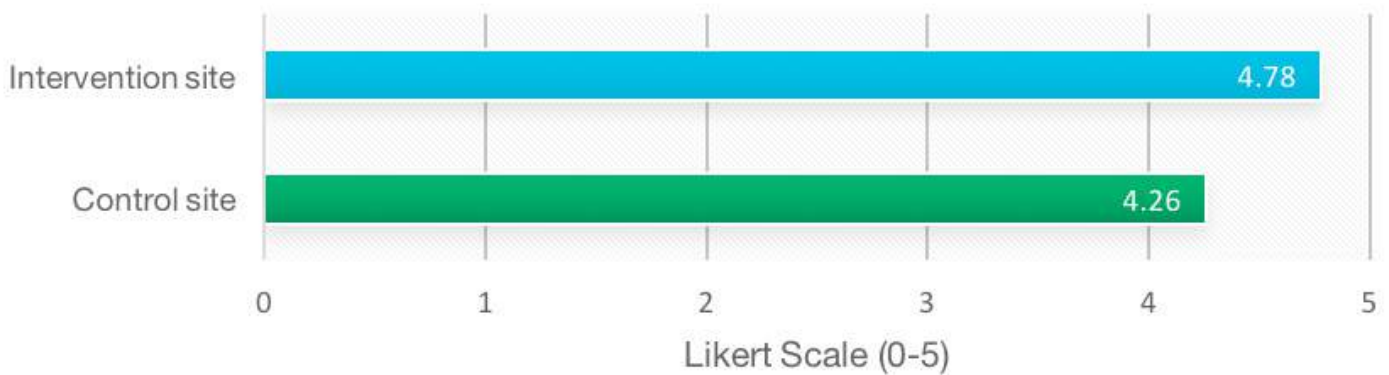


Figure 16: Perceived attractiveness: A higher mean value indicates higher perceived attractiveness. Participants perceived the intervention site as more attractive than the control site. The difference is statistically significant.

Would you advise a friend or a relative to use this place?

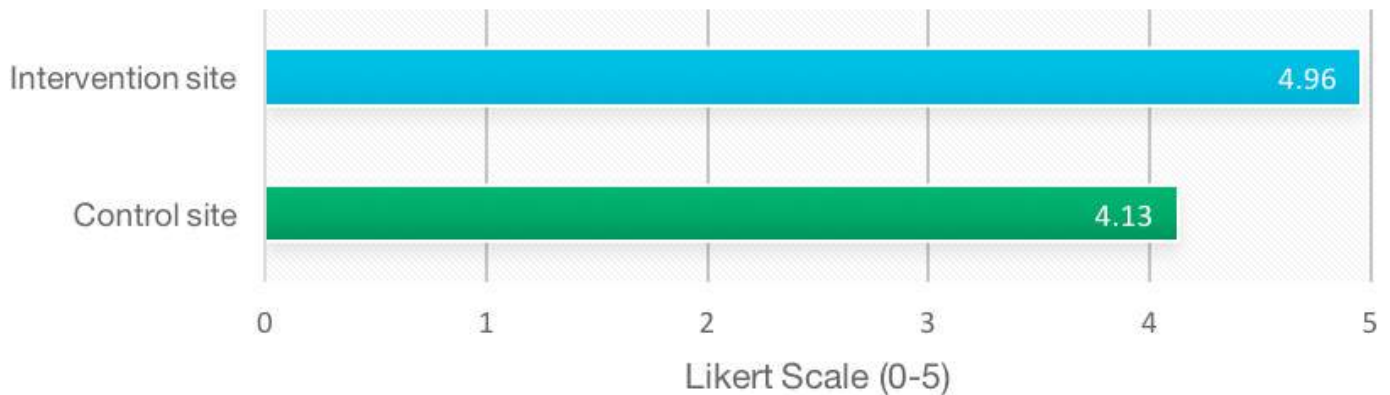


Figure 17: Recommending to a friend: A higher mean value indicates a greater likelihood that a participant would recommend visiting to a friend. Participants reported they are more likely to recommend the intervention site than the control site. The difference is statistically significant.

The full subjective well-being and place quality survey data is attached in appendix C.

Physiological wellbeing results

We found no benefit of the intervention to physiological wellbeing. Our analysis showed no statistical significant differences between the intervention walk as compared to the control walk. Notably, the most reliable of our physiological measures for field testing, heart rate variability, did not produce a significant difference. The only exception among measures is on our skin temperature (ST) metric where the pattern was not as hypothesized (i.e. the control walk had a more positive outcome on ST as compared to the Intervention). The lack of positive effects recorded for physiological wellbeing are interesting because of the positive – and significant – effect we found on subjective wellbeing. Arguably, how one feels is as important to one’s wellbeing as body physiology.

But why would the intervention, while improving perceived restorativeness, not register an effect on physiological measures? We suggest that it is because the intervention was not of a great enough magnitude or scale. To date, environmental psychology experiments using physiological metrics (e.g. EEG, fMRI) have only shown significant differences between settings when testing the effects of more extreme variations in environment (e.g. urban gray versus urban green setting) as opposed to a small scale intervention such as the one tested in this experiment.

Not surprisingly, three of our four physiological measures showed greater feelings of wellbeing at the waterfront site than at the baseline site at the Visitors Center. In other words, exposure to water overwhelmed the physiological effect of our intervention. The technical measurement of the physiology of people moving out-of-doors-is in its early conception, and currently does not support strong hypotheses building. While our experiment showed no physical measures of statistical significance, it provides an important protocol on which to build.

Heart rate variability: control tour vs intervention tour

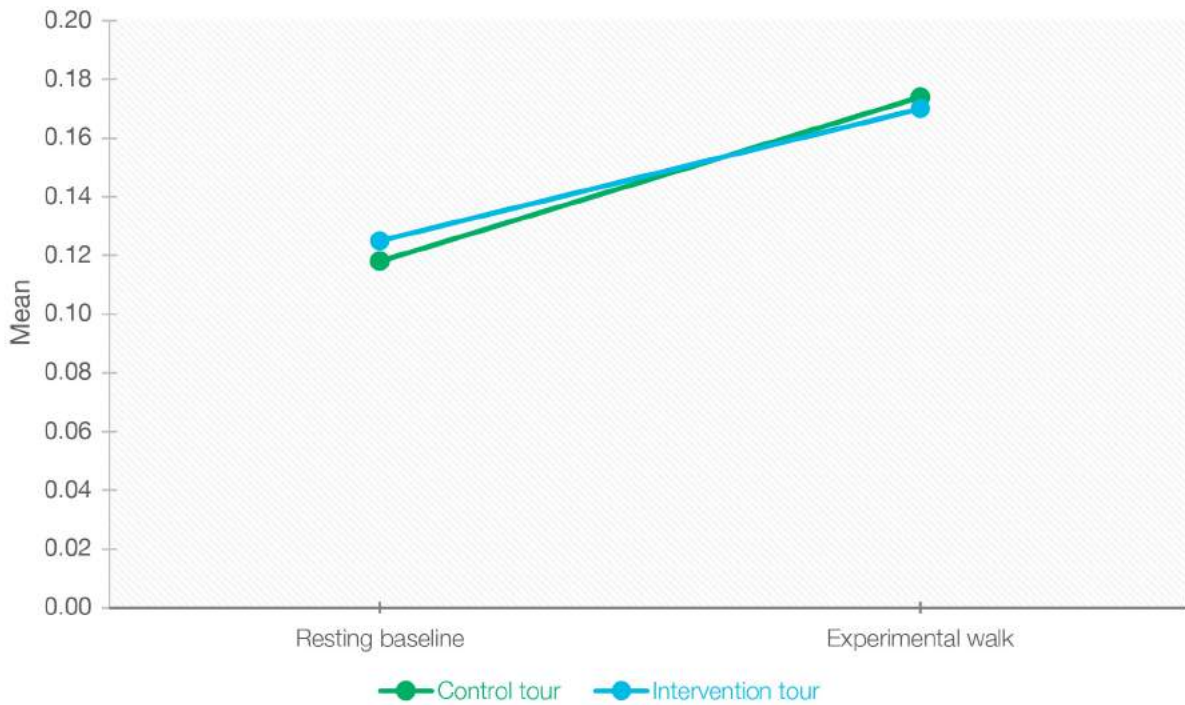


Figure 18: Heart Rate Variability: Resting baseline to experimental walk; control vs. intervention day. A higher value on the y-axis means more HRV and lower stress. Stress went down in the Experimental Walk for both Control and Intervention conditions, as would be expected with exposure to the waterfront. It fell to a greater degree in the Control walk, not as hypothesized. But the difference is not statistically significant.

Heart rate: control tour vs intervention tour

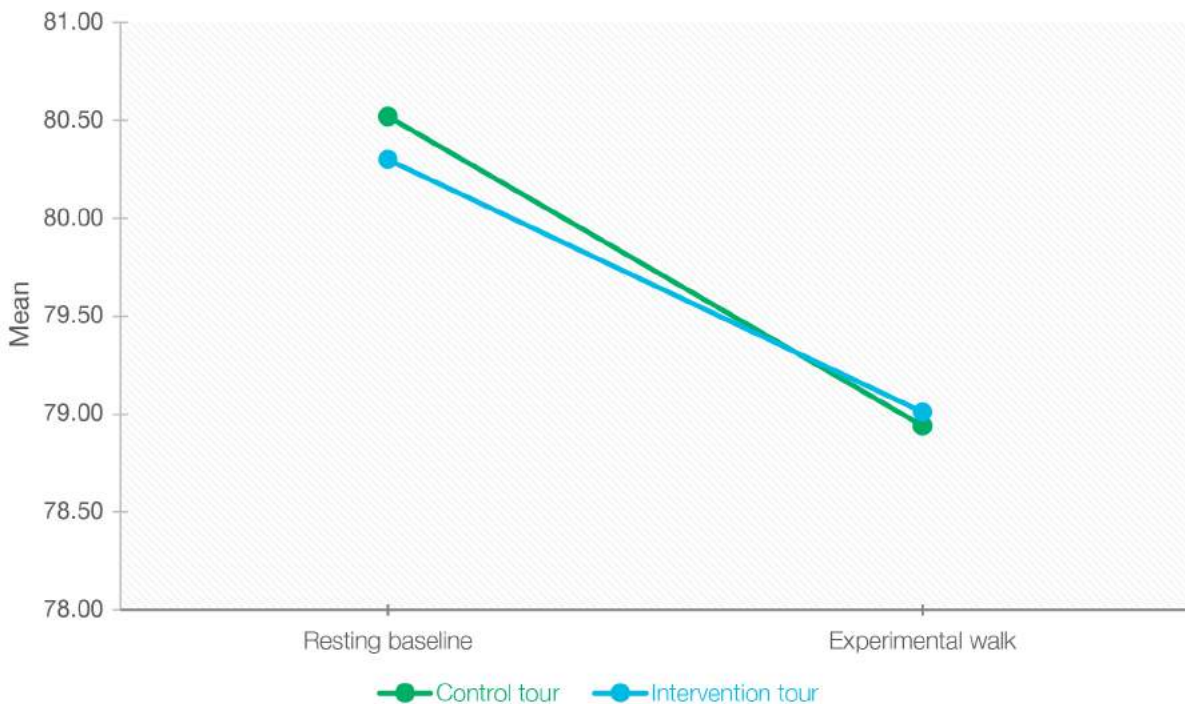


Figure 20: Heart Rate: Resting baseline to experimental walk; control versus intervention day. A higher value on the y-axis means a higher heart rate and indicates higher stress. Stress went down in the experimental walk for both control and intervention. There was no statistical difference between the two conditions.

Galvanic skin response: control tour vs intervention tour

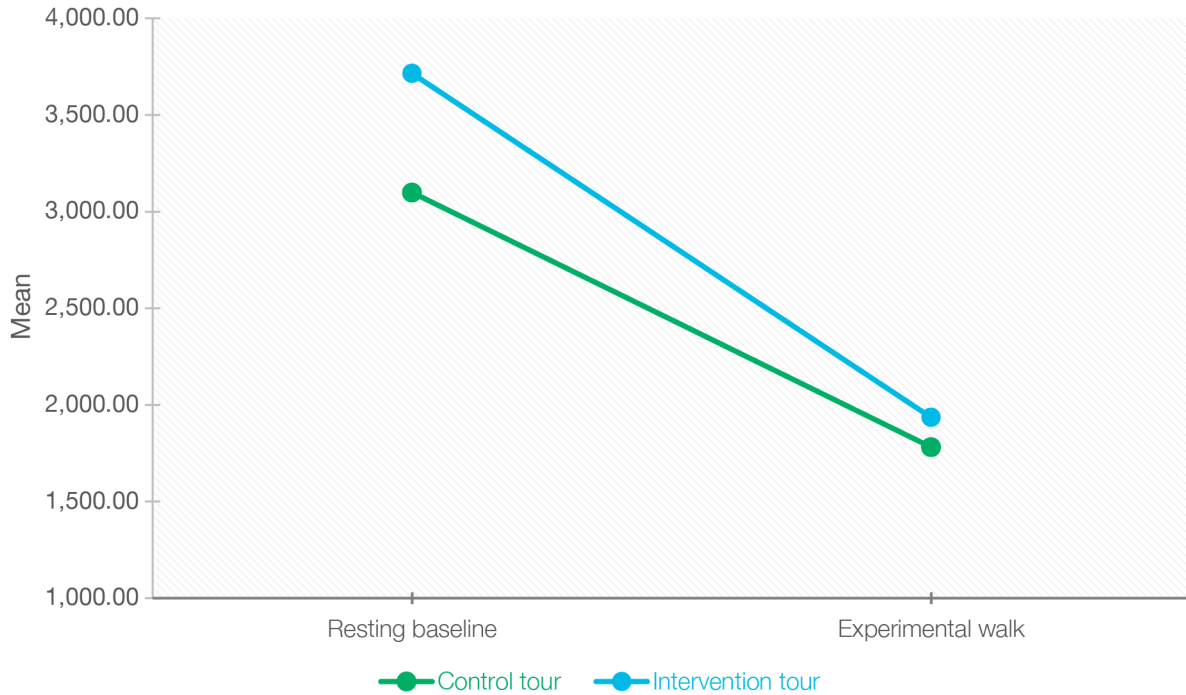


Figure 19: Galvanic Skin Response: Change from resting baseline to experimental walk: Control vs. intervention. A higher value on the y-axis means more ohms and indicates lower stress. Contrary to expectations, stress indicated by skin response *increased* on the experimental walk in both control and intervention conditions, and to a greater level in the intervention. There is no statistical difference between the two conditions.

Skin temperature: control tour vs intervention tour

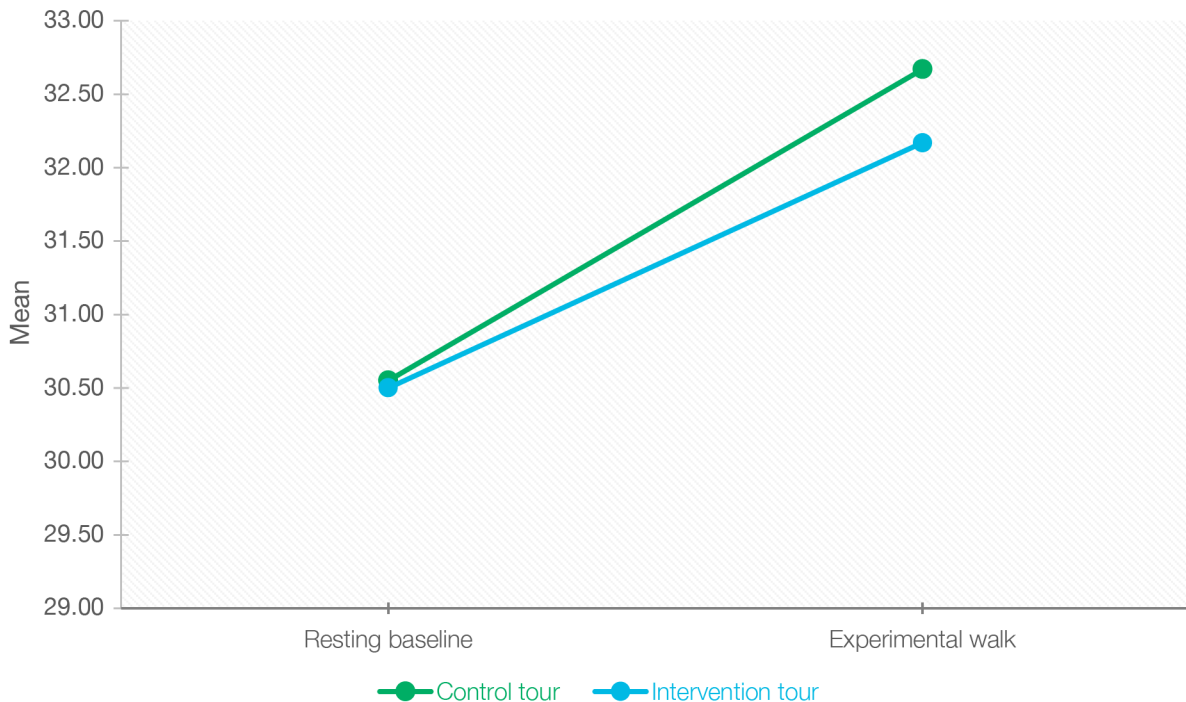


Figure 21: Skin Temperature: Change from resting baseline to experimental walk; control vs. intervention. A *higher* value on the y-axis means a higher skin temperature and indicates lower stress. Stress reduced in the experimental walk on both days, but to a greater degree in the control condition, not as hypothesized. We found mixed statistical results.

On significance

This is the first experiment we know of to test the effect of a low-cost, tactical urban intervention on health and wellbeing in a waterfront location; while we found nothing of statistical significance on the physiological measures, the outcomes on subjective wellbeing are more promising and indicate that further study is warranted using a larger sample size.

We did not anticipate perceived stress would increase from walking in the waterfront control setting. The literature suggests that a waterfront environment will likely have a restorative effect; this is a surprising result. We suggest that the lack of shade in the control setting may have aggravated perceived stress. This finding was not matched in the physiological data.

Behavior mapping results

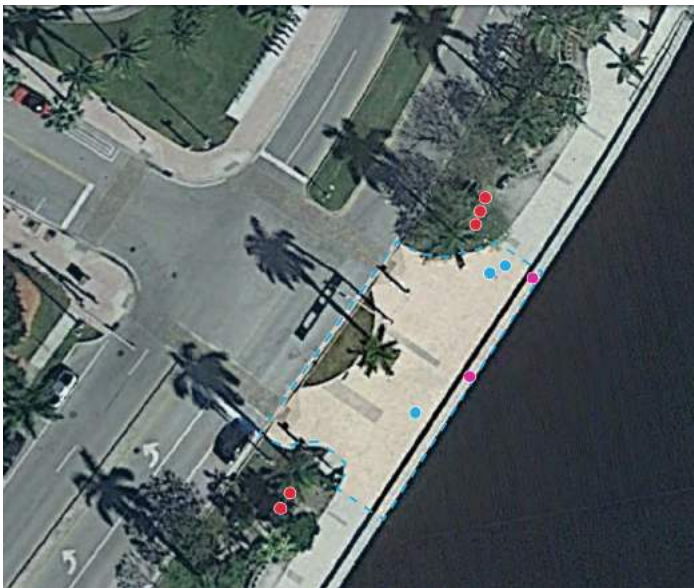
Pedestrian observations help determine behavioral effects of design changes. When we examined data on pedestrian/cyclist volumes and stationary activities at the test site, several stories emerged. The most salient is that the intervention induced more than five times as many passersby to stop and linger at the site, as compared to the site in its control state.

Detailed observations:

Although the Promenade is perceived as an important recreational destination in West Palm Beach, few people actually go there. We recorded an average of about 57 people per hour passing through the site during our weekday observations. In comparison, our research found that Clematis Street records an average of nearly 334 people per hour, more than five times as many as the waterfront testing site.

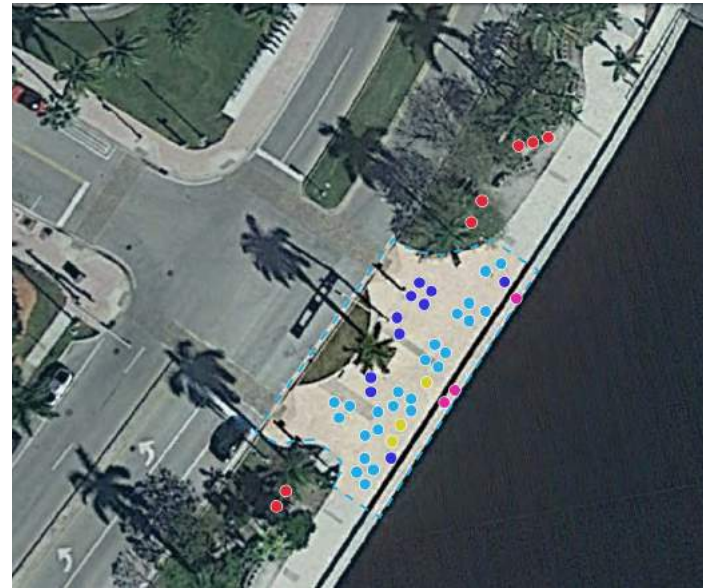
We did not observe a strong difference in the number of site users intervention site as compared to control site. The site saw about 10 percent more people pass through on the day when the intervention was not in place.

What was remarkable was this: The intervention increased the number of individuals who stopped and engaged with the site. About 64 percent of passing pedestrians and cyclists stopped and lingered with intervention day, while on the control day only about 11 percent of passersby stopped. This five-fold increase in stationary activity suggests that, while the intervention was not sufficient in drawing more pedestrians and cyclists, it encouraged a higher percentage of them to linger and interact with the site.



Stationary Activity in Control Site

- Standing
- Secondary Seating
- Benches



Stationary Activity in Intervention Site

- Standing
- Moveable Seating
- Secondary Seating
- Benches
- Physical Activities

Figure 22: The intervention induced people to linger at the waterfront. The intervention site (right) was associated with five times as much stationary activity (such as standing or sitting) as was the site in its control state (left).

Total pedestrian count Intervention day (grey) vs. control day (blue)

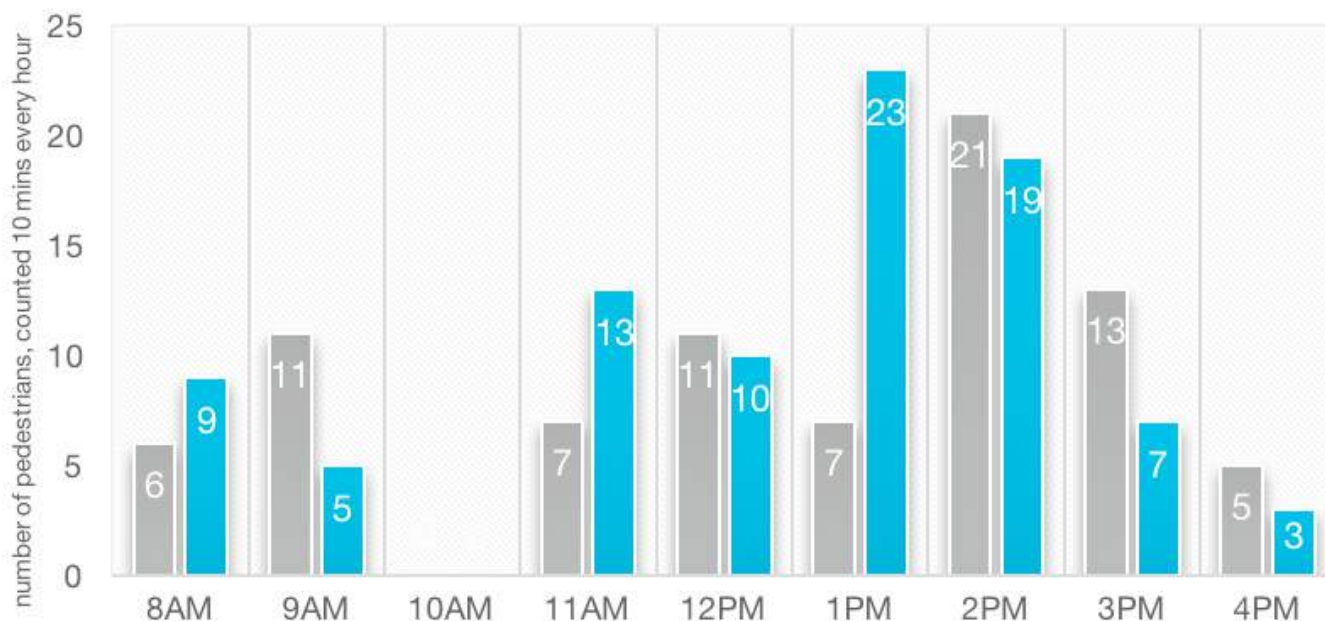


Figure 23: Pedestrian counts on intervention day versus control day.

Pedestrian count shows a total of 81 pedestrians on the intervention day, and 89 pedestrians on the control day. The difference shows that the intervention had no notable effect on pedestrian flow. This was not a surprise given that the intervention was hard to see from nearby locations.

Total cyclist count, intervention vs. control day

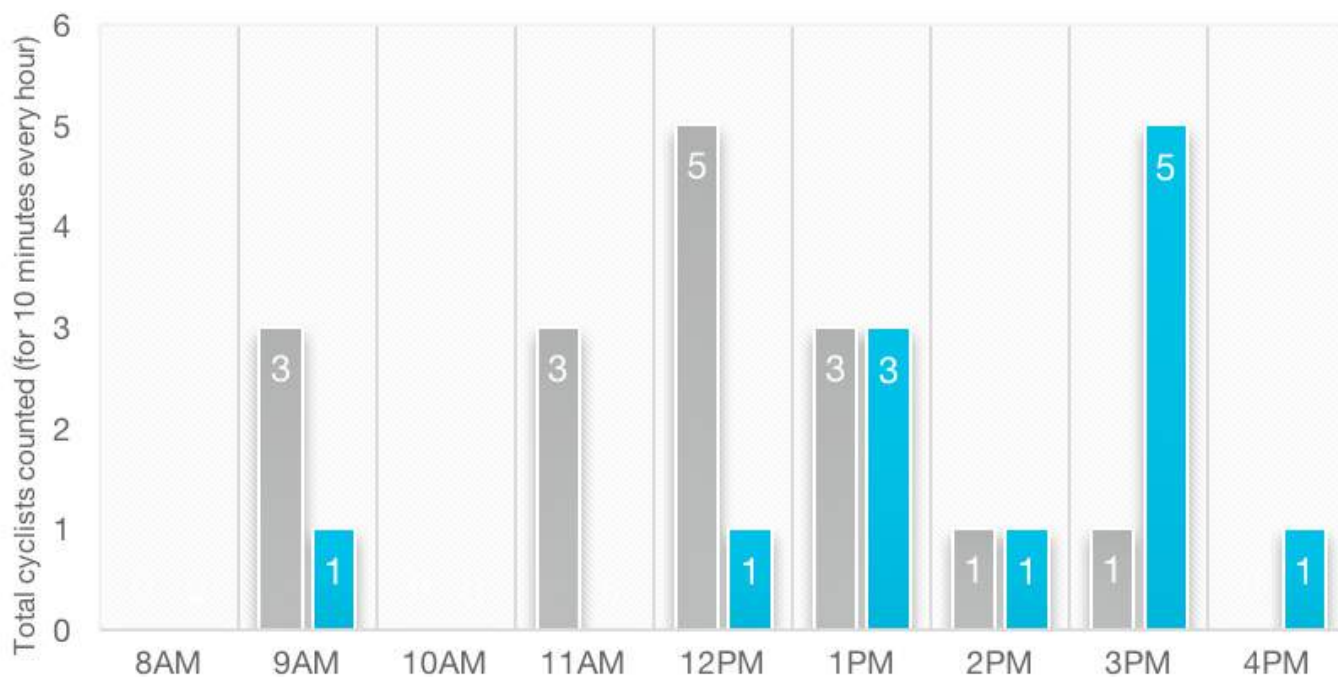


Figure 24: Cyclist count on intervention day versus control day.

Pedestrian count shows a total of 16 cyclists on the intervention day, and 12 cyclists on the control day. The difference suggests that the intervention may have had an effect on cyclist flows. However, the small sample size increases likelihood of error.

Spatial analysis results

This mapping analysis exercise collected data that helped us understand the relationship between the waterfront site and the surrounding context.

Findings of interest:

→ Isovist and visibility graph analysis showed that most of the waterfront promenade is hard to see from the active Clematis Street corridor. This would be expected to reduce pedestrian flows to the waterfront. The area directly east of Clematis Street is the most visible, so would therefore be more likely to draw visitors if it featured a notable attraction or monument.

→ Spatial accessibility analysis showed that the waterfront is not strategically connected within the city's transportation network. In other words, people are not likely to use the waterfront promenade on long-journey

trips between other places in West Palm Beach. There is potential for shorter-journey trips, but these may not occur because of the gap between shore and core.

→ Compared to the active Clematis Street corridor, there is a gap in pedestrian opportunities (or things to see and do) between Narcissus Avenue and the waterfront. These conditions are generally associated with lower levels of pedestrian activity.

These observations suggest that it will require more than a site-specific installation to draw more pedestrian activity to the waterfront. Solutions must consider and respond to the surrounding context, and the weak existing visual and opportunity links between the shore and core.

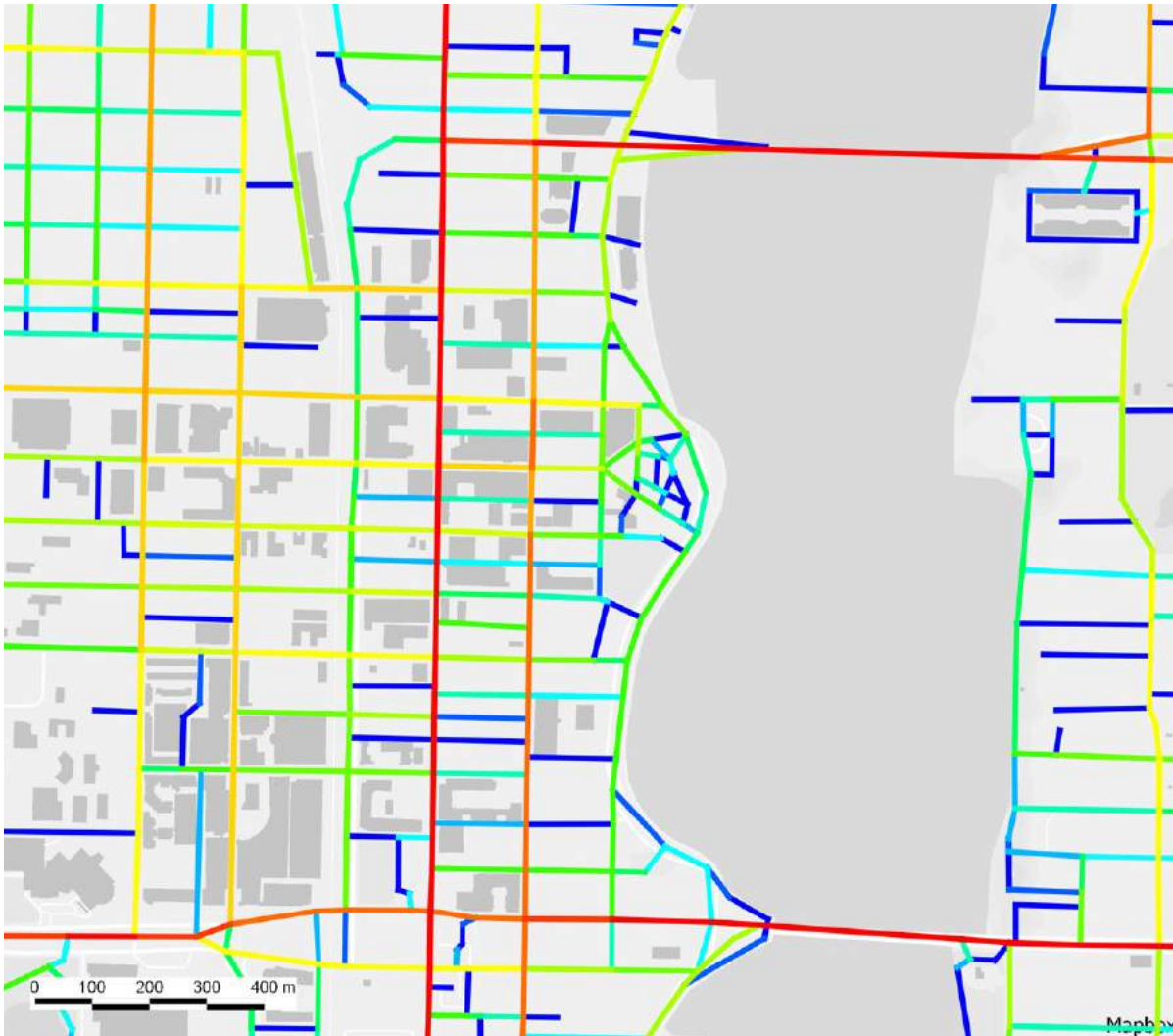


Figure 25: West Palm Beach core spatial accessibility analysis: The waterfront site is in the center of the image, showing relatively low accessibility.

Spatial Accessibility



Spatial accessibility

Spatial accessibility measures the relative accessibility or the through-movement potential of the street network. Space Syntax has established a strong correlation between this and pedestrian movements. More accessible places are more likely to be used to cross the city or district. The output is a heat map showing the relative usefulness of a segment for all possible journeys.

The spatial accessibility analysis shows that the waterfront promenade site does not exhibit high strategic accessibility. In other words, people are not likely to use the waterfront promenade on their long journey trips between other places in West Palm Beach. There is potential for shorter-journey trips but this has not been realized due to the gap caused by the lack of continuous routes lined with shops and opportunities between the shore and the core.

Visibility graph analysis

Visibility graph analysis measures visual distance from all spaces to all others. It shows how easy it is to see locations within the study area from other locations. This is a measure of perceived accessibility.

Red spaces have higher visual accessibility (spaces that are easy to get to) and blue spaces have lower visual accessibility (spaces that are hidden or appear difficult to get to). The analysis shows that the waterfront site in red has the strongest potential to draw high pedestrian traffic from Clematis Street, as it is the most visually integrated waterfront area with Clematis Street. The analysis also shows that the intervention site has lower visual accessibility than the north. A series of interventions at key visibility points would be most likely to encourage users on the waterfront.

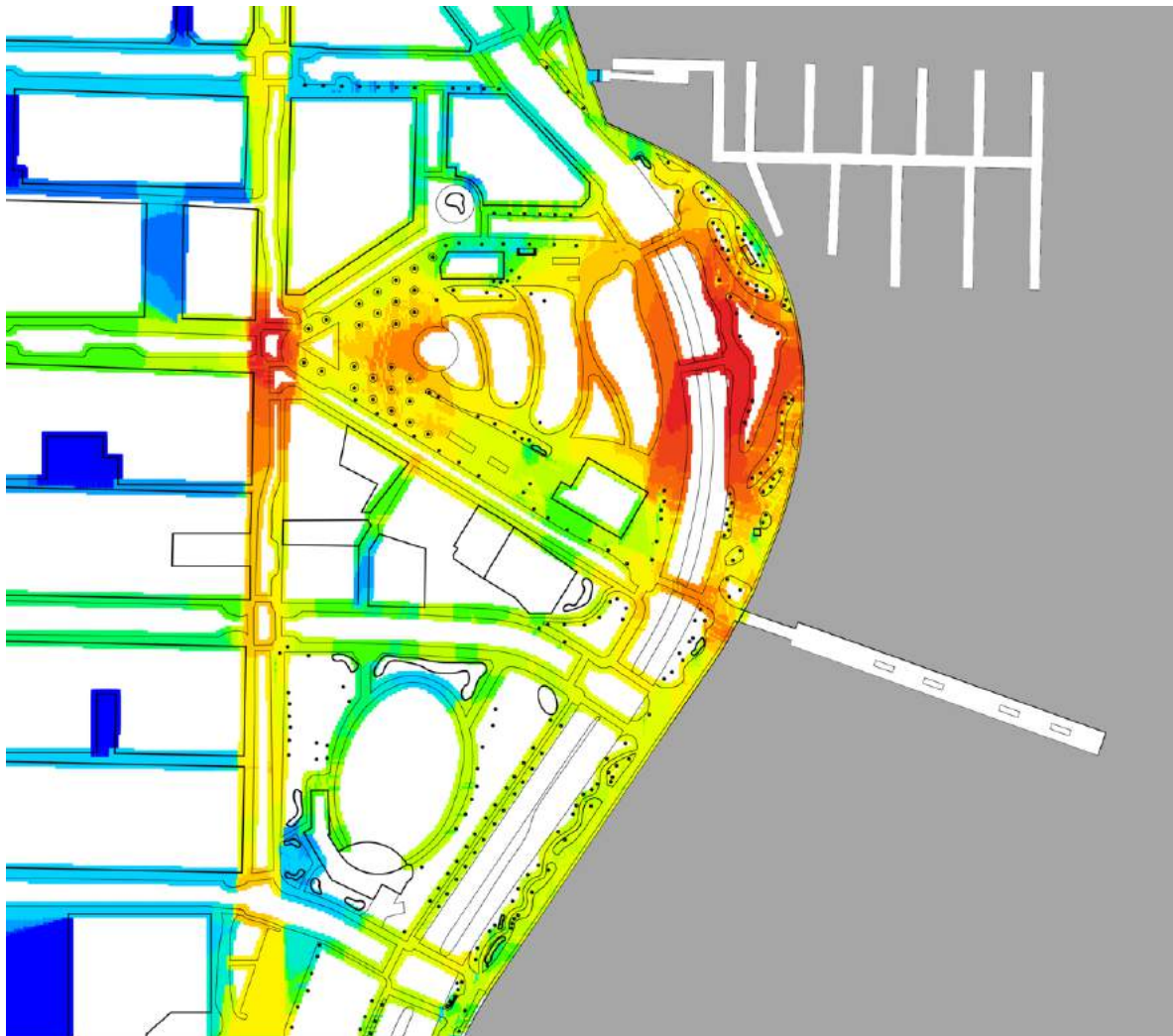


Figure 26: Visual graph analysis (VGA) of West Palm Beach waterfront

Visual integration





Figure 27: Isovist analysis showing the extent of what people can see from various locations. Diagram 0 notably shows the waterfront areas visible from the east end of the active Clematis Street corridor. The intervention site, and much of the waterfront, is not clearly visible from that location.

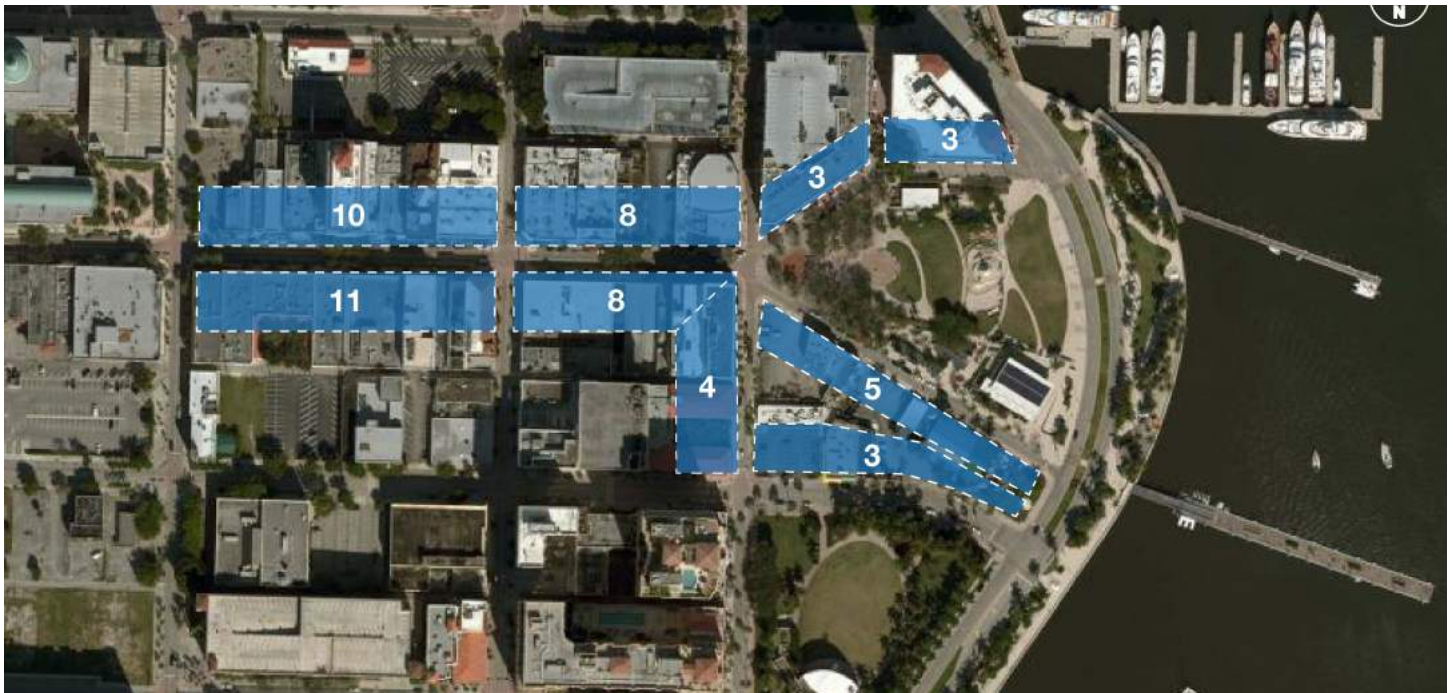
Isovist analysis

Isovist analysis shows the extent of landscape that can be seen from particular locations. Of particular interest is an analysis of views from the corner of Clematis Street at Narcissus Avenue (Figure 27 - diagram 0). This reveals that much of the waterfront is not visible from the Clematis Street corridor. Likewise, the core is also not visible from the waterfront (Figure 27 - diagrams 5 & 6). Space Syntax research shows that when people cannot see a location, they are less likely to walk there.

Pedestrian opportunities analysis

We counted the number of shops and services along street edges from the east end of the Clematis Street corridor through to the waterfront. This revealed abundant opportunities for pedestrians on Clematis Street, and a scarcity of opportunities approaching the water. Research

has shown that when there are fewer opportunities, pedestrian counts are lower, they walk faster, and they are less likely to linger.³⁴ This opportunities gap may partially account for low pedestrian numbers on the waterfront test site, even with the intervention in place.



Legend

10 Opportunity density score
(number of pedestrian opportunities per 100 yards)

Figure 28: Opportunity analysis shows that the number of opportunities per 100 yards declines as we approach the waterfront. Adding various opportunities on the waterfront can help draw visitors.

Notes from post-tour interviews

In informal interviews following final tours, participants noted with appreciation that the intervention offered comfort, shade, and the ability to move their chairs; it also piqued their curiosity. Given previous research on restorative environments, we were not surprised that it had a positive effect on wellbeing. But what elements were most successful? Participant responses offer some hints.

- Some respondents told us they liked the 'grassroots' and personal/non-institutional feel of the intervention.
- Some liked being able to move chairs and tables to control comfort and social exposure.
- Some liked being reminded of local history and sense of uniqueness.

- Some commented on the discomfort created by hot Florida sun, and noted that on summer days, they would not use the waterfront without shade.
- Several people expressed discomfort with the homeless presence on the waterfront and nearby. They preferred not to use benches in proximity to the homeless. Specifically, some complained about the scent of homeless people, their loud talking and yelling, and aggressive panhandling.

Recommendations

Our pilot experiment in West Palm Beach produced findings that should interest designers of public spaces. Below we offer a set of practical recommendations based on analysis of data from the pilot experiment as well as the site's spatial context. These recommendations are also informed by precedent research in the social and psychological effects of urban design, as well as informal feedback from participants and residents of West Palm Beach.

Lessons for designers in general

There is no shortage of elegant but stark and bare designs in contemporary cities. Indeed, design journals frequently celebrate the modern and austere. Yet we are often left with urban spaces that fail to attract people or make them happy. Previous research has shown that urban spaces with more engaging attributes are more successful at attracting pedestrians. Our work in West Palm Beach took this knowledge a step further. We identified a clear link between restorative environment theory, tactical urbanism methods, and human wellbeing.

A low-cost tactical intervention designed to provoke feelings of restorative fascination and comfort had a significant positive impact on people's subjective wellbeing. It induced pedestrians to linger longer. It made visitors feel more welcome. It allowed them to feel more trust in strangers, and to express more attachment to the place. All in all, it made people happier. This would not be worth attention if we had simply taken an unpleasant place and made it pleasant, but the test site was already pleasant by most designers' measures. This was a safe, landscaped promenade featuring views of water, boats and palms. We improved its performance by inserting a node of fascination.

The data seems to indicate that designers who are interested in creating vibrant, healthy places should reduce the amount of blank spaces and edges on their structures and open areas.

Overly blank, underperforming spaces may be improved by adding attributes of restorative fascination. To create this effect, a designer might adopt the following two strategies:

1. Include elements that boost feelings of 'fascination' and 'being away' from everyday life.

To accomplish this, designers should create spaces that focus people's attention on natural or unique local features, or that introduce such elements where they don't exist. It is also helpful to provide greater comfort to induce lingering and rest: provide protection from sun, rain; screen excessive traffic noise, and provide seating that users can adjust based on their needs.

2. Use a variety of tools to transform an environment rather than a single "big idea."

A suite of interventions employed together can draw pedestrians and hold their interest in key urban nodes, fostering face-to-face encounters, boosting prosocial behavior and even fostering local economic development. Drawing inspiration from tactical urbanism, we suggest combining color treatment, public art, additions of local flora, seating and shade, as well as interactive elements such as street games.

3. Offer visitors a chance to interact with or manipulate the environment.

This can be as simple as offering movable chairs and tables, or offering fixed binoculars, or a blackboard to interact with.

Recommendations for West Palm Beach

How can West Palm Beach improve the performance of its waterfront public spaces? Our research suggests that the waterfront promenade can indeed become a stronger magnet to attract people and foster subjective wellbeing. It is possible to improve the restorative qualities of this space while making it more social and friendly. We suggest the following strategies.

1. Offer more engaging stimuli.

Put simply, the promenade would be more social, attractive and inviting if there were more things for people to see and activities to do. The waterfront should provide more visual interest. Participants were excited by art that piqued their curiosity about the location. We would recommend the insertion of more public art, especially art made by local people, or reflecting local cultural or natural history.

2. Give people a chance to express themselves.

In post-experiment interviews, participants said they appreciated the informal, grassroots, non-institutional quality of the intervention. We encourage West Palm Beach to consider creating opportunities for local people or community groups to transform parts of the waterfront. Also consider participatory art projects that actively involve local people in concept and creation.

3. Provide more comfort.

If West Palm Beach hopes to draw more people to the waterfront, it should provide more comfort. Shade is crucial for creating comfort. People will not linger in the heat and glare if they cannot find shade. The landscaping and palms along the waterfront provide some shade, but this could be augmented with umbrellas or tensile structures. The fixed bench seating currently on the waterfront is not comfortable to sit in nor is it moveable. People preferred movable seating, so they could mediate their views and their social environment.

4. Offer more ways to connect with the natural environment.

The addition of a pier with seating and boating facilities has been a good start. How might people interact with the water in other ways? Fishing has been banned from the promenade, but the seawall could be interrupted by steps so that people might touch and feel the water's edge. Insertions of more natural flora, including rehabilitation of the water's edge ecosystem, would spark curiosity and have a restorative effect on visitors.

Our intervention gave people only a brief opportunity to engage with the water setting. What West Palm Beach lacks, and what people here and in other waterside cities tell us they long for generally, is a chance to touch and feel water. One major investment we would recommend would be for a public swimming or wading pool along the promenade.

5. Use distinct visual cues to draw people to a strategic site on the water's edge.

To attract pedestrians, a destination needs to pique people's interest from a distance. Our visual interest analysis noted that a pedestrian walking the Clematis St. corridor currently has only a partial and obscured view of the waterfront. What's more, it offers almost no visual cue, or landmark to draw people from the busy corridor across the Great Lawn to the promenade. We recommend adding a landmark feature to the promenade that both offers a

beguiling visual cue, and a reason for visitors to linger. This should be located directly east of Clematis Street to maximize visibility. This might be a viewing tower, a lighthouse, or a tall sculpture with refreshment kiosk at its base, or some other creative intervention.

6. Offer more amenity and activation through modest commercial enterprise.

Our opportunities and spatial analyses revealed that there is a gap in active land use between the Clematis Street corridor and the waterfront. The over-provision of open space, and the under-utilization of existing commercial spaces, create an activity gap between the urban area and the waterfront. The addition of a refreshment kiosk or café on the waterfront would activate the waterfront area and could provide the amenity to support longer dwelling time at the end of a walk or as a meeting point. But West Palm Beach should also take steps to repair the activity gap between its shore and core. We recommend that the city incentivize small-scale commercial activity along North Clematis, South Clematis and Datura. This may include food trucks or retail kiosks. We also encourage landholders to break existing empty retail space into smaller units to provide more variety per block (this may also add commercial viability).

A note about the homeless population and the waterfront

We note a tension on the waterfront between those users who are part of the social and market economy, and those who are not, such as the homeless. Many of our survey participants expressed discomfort with the homeless presence on the waterfront and nearby, and said they were less likely to visit the area because of the homeless. It was noted by some that the homeless population occupy park benches and shaded areas without contributing positively to West Palm Beach. Our team, however, noted a striking lack of opportunities for people of modest means to enter the social and market economy.

There is nothing constructive for the homeless to do in the area. There is no place for them to shower, no secure place for them to leave their belongings away from public space, and there is nowhere for them to charge their telephones. These are key barriers for people who actually want to find employment. These also lead the homeless to create more of a visual, aural, and olfactory interference with other visitors' enjoyment. The following measures have been used successfully elsewhere to improve the quality of public space for all and quality of life for homeless people:

- [Provide low-barrier showers](#)
- [Provide spacious lockers for people to store their belongings](#)
- [Provide a secluded social space for street-involved people to use and co-manage](#)

Creating a more attractive and vibrant waterfront will ameliorate the social discomfort some people feel in the area. When a wider variety of people are attracted to a place in greater numbers, then visitors feel less threatened by the street-involved population.

Opportunities for future research

Cities are beginning to take an evidence-based approach to improving health and wellbeing through design and planning practices. The *Shore to Core* experiment revealed that restorative environment theory can be applied to guide designs that both engage people and boost social wellbeing. Further testing and experimentation can help cities measure the success of new design interventions and identify new strategies for nurturing vibrant, safe, resilient and thriving downtowns, while boosting health and happiness of residents or visitors.

We recommend pursuing further research in the following research areas. Each theme question is accompanied by testing program options. These may be used as parts of a longer-term wellbeing research framework, either on their own or along with temporary tactical interventions.

1. How do spaces influence people's wellbeing?

As we demonstrated in *Happier by Design*, small changes in place design can have a strong impact on subjective wellbeing, belonging, place attachment and social trust. These emotions matter in their own right. But they also matter for anyone concerned about community resilience. People spend more in places to which they feel attached. People are more likely to linger and return to places that make them feel happy. Program options:

- **Survey City:** Direct surveys that capture subjective and objective measures of wellbeing and correlate these findings with perceptions of place belonging and social trust.
- **Quantified Self:** Use human sensors/smartphones to gather data on health, happiness, mobility, and use of city spaces, and share results in real time so residents understand how these spaces impact their own wellbeing.
- **Your City, Your Lab:** A program of education and knowledge transfer to empower local experts and the general public to undertake and interpret their own research on place effects on wellbeing.

2. How do people move and behave?

The speed at which people travel, the mode they use, and the degree to which they linger in city spaces all have a direct impact on retail success, street life, safety and social capital. Program option:

- **Observational research on human movement + behavior:** This method could be used to measure behavioral effects of pedestrian infrastructure changes and the addition of social magnets such as kiosks or art in key public spaces. (Gehl Architects and Street Plans Collaborative have begun this work downtown.)

3. How do changes in urban systems and form expand or contract opportunities for pedestrians?

Within the geometry of local roads, pathways, buildings and viewscapes exists a system that determines how and where pedestrians are likely to move. Program option:

- **Space Systems Analysis:** Use space and visual field analysis of local networks to help West Palm Beach direct infrastructure improvements and development that boosts pedestrian activity and local vitality. Combine this with opportunities analysis to ensure new development continues to draw pedestrian traffic.

The *Shore to Core* pilot program offered a taste of a research and evidence-based approach to urban design. We encourage policy makers and city-builders to continue measuring the links between design and wellbeing in order to nurture health, happiness, inclusion, and resilience.



Students from Dreyfoos School of the Arts and City of West Palm Beach use the Street Plans tactical urbanism approach at South Tamarind Avenue and Fern Street in West Palm Beach. Sherryl Muriente image.

Limitations

As the team chose to take an innovative approach to research, there were inevitable limitations to this study. The section below identifies these limitations to inform further research.

Weather

During the three days of the experiments, the site experienced no rain and temperatures were relatively consistent, 73 degrees and sunny. There was a storm on the night before Day 1, which may have caused a drop in attendees on Day 1. Having a larger sample size would have improved the statistical power of this experiment.

Small sample size

The major limitation for statistical analysis was the limited sample size of 23 people. This low number meant the team could not investigate demographic differences by age, gender, ethnicity, etc. The small sample size was due in part to the fact that we conducted tests on weekdays, when it was more difficult for students and employed people to participate. We did this to avoid the Saturday market near the on West Palm Beach waterfront, and also to avoid the weekend of the United States presidential inauguration, which we believed might influence the mood of participants. Another factor was our requirement that participants conduct walks on two separate days to experience the test site in both its control and intervention state.

Also, the low pedestrian and cyclist flow on the waterfront causes uncertainty. The standard methodology for counting pedestrians measures flow for 10 minutes every hour. However, when the pedestrian/cyclist flow is low, it increases statistical uncertainty. Future experiments on low traffic areas need to count for longer intervals than 10 minutes to avoid this uncertainty. Unfortunately, this was not logistically feasible for this experiment.

Timing

Work of this nature is usually conducted over several months, but our team had to design and implement the pilot study in three months. More time would have allowed for a more thorough analysis beforehand, along with larger sample sizes.

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33. A note about order effects: We did not find evidence of order effects on either the subjective mood scales or place variables. Therefore, we analysed and present the data as one total group.
34. Gehl and Svarre, 2013; Montgomery, 2013

[Click on reference to go back to previous page](#)

Appendix A: Testing methodology + timeline

Group A testing experience



Group A

7 participants
Organized in two subgroups

Day 1

Group A was tested on control site

Day 2

Group A was tested on the same site after the physical intervention was implemented.

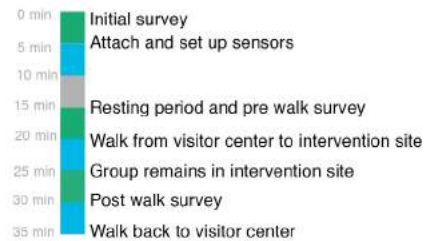
Size of subgroups in tests:

Group A was tested in two different subgroups: A1 and A2. A1 had 4 participants and A2 had 3 participants. Subgroup A1 was tested first, followed by subgroup A2, both on Day 1 (control). These tests were repeated the same times of day on Day 2 (intervention) with the same participants.

Type of tests administered:

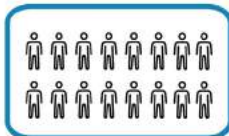
Physiological test
Subjective assessment survey

On both Day 1 and Day 2, Group A conducted a test that took approximately 45 minutes.



Each subgroup will be given 1.5 hours to complete testing in order to provide adequate time for groups to arrive and exit the site.

Group B testing experience



Group B

16 participants
Organized in two subgroups

Day 2

Group B was tested on the site after the tactical intervention.

Day 3

Group B was tested on the control site, without the tactical intervention.

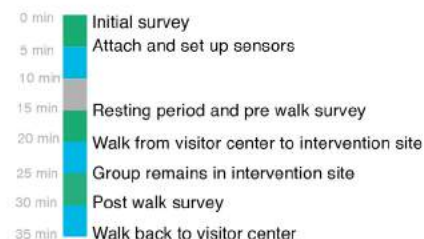
Type of tests administered:

Physiological test
Subjective assessment survey

Size of subgroups in tests:

Group B was tested in two different subgroups: B1 and B2. B1 had 7 participants and B2 had 9 participants. Subgroup B1 was tested first, followed by subgroup B2, both on Day 2 (intervention). These tests were repeated the same times of day on Day 3 (control) with the same participants.

On both Day 2 and Day 3, Group A conducted a test that took approximately 45 minutes.



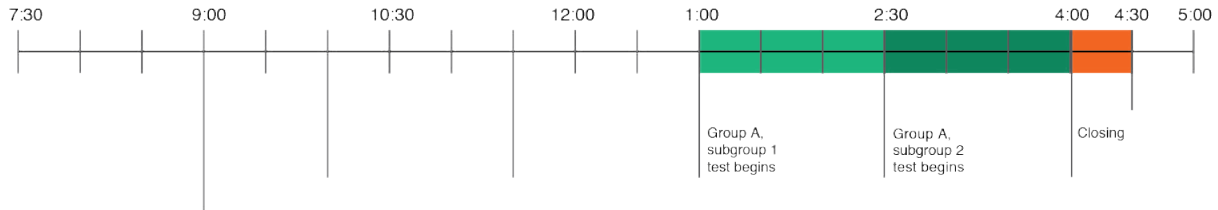
Each subgroup will be given 1.5 hours to complete testing in order to provide adequate time for groups to arrive and exit the site.

Testing timeline

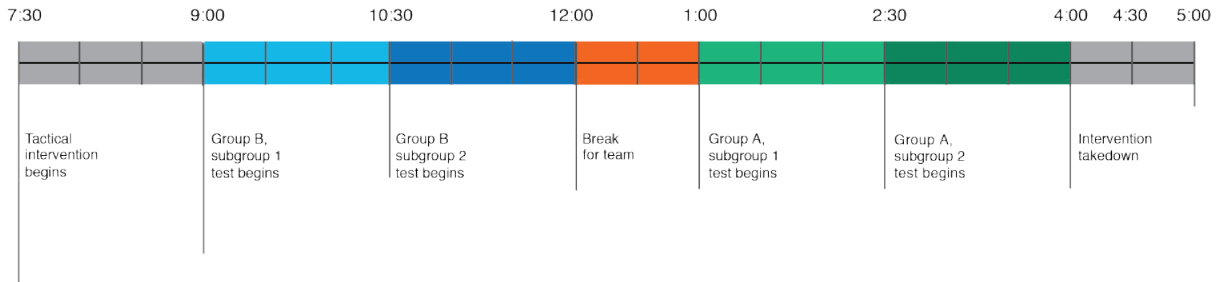
Testing on days 1, 2 and 3 proceeded according to the timeline below. Note that there was a buffer between each testing subgroup to accommodate any unforeseen circumstances of delay.

The testing over three days followed this timeline:

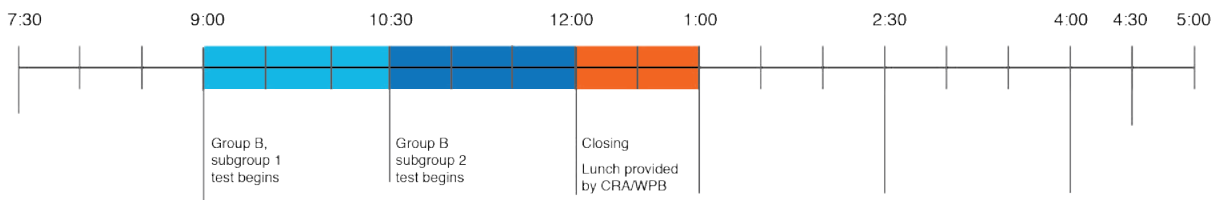
Day 1



Day 2



Day 3



After the testing was completed, the team conducted informal interviews with the participants to better understand their reactions to the tactical intervention and dissect their likes and dislikes pertaining to the site. The results of these interviews have been integrated in the recommendations section below.

Appendix B: Background on the Shore to Core Competition

The city of West Palm Beach collaborated with the Van Alen Institute to launch the *Shore to Core* competition to inspire innovation in design in the area. For its research stream, the competition invited research teams to develop a framework for studying how physical transformations may affect the wellbeing of West Palm Beach residents. The Happier by Design team, comprised of Happy City, the University of Virginia, StreetPlans Collaborative and Space Syntax, won this research competition.

The *Shore to Core* competition challenged the research team to:

- Develop a research methodology to advance the understanding of how the built environment affects individuals' wellbeing in areas such as physical health, mental health, and/or social capital
- Conduct a pilot study in the study area outlined in the *Shore to Core* RFQ that can collect data to inform future research
- Outline a set of metrics and methodology for collecting, analyzing, and interpreting data
- Develop a methodology that collects physiological, subjective, and observational data

Appendix C: SPSS subjective wellbeing results

Table 1. Demographics

Variable

Age	25–34 43.5%	35–44 30.4%	45–54 17.4%	55–64 4.3%	65+ 4.3%	
Gender	Male 47.8%	Female 52.2%				
Race	Black 8.7%	White 60.9%	Hispanic, White 21.7%	Hispanic, Black 8.7%		
Subjective Income	Living comfortably 56.5%	Coping 21.7%	Finding it difficult 17.4%	Finding it very difficult 0%	Don't know 4.3%	
Work Status	In paid work 87%	In education 0%	Unemployed & actively looking 4.3%	Retired 4.3%	At home caring for children or others 4.3%	
Education	High school diploma or GED 8.7%	Some college, but no degree 8.7%	Associates Degree 13%	Bachelor's Degree 26.1%	Master's Degree 34.8%	Professional/ Doctorate Degree 8.6%
Marital Status	Single 26.1%	Married 52.2%	Civil partnership 13%	Cohabiting 13%	Divorced/ separated 8.7%	
Child under 16	%Yes 39.7%	%No 60.3%				
Time in neighborhood: Mean (SD) in years	6.671 (6.12)					
Visited location before?	Yes, several times a week 47.8%	Yes, several times a month 34.8%	Yes, several times a year 8.7%	Not in past year 8.7%		

Table 2. Place Variables

Note: a lower mean figure indicates a more positive outcome.

Variables	Control: Mean (SD)	Intervention: Mean (SD)	Wilcoxon Signed Rank Test
Place Belonging	3.83 (1.23)	4.74 (0.689)	p>0.05*
Social trust (lost wallet)	2.17 (0.834)	3.00 (1.087)	p>0.01**
Place welcoming	3.87 (0.869)	4.83 (0.491)	p>0.001***
Place safety	3.87 (0.757)	4.52 (0.593)	p>0.01**
Place attractiveness	4.26 (0.915)	4.78 (0.422)	p>0.01**
Place recommendation	4.13 (1.014)	4.96 (0.209)	p>0.001***
Perceived restorativeness: Fascination	3.57 (1.037)	4.43 (0.59)	p>0.001***
Perceived restorativeness: Being away	3.91 (0.949)	4.61 (0.583)	p>0.01**

Table 3. Subjective Wellbeing (SWB)

Note: an increase in arousal/hedonic tone indicates a positive wellbeing outcome; a decrease in stress denotes a positive wellbeing outcome.

This test shows participants' pre-walk scores did not differ from the control to the intervention days, i.e., they were constant at baseline over two days of measurement.

Variables	Control: Mean (SD)	Intervention: Mean (SD)	Wilcoxon* Signed Rank Tests
Arousal, pre-walk	11.52 (2.108)	12.22 (2.812)	0.187
Hedonic tone, pre-walk	14.13 (1.792)	14.52 (1.275)	0.213
Stress, pre-walk	6.22 (2.392)	6.52 (2.333)	0.653

Table 4. Subjective Wellbeing (SWB) Change Variables

Arousal, pre-walk minus post-walk	.13 (1.842)	-.83 (2.037)
Hedonic tone, pre-walk minus post-walk	.00 (1.758)	-.78 (1.166)
Stress, pre-walk minus post-walk	-.52 (2.064)	.74 (1.711)

Note: Change data denotes rate of change from the pre-walk mean to the post-walk mean; a negative value for arousal and hedonic tone means a positive change; a positive value on stress denotes a positive change.

*Wilcoxon is a non-parametric means test which was used here to test repeat measurement on a single sample to assess whether the means differ post walk in the intervention vs. control sites; it is a paired difference test.

Table 4. Repeated Measures ANOVA¹ for Changes in Mood Scales

Variable	Value	F-Statistic	DF	Partial Eta Squared**	P-Value
Arousal, pre-walk minus post-walk	0.888	2.773	22	0.112	0.110
Hedonic tone, pre-walk minus post-walk	0.885	2.872	22	0.115	0.104
Stress, pre-walk minus post-walk	0.789	5.896	22	0.211	0.024 *

**Effect size is a measure of the magnitude, or size, of an effect; it shows the scale of difference between the effect of the two settings on emotional wellness.

According to Cohn, Small effect = 0.01; Medium= 0.059; Large= 0.138, so we see large effect size here, but it is a tiny sample.

¹ The analysis of variance (ANOVA) test was used to determine whether there are any statistically significant differences between the change data for control vs intervention. The distribution of the data met the requirement for skewness and kurtosis (a measure of the distribution of the data). We are reporting a one-way ANOVA factoring 'setting' i.e. control vs intervention setting.

Appendix D: Surveys

This survey is part of a study for West Palm Beach Development Agency that is exploring the relationship between the waterfront and wellbeing.

The information we collect will be used to shape a design project addressing the waterfront. The information will also inform the planning of downtown WPB and what kinds of places support people's wellbeing.

Thank you for your willingness to participate.

All your answers are anonymous and your identity will be kept secret, the data being used solely for the present study.

Shore to Core Survey 1

Name _____

Participant ID No _____

Part 1: YOURSELF (Please tick or complete the response where indicated)

1. Age

- 16 - 24
- 25 - 34
- 35 - 44
- 45 - 54
- 55 - 64
- 65+

2. Gender

- Male
- Female
- Choose not to identify

3. Race/Ethnicity

<p>3a. Are you Hispanic or Latino?</p> <p><input type="checkbox"/> Yes</p> <p><input type="checkbox"/> No</p>	<p>3c. What is your racial background? (select all that apply)</p> <p><input type="checkbox"/> American Indian or Alaska Native</p> <p><input type="checkbox"/> Native Hawaiian or Other Pacific Islander</p> <p><input type="checkbox"/> Asian</p> <p><input type="checkbox"/> Black or African American</p> <p><input type="checkbox"/> White</p> <p><input type="checkbox"/> Other: please specify</p> <hr/>
<p>3b. [If 'yes' to above] Which of the following best describes your Hispanic origin or descent?</p> <p><input type="checkbox"/> Mexican American or Chicano</p> <p><input type="checkbox"/> Puerto Rican Cuban</p> <p><input type="checkbox"/> Other Hispanic: please specify</p> <hr/>	

Part 2: The next series of questions ask you about your mood right now: The best approach is to **answer each question fairly quickly**. Please tick the response that most accurately captures your feelings **right now**.

	Definitely	Slightly	Not Much	Definitely Not
Active				
Contented				
Edgy				
Energetic				
Happy				
Nervous				
Calm				
Sluggish				
Sad				
Relaxed				
Sorry/Regretful				
Passive				

**THANK YOU, PLEASE RETURN THIS SURVEY TO THE RESEARCHER
AND COMMENCE YOUR WALK AS DIRECTED**

Shore to Core Survey 2

Name _____

Participant ID No _____

1. Please answer these questions again about your mood **right now**. The best approach is to **answer each question fairly quickly**. Please tick the response that most accurately captures your feelings **right now**.

	Definitely	Slightly	Not Much	Definitely Not
Active				
Contented				
Edgy				
Energetic				
Happy				
Nervous				
Calm				
Sluggish				
Sad				
Relaxed				
Sorry/Regretful				
Passive				

**Please answer the following questions about your feelings about this place.
It's best to not think too carefully about the answer, and just give your
immediate response**

2. How strongly do you feel you belong to this place?

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

**3. If you lost a wallet with \$100 in it, how likely do you think your wallet
would be returned in this place?**

- Very likely
- Likely
- Neither likely nor unlikely
- Unlikely
- Highly unlikely

4. How strongly do you feel welcomed in this place?

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

5. How safe do you feel using this place?

- Very safe
- Safe
- Neither safe nor unsafe
- Unsafe
- Very unsafe

6. How attractive and pleasant is this place?

- Very pleasant
- Pleasant
- Neither pleasant nor unpleasant
- Unpleasant
- Very pleasant

7. Would you advise a friend or relative to use this place?

- Yes, definitely
- Yes, maybe
- Neither/nor
- No, not much
- No, definitely not

8. There is much to explore and discover in this place

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

9. This is a place to get away from things that usually demand my attention

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

11. Have you visited this space before?

- Yes frequently, several times a week
- Yes sometimes, several times a month
- Not very often, several times a year
- Not at all in the last year

Finally, please tell us a little more about yourself

12. Which of the following descriptions comes closest to how you feel about your household's income at present?

- Living comfortably on present income
- Coping on present income
- Finding it difficult on present income
- Finding it very difficult on present income
- I don't know / prefer not to answer

13. Which of these descriptions best relates to your work situation (in the last seven days)?

- In paid work (or away temporarily) (employee, self-employed, working for your family business)
- In education, (not paid for by employer) even if on vacation
- Unemployed and actively looking for a job
- Unemployed, wanting a job but not actively looking for a job
- Permanently sick or disabled
- Retired
- In community or military service
- At home caring for children or other persons
- Other, please specify: _____

21. What is the highest degree or level of school you have completed?

- Less than high school diploma
- High school diploma or GED
- Some college, but no degree
- Associates Degree (for example: AA, AS)
- Bachelor's Degree (for example: BA, BBA and BS)
- Master's Degree (for example: MA, MS and MEng)
- Professional Degree (for example: MD, DDS, JD)
- Doctorate (for example: PhD, EdD)

22. What is your marital status?

- Single
- Married
- Civil partnership
- Cohabiting/Living as married
- Divorced/separated
- Widowed

23. Are you a registered disabled person?

- Yes
- No

24. Do you have young children under the age of 16 living in your household?

- Yes
- No

25: Zip code _____

26. Length of time in this neighborhood _____ **years**

Shore to Core Survey 3

Name _____

Participant ID No _____

Please tell us about how you're feeling **right now**. The best approach is to **answer each question fairly quickly**. Please tick the response that most accurately captures your feelings **right now**.

	Definitely	Slightly	Not Much	Definitely Not
Active				
Contented				
Edgy				
Energetic				
Happy				
Nervous				
Calm				
Sluggish				
Sad				
Relaxed				
Sorry/Regretful				
Passive				

**THANK YOU, PLEASE RETURN THIS SURVEY TO THE RESEARCHER
AND COMMENCE YOUR WALK AS DIRECTED**

Shore to Core Survey 4

Name _____

Participant ID No _____

1. Please answer these questions again about your mood **right now**: The best approach is to **answer each question fairly quickly**. Please tick the response that most accurately captures your feelings **right now**.

	Definitely	Slightly	Not Much	Definitely Not
Active				
Contented				
Edgy				
Energetic				
Happy				
Nervous				
Calm				
Sluggish				
Sad				
Relaxed				
Sorry/Regretful				
Passive				

**Please answer the following questions about your feelings about this place.
It's best to not think too carefully about the answer, and just give your
immediate response**

2. How strongly do you feel you belong to this place?

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

**3. If you lost a wallet with \$100 in it, how likely do you think your wallet
would be returned in this place?**

- Very likely
- Likely
- Neither likely nor unlikely
- Unlikely
- Highly unlikely

4. How strongly do you feel welcomed in this place?

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

5. How safe do you feel using this place?

- Very safe
- Safe
- Neither safe nor unsafe
- Unsafe
- Very unsafe

6. How attractive and pleasant is this place?

- Very pleasant
- Pleasant
- Neither pleasant nor unpleasant
- Unpleasant
- Very pleasant

7. Would you advise a friend or relative to use this place?

- Yes, definitely
- Yes, maybe
- Neither/nor
- No, not much
- No, definitely not

8. There is much to explore and discover in this place

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

9. This is a place to get away from things that usually demand my attention

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree