

Accessibility of Urban Greenspace and Its Impact on Health

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Abstract

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As the world becomes increasingly urbanized, there is a growing need to better understand the role nature plays in our well-being. A review of the current literature suggests a myriad of potential health benefits can arise from nature contact including reduced stress, increased life-satisfaction, reduced obesity, and greater social connectedness, to name a few. With the evidence continuing to mount, cities and organizations are increasingly looking for ways to improve access to natural spaces for urban residents. In order to help guide this process, I conducted three studies assessing the health benefits of urban greenspace and its accessibility in the Pacific Northwest.

The first study is a health assessment of an urban greening project conducted for the City of Bellevue. Working alongside city officials, I designed and implemented a neighborhood survey to identify what benefits arose in the community as a result of the greening project. I found that the project not only made the area feel safer for a majority of residents, but also increased the walkability of the neighborhood and helped to foster a greater sense of community.

To determine whether these benefits were distributed equally throughout the neighborhood, I conducted a secondary analysis looking at residents' proximity to the project site, age, and gender. While proximity to the site had no effect on perceived benefit of the project, my analysis found that females felt the neighborhood was now safer as a result of the project compared to males, and that residents aged 18-44 felt the project resulted in a greater sense of community than older residents. These findings have been compiled into a report for the City of Bellevue and will serve to help guide future neighborhood assessments moving forward.

The second study is a qualitative investigation conducted for Seattle Parks and Recreation to better understand what barriers are preventing residents of Seattle from spending more time in city-managed natural spaces. Through interviews with community leaders, I identified a wide range of barriers and concerns which can be categorized into four main themes: physical access, safety, political process, and engagement. At the request of city officials, I also crafted a number of community-driven recommendations as to how best overcome these barriers. These findings have been drafted into a report and shared with Seattle Parks and Recreation to aid their strategic planning moving forward. This report was also made available to each of the community partners with whom I spoke.

The final study is an experiment investigating what benefits arise from nature contact in children diagnosed with Attention-deficit/Hyperactivity Disorder or Autism Spectrum Disorder. In partnership with the University of Washington Autism Center, I evaluated children's psychological well-being and feelings towards nature after spending time in both natural and non-natural environments over the course of four weeks. By utilizing a cross-over design, each participant was able to experience each of our environmental treatments over the course of the study. The analysis utilized a multi-level model, however it failed to identify significant

differences across any of our environmental treatments. This study had a number of important limitations that may have influenced our findings which are discussed in detail in the paper. Moving forward, it is my recommendation that future researchers replicate this study within a more controlled experimental design.

This body of work contributes to the nature and health literature by providing some of the first community specific case-studies assessing nature contact and health in this region. Each of these studies benefited greatly from individuals and organizations that I worked alongside and showcase the potential for strong partnerships available in the Pacific Northwest around nature contact and health. It is my hope that the methods and results of these studies will guide both urban planning decisions and additional research moving forward.

Table of Contents

| | |
|--|----|
| Chapter 1: Health Assessment of a Neighborhood Enhancement Project..... | 1 |
| Chapter 2: Equitable Access to Park Space..... | 36 |
| Chapter 3: A Randomized Cross-over Study Assessing the Impact of Environment on Affect and Connectedness to Nature in Children with Attention-Deficit/Hyperactivity Disorder (ADHD) and Autism Spectrum Disorder (ASD)..... | 61 |

I. How is nature contact associated with specific outcomes of public health importance?

Health Assessment of a Neighborhood Enhancement Project, in Eastgate, Bellevue, Washington, 2019

Table of Contents

Executive Summary.....1
Introduction.....3
Methods.....7
Findings.....13
Recommendations.....21
Conclusion.....23
References.....25
Appendix.....27

EXECUTIVE SUMMARY

Younger residents experienced greater improvements in their sense of community as a direct result of the street-scaping work.

This Livable City Year (LCY) project assessed the community and individual-level health benefits that arose from a recent streetscape installation in Bellevue's Eastgate neighborhood. The streetscape installation at SE 38th Street was funded by the City's Neighborhood Enhancement Program and was voted in by residents in 2016. Over the past several years, the Community Development Department has worked alongside Parks & Community Services to revitalize a one-block stretch along SE 38th Street by removing invasive weeds and replacing them with enhanced landscaping, cleaning up trash, and extending the sidewalk. We engaged neighborhood residents and consulted the scientific literature to design a survey that would assess the health impacts of the streetscape enhancement. We investigated the work's impact on walkability, safety, happiness, sense of community, and trust for nearby residents. Surveys were distributed by mail and on-line to 262 Eastgate residents in May 2019.

We found that a majority of respondents felt the streetscape enhancement improved the walkability and safety of the neighborhood, making the project site more pleasant to pass by. Additionally, we explored whether the perceived benefits of the project were distributed equally among residents by testing for differences in responses based on proximity to the streetscape enhancement, gender, age, whether someone walks by the project site or not, and how long someone has lived in the community. We found that women reported feeling safer and that younger residents experienced greater improvements in their sense of community as a direct result of the streetscape enhancement.

This project fills a much-needed knowledge gap for the City in that it provides the first-ever assessment of a Neighborhood Enhancement Program project. It is also the most comprehensive assessment of resident response to an enhanced right of way planting for the City. We hope this work will enable Bellevue to strengthen both the Neighborhood Enhancement Program and the Street Tree and Arterial Landscape Program by demonstrating the benefits that can arise from their work. Moving forward, this LCY project is meant to serve as an assessment template for future enhancement projects in Bellevue.



Nancy Evans' Rhododendrons have orange-red flower buds and is featured in the City's Neighborhood Enhancement Project on SE 38th Street in Bellevue.
BERNARD SPRAGG

INTRODUCTION

This project helps fill a much-needed information gap for the City by creating the methodology needed to evaluate individual projects.

It is well understood that a neighborhood's design and condition have important implications for the health of its residents. In light of this, many cities are increasingly providing initiatives that allow residents to have a say in how their neighborhood looks and feels. The City of Bellevue's Neighborhood Enhancement Program (NEP) is one such initiative, whereby residents can propose and vote for improvement projects in their neighborhood. To be eligible, a project must benefit the general public, be on public property, be consistent with City plans, and be maintainable by the City. Since 2015, Bellevue has completed six NEP projects, and the City has invested more than \$392,000 into the program.

While Bellevue routinely asks residents for feedback on the overall NEP process, the City has never once assessed a specific project upon completion. This is a noticeable data gap, as the City has no system in place to determine whether a NEP project is viewed as successful or if it meets residents' expectations. This Livable City Year (LCY) project closes this knowledge gap by conducting the first ever evaluation of a NEP project, thereby providing a template to conduct effective assessments moving forward.

BACKGROUND

The NEP project studied in this Livable City Year project was voted in by Eastgate residents in 2016. Out of the 26 projects on the ballot, this project received the second most votes from residents. The project site is in the city-owned right of way (ROW) on the south side of SE 38th Street in the city's Eastgate neighborhood. Until it was annexed by the City of Bellevue in 2012, Eastgate was a part of unincorporated King County and did not receive the kind of enhanced ROW vegetation maintenance services that the City provides.

Two departments, Community Development (which houses the Neighborhood Enhancement Program) and Parks & Community Service (specifically the Street Tree and Arterial Landscape workgroup [STAL]) worked together to bring this project to life. NEP covered the initial construction and worked alongside STAL to design the new plantings, source plants, and direction construction. After construction, it was decided that STAL would oversee maintenance of the site as a City ROW.

This Neighborhood Enhancement Program improved the site by removing trash and debris, clearing invasive weeds, improving retention of the steep slope, extending the sidewalk, and planting attractive ROW



Aerial view of Eastgate neighborhood GOOGLE EARTH PRO

landscaping. As a result, this once dilapidated and run-down block that was a common location for long-term street parking and trash dumping has become a pleasant and refreshing area through which to walk. As one of two entrances to a neighborhood cul-de-sac with more than 260 homes, SE 38th Street experiences a lot of passersby on a daily basis. The high visibility of the project and its recent completion work made it a strong candidate for the first NEP project assessment.

This project builds upon previous research focused at the intersection of urban planning and public health. As mentioned previously, a neighborhood's design can have important implications for its residents' psychological health (Lawton 1997). Similarly, the condition of the neighborhood — how well-kept it is, the amount of debris and trash — has been shown to impact perceived safety for nearby residents (Pitner et al. 2012). To better understand how the characteristics of neighborhoods impact community and individual-level health indicators, many cities and neighborhood associations routinely survey residents to identify areas that could be targeted to improve quality of life. These surveys tend to ask questions related to the residents' overall satisfaction of living there, walkability, safety, and amenities (City of Fort Worth 2017, City of Redwood City 2015).

Although Bellevue conducts an annual city-wide survey that provides a snapshot of neighborhood conditions, the City does not have any protocol in place to assess the change in neighborhood conditions as a result of specific projects. Hence, this project helps fill a much-needed information gap for the City by creating the methodology needed to evaluate individual projects.



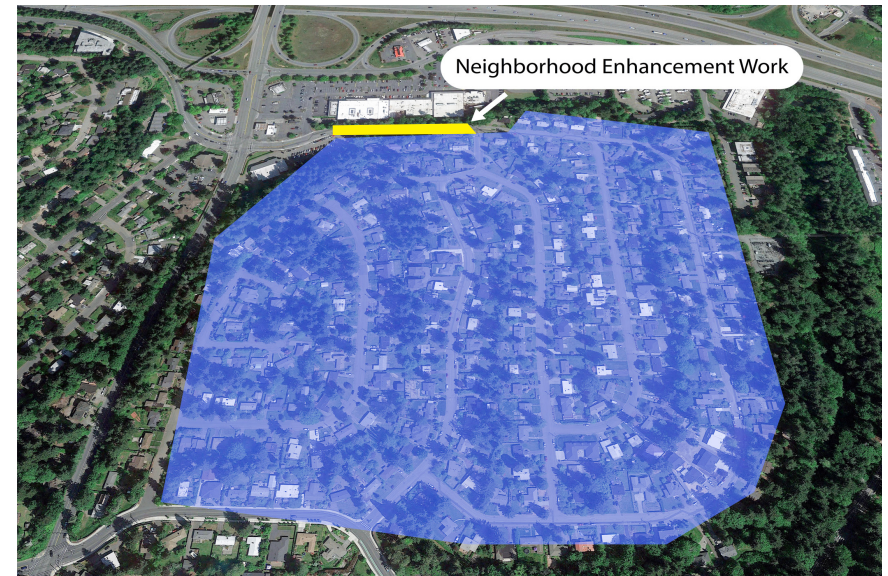
Viburnum plicatum 'Mariesii' is known for its bright white flowers and is featured in the City's Neighborhood Enhancement Project on SE 38th Street in Bellevue. WOUTER HAGENS

METHODS

We determined that the best way to assess the impact of this project was to survey Eastgate residents. However, given budget restraints and the limited scope of the streetscape installation, we thought it impractical to survey the entire community. To determine the geographic area for our survey distribution, we met with residents who lived near the project area and asked them to help identify which homes would most likely have been impacted.

From here, the next step was to design a survey that accurately identified and quantified what benefits may have arisen from the project work. To accomplish this, our team consulted urban planning case studies and other cities' neighborhood surveys to see what types of outcomes were commonly assessed for similar projects. We also sat down with City staff who manage the NEP and oversee streetscape maintenance to determine what specific information would be most useful for the City to have. We used this feedback to craft a set of questions specific to the work on SE 38th Street. The survey's flow, wording, and structure were all formatted according to best practices in survey design research (Dillman 2014). By avoiding ambiguous wording and keeping the survey short and visually appealing, we hoped to maximize our response rate. Before distributing the survey, we piloted it both with residents of the neighborhood and with graduate students in a survey design course at the University of Washington.

Because we were primarily interested in residents' attitudes following the streetscape installation, we included Before and After photos in our survey to help respondents compare the two time-points. This helped us attribute neighborhood characteristics such as safety or walkability to the project site as opposed to other changes that took place in the neighborhood over the past several years.



Survey distribution area in blue. Street-scaping work shown in yellow. GOOGLE EARTH PRO

RIGHT OF WAY BEFORE IMPROVEMENT



View along SE 38th Street prior to the streetscape enhancement. CITY OF BELLEVUE

RECENTLY PLANTED STREETScape



View along SE 38th Street after the streetscape enhancement. RICK THOMAS

PRIMARY OUTCOMES ASSESSED IN NEIGHBORHOOD SURVEY

| Variable Name | Variable Description |
|------------------|--|
| Walkability | Respondents report whether they are more likely to walk or bike by the project site and if they are more comfortable walking around their neighborhood |
| Perceived Safety | Respondents report on neighborhood safety and whether they feel comfortable having their child walk alone in the neighborhood |
| Trust | Respondents report on their level of trust of people they see in the neighborhood |
| Quality of Life | Respondents report on whether their neighborhood has become a more pleasant place and if there is a greater sense of community |
| Happiness | Respondents report on their feelings of happiness passing by the improved streetscape |
| Stress | Respondents report on their feelings of stress passing by the improved streetscape |

RICK THOMAS



Livable City Year student Rick Thomas discussing the survey with an Eastgate resident.. SUSANNA CHUNG

Our six primary outcomes of interest are shown in the table. We asked all residents to indicate the extent of positive impact of the Neighborhood Enhancement Project using a 5-point Likert Scale ranging from Strongly Disagree to Strongly Agree. We also asked residents to self-report demographic data.

We obtained a list of addresses for all homes within our survey distribution area from the City and distributed the surveys during Week 6 of Spring quarter. We distributed the survey both online and through the mail, to accommodate the heterogenous nature of the neighborhood. In total, we sent out 262 surveys. Respondents had two weeks to fill out the survey and were sent a reminder postcard one week following survey distribution.

Although we decided it was necessary to geographically constrain our survey distribution, we recognized that we might be failing to solicit responses from other Eastgate residents who had been affected by the streetscape enhancement. To address this possibility, we posted a number of signs along SE 38th Street with a QR code and website link that residents could use to complete the survey if they were interested. A member of our team also attended the kick-off event for the newly-formed Eastgate Community Association, which provided an additional opportunity to survey residents outside of our distribution area.

This Livable City Year project is the first-ever evaluation of a NEP project, and provides a template to conduct effective assessments moving forward.



Yard signs such as the one shown were placed at two locations along SE 38th Street at the NEP project site. Passersby had the opportunity to scan a QR code or visit a website to complete the survey. RICK THOMAS

FINDINGS

SURVEY RESPONSE

A total of 73 surveys were returned, eight of which came from outside of our distribution area. This equates to a 22% response rate. As can be seen in the table below, the majority of responses came by mail.

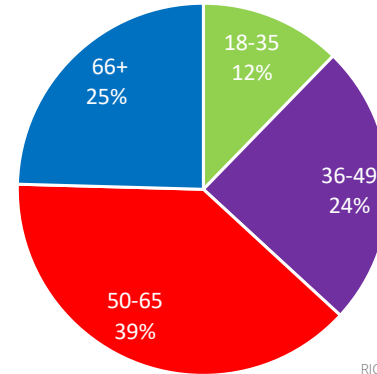
Survey responses reflect a wide age distribution in the neighborhood with a median (x) and mean (y). Conversations with neighborhood residents suggested that the community is made up of many older (or something like 50+/55+ members).

To get a sense of how often and in what manner respondents experienced the project area, we asked them how many times they walk, bike, and drive past the enhanced landscape on SE 38th Street in an average week. We found that the majority of residents reported driving past the project area more than walking or biking.

SURVEY RESPONSE

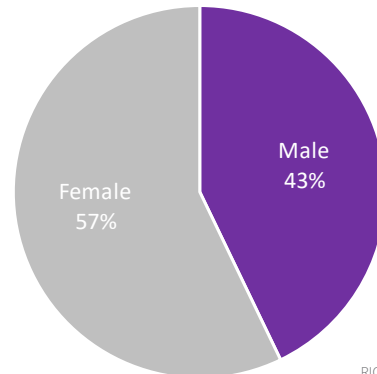
| Mode of Survey Return | Number of Surveys Returned | Percentage of Responses |
|-----------------------|----------------------------|-------------------------|
| Mail-in | 45 | 62% |
| Online | 12 | 16% |
| In Person | 16 | 22% |
| Total | 73 | 100% |

AGE OF SURVEY RESPONDENTS (N=73)



RICK THOMAS

GENDER DISTRIBUTION OF SURVEY RESPONDENTS (N=73)



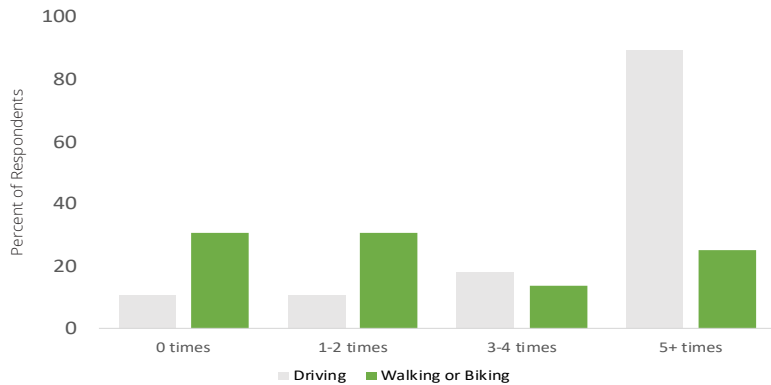
RICK THOMAS

REPORTED HEALTH OUTCOMES

Our survey suggests that a majority of the neighborhood's residents perceive numerous benefits as a result of the enhanced streetscape.

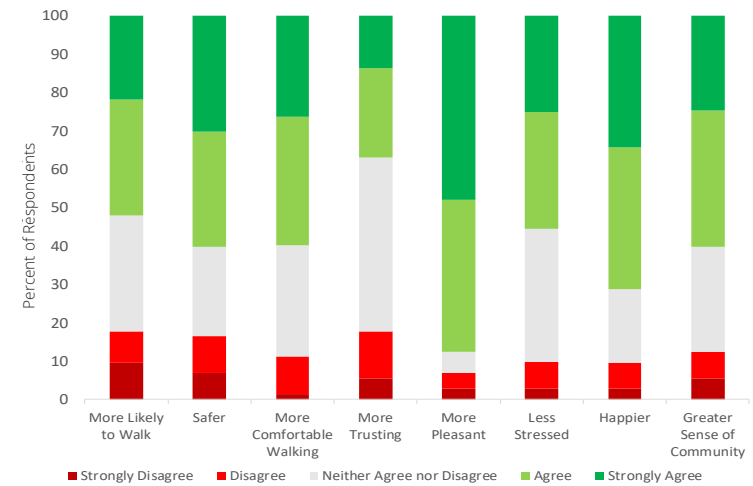
More than half (52%) of survey respondents report they are now more likely to walk or bike to nearby destinations as a result of the streetscape enhancement. Roughly 60% of respondents report feeling that the neighborhood has gotten safer due to the work, and 71% report feeling happier when they pass by SE 38th Street. The most positive outcome is an impressive 88% of respondents reporting feeling that the street has become a more pleasant place to pass by. To help the City identify which aspects of the project contributed most to the health outcomes, we asked residents to select their top two influential factors, either from a list, or to write in their own response. The two features of the project that residents cited most often as the most valuable were the removal of RVs and other street parking, and the landscaping work that was done. It is important to point out that removing cars or restricting parking was not part of this NEP project. Nevertheless, we hypothesized that the owners of the vehicles might self-select away from SE 38th Street when they saw the investment the City was making there. Consequently, although parking was outside the scope of this NEP project, it is feasible that the enhanced landscaping improved the parking issue.

FREQUENCY AND MANNER OF EXPERIENCING THE PROJECT SITE



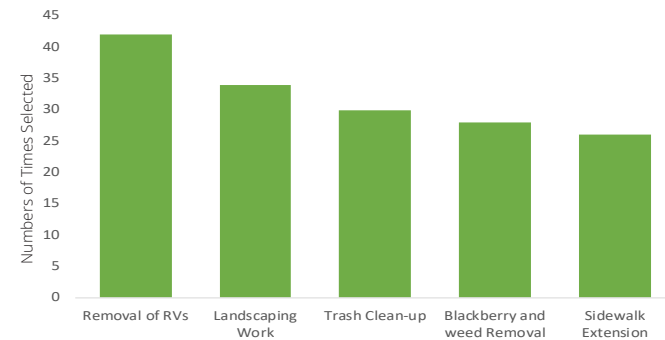
Respondents were asked how often they 1) walked or biked and 2) drove past the NEP project in an average week. RICK THOMAS

DISTRIBUTION OF RESPONSES ACROSS COMMUNITY AND HEALTH INDICATORS (N=73)



RICK THOMAS

MOST VALUABLE PERCEIVED OUTCOMES (N=73)



Respondents were asked to identify which two perceived outcomes of the NEP work they found most valuable. RICK THOMAS

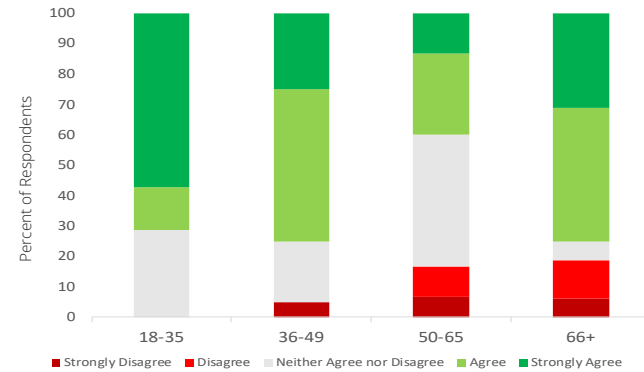
STATISTICAL ANALYSES

We were interested in whether the reported health outcomes were distributed equally throughout our survey population, or if certain subpopulations perceived greater or fewer benefits. Specifically, we were interested in how a resident's proximity to the project site, age, gender, length of residence in Eastgate, and frequency of walking past the site might impact the outcomes they reported. We summarize these research questions below:

1. **Proximity:** Do residents who live closer to the project site value the streetscape enhancement differently than those who live further away?
2. **Age:** Do older residents value the streetscape enhancement differently than younger residents?
3. **Walking:** Do residents who walk by the streetscape enhancement value the work differently than those who do not walk past?
4. **Gender:** Do women value the streetscape enhancement differently than men?
5. **Duration:** Do residents who have lived in the neighborhood for longer periods value the streetscape enhancement differently than those who have lived there for shorter periods?

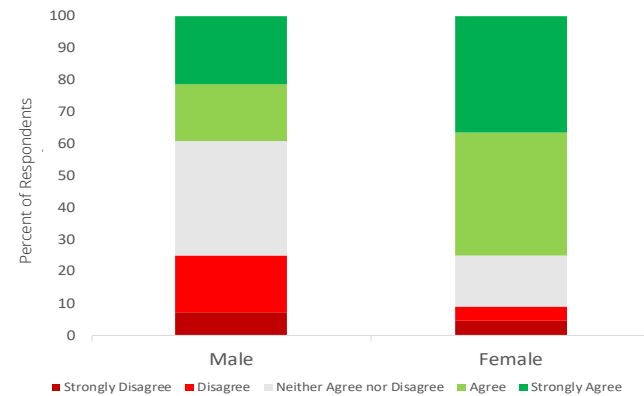
To answer these questions, we subdivided our survey results and performed a number of statistical tests to look for significant differences between our groups of interest. Across our five comparisons of interest, we found that gender and age were the only two to have a significant impact on reported health outcomes. Specifically, we found that women reported greater perceived safety than men, and that younger residents (18-49 years old) reported a greater sense of community as a result of the streetscape enhancement than individuals aged 50-65. For more information on our statistical methods, see Appendix A.

REPORTED GREATER SENSE OF COMMUNITY, BY AGE (N=73)



To what extent the streetscape enhancement led to a greater sense of community, subdivided by age of respondent. Statistical tests revealed that respondents aged 18-45 perceived a significantly greater increase in sense of community as compared to residents aged 50-65. RICK THOMAS

REPORTED IMPROVED PERCEIVED SAFETY, BY GENDER (N=73)



To what extent the streetscape enhancement improved perceived safety, subdivided by gender of respondent. Our statistical analysis revealed that women reported a significantly greater increase in perceived safety. RICK THOMAS

QUALITATIVE RESPONSES

POSITIVE

In addition to our health outcomes of interest, respondents had the opportunity to provide additional observations about the project area, both positive and negative. Responses were many and varied, though a few common themes emerged. Additional positive comments tended to focus on how the neighborhood feels more welcoming and was a long overdue and much needed neighborhood improvement. For example:

"It feels more like a neighborhood and less like a collection of homes."

"I'm so glad this NEP project won and got done. The area was such a blight, ugly, and frankly embarrassing for the neighborhood."

— Eastgate neighborhood residents

NEGATIVE

The three negative issues cited most frequently included:

1) The lingering presence of RVs and camper vans which made the area feel less safe and pleasant to pass by was the most commonly cited issue. As mentioned previously, removing cars or restricting parking was not part of the project. Contrary to our hypothesis that the project might self-select people away from parking in the project area, several respondents felt that the long-term parking issues had gotten worse since the NEP project began. Parking issues came up in other comments as well, with several residents complaining about what they perceived to be overflow parking of T-Mobile employees working in Factoria.

2) Several respondents reported safety concerns due to people driving too fast looking for parking within the neighborhood. As with the parking issues cited above, neighborhood safety was outside the scope of work of this NEP project. Nevertheless, this feedback provides an interesting insight into the neighborhood's concerns and perceptions of how the NEP project has affected their community.

3) Another issue that got brought up was the large tangle of weeds and vines adjoining the project site which left several residents feeling as if the project was incomplete.

A full list of all responses can be found in Appendix B.

LIMITATIONS

This neighborhood survey faced a number of limitations. First, the duration of our response window was shorter than survey researchers recommend. As a result, although our response rate was fairly high, we likely missed input from other residents. It is recommended to typically field a survey for a month with multiple reminders sent throughout. Given the LCY project timeline, residents were given only three weeks for the survey (they were originally given two, but we postponed our data analysis to allow for more responses to come in) and received a single reminder. The importance of the reminder postcard is evident in the spike of responses we received immediately after sending it out.

It is also important to acknowledge that although a diverse range of ages responded to the survey, without knowing the underlying demographics of the neighborhood, it is difficult to determine just how representative our results are. Because residents could choose whether to complete the survey or not, there is likely a response bias for people who were either strongly in favor or against the streetscape enhancement. As a result, although these results are powerful, we caution from generalizing the results to the greater Eastgate neighborhood.

**"It feels more like a neighborhood
and less like a collection of homes."**

— Eastgate neighborhood resident

RECOMMENDATIONS

We believe the results of the survey provide credible evidence that the streetscape enhancement on SE 38th Street has benefited the neighborhood across numerous dimensions. A couple of key themes emerged from the data that are worth highlighting here.

Neighborhood design has important implications for resident well-being. Our results support what other community surveys and studies have found in that small changes to a neighborhood can have significant impacts on nearby residents. This goes beyond mental health impacts, such as stress reduction and happiness, to include lifestyle changes, such as walking more often.

Benefits are disbursed throughout the neighborhood. The fact that our analysis reported no significant difference in health outcomes between residents who lived closer to the project site than further away suggests that the entire community is benefiting from the work.

People of all walks of life benefit from the project. Apart from a greater sense of community, we found no significant difference in health outcomes across different age groups, and no differences at all between new Eastgate residents and long-time residents. This gives credence to the idea that this work is largely a public good available to everyone in the neighborhood.

Involving community leaders can drastically improve results. Our team would not have had near as much success if it were not for the assistance of the recently formed Eastgate Community Association. A handful of residents were involved in almost every stage of this survey, from initial survey design, to spreading the word in order to boost response rate, to filling out the survey themselves. It is our recommendation that the City involve community leaders as much as possible in future neighborhood enhancement surveys, making clear to them how the results will directly benefit the community. This approach not only shares the burden of work with the community, but could result in improved quantity and quality of responses.

More work could be done. From our conversations with residents and from the open-ended responses provided, it is clear that many residents feel as if the work on SE 38th Street is just getting started. Finding ways to work with the property owners to remove the remaining undesirable vegetation could go a long way to improving community perception of the project. Many neighborhood residents are unhappy that encampments are still present as well.



LCY student researcher and author Rick Thomas presents his findings to City of Bellevue staff on June 13, 2019. TERI THOMSON RANDALL

CONCLUSION

This LCY project identified the community and individual health outcomes that arose from the City of Bellevue's streetscape enhancement on SE 38th Street. In doing so, this project has demonstrated that surveys to assess health outcomes are a valuable source of feedback for the Bellevue NEP program. This project has also created a template for future assessments. While the City will need to adapt some of the survey questions to fit other projects, many of the metrics we looked at are applicable to enhancement work in neighborhoods across the city. It is our hope that this project and the results generated will help inform future NEP projects and help the City of Bellevue make the case for the NEP overall.

Small changes to a neighborhood can have significant impacts on nearby residents. This goes beyond mental health impacts, such as stress reduction and happiness, to include lifestyle changes, such as walking more often.



*The plant *Cornus stolonifera* is known for its red hardwood and is featured in the City's Neighborhood Enhancement Project on SE 38th Street in Bellevue. LISA PARKER*

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APPENDICES

APPENDIX A: STATISTICAL METHODS

To determine if the health outcomes of interest were distributed equally across responses, we first had to subdivide our data into subpopulations. Below are our methods and rationale for this subdivision.

Proximity: We compared residents who lived within a quarter-mile walk of the project site (n=28) to those who lived further than a quarter-mile walk (n=18). We determined this by asking residents for their home address and then entering this data into Google Earth Pro and measuring the walking distance between the home and the closest edge of the project site. We chose this radius based on the layout of the neighborhood and to guarantee we had enough data points in both groups. Because none of our survey questions were mandatory, about half of respondents did not indicate their exact address, either leaving it blank or providing cross-streets, which lowered our sample size and strength of our analysis.

Age: We compared residents across all four of our age categories: 18-35, 36-49, 50-65, and 66+. These age options were chosen based on other community surveys we consulted.

Walking: We compared residents who reported walking or biking past the project site at least once per week (n=50) to those who reported never walking or biking past (n=22).

Duration: We asked residents to write in the number of years they have lived in the community. Using this information, we compared residents who had lived there less than 6 years (n=19), residents who had lived there 6-20 years (n=19), and residents who had lived there longer than 20 years (n=27). We chose these cutoffs to ensure we had sufficient data points in each category.

Gender: We asked residents to indicate their gender and then compared those who responded as female to those who responded as male.

All statistical tests were conducted in R Studio. Given that the survey data were not normally distributed for any of our health outcomes of interest, we relied on non-parametric tests to assess meaningful differences between comparison groups of interest. For inquiries that involved only two comparison groups — proximity, gender, and walking — we used the Mann-Whitney-Wilcoxon Test. When we were comparing more than two groups — e.g., age and duration spent in the community — we used the Kruskal-Wallis Test. If a significant result was found for this test, we conducted post-hoc Mann-Whitney-Wilcoxon Tests on each pair of comparison groups. We used a significant level of 0.05.

APPENDIX B: QUALITATIVE SURVEY RESPONSES

Below are the open-ended responses from the survey. Respondents were asked: “Please list any additional impacts of the neighborhood enhancement work that come to mind. These can be positive or negative.” All responses are identified for confidentiality reasons.

Continue with side walk effort

It is great to not get caught by overgrown blackberries when walking and there is less camping

Get rid of the motor home

You gave the homeless folks a nice landscaped yard

Metal fence. No trees- view at stop

Organize power line and more street light could be next?

Still a lot of RVs illegally parking

There are still random RVs that park along SE 38th (Behind the Safeway) that make me feel uncomfortable at times

Positive: making the neighborhood looks nice and safe is very important to me

Cut and destroy clinging/climbing vines, outlaw recreation vehicles parking on the street for people using them to live in. Don't plant plants that people can or want to steal

This was a good improvement to our neighborhood

The enhancement work looks great, but since then there are more RVs/questionable vehicles parked there than before

The motorhomes that are there spilling trash and “fluids” negate the great work done. Recommend no overnight parking signs

It would have been nicer to have negotiated with the bordering neighbors to fully landscape the hill (as a portion is their land). It looks pretty nice at the bottom but looks less nice at the top.

The space looks a lot better, but the eyesore of Tmobile parking and transient RVs has become more noticeable

The little wall is very attractive, as are the plants. I'm sure it was a lot of hard work and is all beautiful. What a contrast to previous!

Enhancement is blocked by “No Parking” all the time. Also by RVs and T-Mobile Overflow. It has done almost nothing for “improving” my neighborhood

Garbage more visible so will be piled up, we assume

This has always been a great community with great neighbors!

APPENDIX B (CONTINUED)

Love well kept yards. This is an extension of the neighborhood and being well kept enhances the whole area

Safer for our dogs

Safer, greater view of surroundings

Positive: got rid of street campers and trash. Nice bike commuter route. Not very happy with T-mobile parking at church- find alternative ways to get that staff to work outside of cars

Would love to see more sidewalks, clear/wide and maintained

We can have more walking time to relax

The clean up helps discourage rat habitat. Thank you!

Enhances entire image of neighborhood and property value

Visitors have commented how much better appearance. Mostly I appreciate removal of Rvs and tents

Nice looking street after you fixed it. Just the RVs need to be removed

Makes neighborhood look better

Because this location is frequently seen in the periphery while entering/ exiting the commercial plaza used by the broader South Bellevue community, this improvement also helps improve the perception of the neighborhood in the wider community.

It makes me happy to see tangible improvements in the neighborhood. For too long, it seems like Eastgate has been neglected for investments by the city of Bellevue. I'm glad that this is being rectified.

It feels more like a neighborhood and less like a collection of homes.

I'm so glad this NEP project won and got done. The area was such a blight, ugly and frankly embarrassing for the neighborhood. I thought, and so did several neighbors, that the project was half finished because of all the mess of dead branches and vines on the upper portion of the planted area. Then I learned from Rick Thomas that the upper mess is on private property. To me, the NEP project looks half done, and the value is rather diminished. Like half the blight is gone, but the other half is still there. The area looks better, but not yet really nice. What can the City do about sprucing up the private property area?

Flower blooming trees are more appreciated and more enjoyable to look at compared to simple green trees.

We need a good sidewalk for the pedestrians on 150th Ave SE because it, is too narrow and I am always afraid for the people who walk there while I am driving my car.

There is a camper parked right in front of the enhancement and it's been there for almost a month. This does not bring me joy!

I love the choice of perennials and would like to help with paying a landscaper to remove the old blackberry dried limbs.

Who maintains the newly enhanced area? It would be neat to read about the people.

APPENDIX C: SURVEY MATERIALS





Neighborhood Enhancement Program Survey

Thank you for taking the time to complete this survey. We are interested in your opinion on changes that arose in the community due to the neighborhood enhancement work done on SE 38th street. This outreach is being conducted by the University of Washington's Livable City Year program in partnership with the City of Bellevue. This survey should take less than 5 minutes and all your responses will remain completely confidential.

Survey responses must be post-marked or submitted online by **Friday, May 24th**. To complete this survey online, type the following link into your web browser: <https://tinyurl.com/NEP38th>

- The neighborhood enhancement work is on SE 38th street between 150th Ave SE and 154 Ave SE (shown on the map to the right).
- This work is part of the City of Bellevue's Neighborhood Enhancement Program and was voted in by residents in 2016.
- Photos of the space before and after the enhancement work are shown below.
- For questions, please contact Rick Thomas at rthomas1@uw.edu or 408-332-4086.






Before
After

Introduction page and survey form. This survey was distributed along with a self-addressed, stamped envelope.

Bellevue Neighborhood Enhancement Program Survey

Thank you for taking the time to complete this survey. When finished, please place this sheet into the envelope provided to submit your responses. The results of this research will be used to help inform future Neighborhood Enhancement Projects in your community.

For each question, please select the response(s) most true to you

- On average, how many times a week do you walk or bike past the neighborhood enhancement work on SE 38th street? Please select one answer.
 - 0 times
 - 1-2 times
 - 3-4 times
 - 5 or more times
- On average, how many times a week do you drive past the neighborhood enhancement work on SE 38th street?
 - 0 times
 - 1-2 times
 - 3-4 times
 - 5 or more times
- How much do you agree or disagree with the following statements? Please check one box for each statement.

| Statement | Strongly Disagree | Disagree | Neither Agree nor Disagree | Agree | Strongly Agree |
|---|--------------------------|--------------------------|----------------------------|--------------------------|--------------------------|
| AS A RESULT OF THE NEIGHBORHOOD ENHANCEMENT WORK: | | | | | |
| I am more likely to walk or bike along SE 38th street to destinations such as the bus stop, restaurants, or grocery store | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| My neighborhood feels safer | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I am more comfortable walking around my neighborhood | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I am more trusting of people I see around my neighborhood | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| SE 38th street has become a more pleasant place to pass by | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I am less stressed when I pass by SE 38th street | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I am happier when I pass by SE 38th street | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| There is a greater sense of community in my neighborhood | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

1

Bellevue Neighborhood Enhancement Program Survey

4. Please list any additional impacts of the neighborhood enhancement work that come to mind. These can be positive or negative.

5. Do you have any children under the age of 16 living at home?
 No Yes

↳ **If Yes:** How much do you agree or disagree with the following statement: **As a result of the neighborhood enhancement work, I am more comfortable with my child walking alone in my neighborhood.**

Strongly Disagree
 Disagree
 Neither Agree nor Disagree
 Agree
 Strongly Agree

6. What aspects of the neighborhood enhancement work do you find most valuable? Please select your top two:

Removal of RVs and other street parking
 Trash clean-up
 Removal of weeds and blackberry plants
 Landscaping work
 Sidewalk Extension
 Other

↳ Please specify: _____

7. How many years have you lived in this neighborhood? _____ years

8. Did you vote for this project when it was on the ballot in 2016 as part of the Neighborhood Enhancement Program?

Yes
 No
 Can't remember
 Prefer not to answer

9. What is your age range?




18-35
 36-49
 50-65
 66+

10. What is your gender?


Male
 Female
 Prefer not to answer

11. What is your street address? _____

2








Has this Neighborhood Enhancement Project had an impact on your community? Let us know how!



Scan the QR code or follow the link to take our 5 minute survey: www.tinyurl.com/NEP38th
 Email rthomas1@uw.edu with any questions

Yard signs were placed at two locations along SE 38th Street at the NEP project site. Passersby had the opportunity to scan a QR code or visit a website to complete the survey.

Has your community been affected by the neighborhood enhancement work on SE 38th Street? Share your thoughts!

The University of Washington is partnering with the City of Bellevue to help improve your community. If you haven't had a chance yet to complete our survey, please fill out the form we dropped off last week, or complete the survey online at: <https://tinyurl.com/NEP38th>

Survey responses must be received by **Friday, May 24th**.

For questions please contact Rick Thomas at rthomas1@uw.edu

This reminder postcard was mailed to residents one week after survey distribution.

II. What are the obstacles, both subjective and objective, to increasing the frequency of nature contact for disadvantaged communities?

Seattle Parks and Recreation Report: Equitable Access to Park Space

Table of Contents

Overview 36

Introduction..... 36

Methods 37

Barriers..... 38

Physical Access 38

Case Study: Jefferson Park 39

Safety 41

Case Study: Roxhill Park 43

Political Process 44

Case Study: Rainier Beach Urban Farm & Marra Farm 45

Case Study: Be'er Sheva Park 47

Case Study: 48th and Charlestown Street Park 49

Engagement 50

Community-oriented Solutions..... 54

References 58

Overview

This report summarizes the findings from an investigation into the barriers to park access in Seattle. From January-April 2019, a team at the University of Washington conducted semi-formal, open ended interviews with community organizers and leaders that are active throughout the city. A wide range of barriers and concerns were identified throughout the process, which can be categorized into four main themes: *physical access*, *safety*, *political process*, and *engagement*. Each of these categories are discussed in detail below along with case studies and community-driven recommendations to lower barriers. These findings are meant to inform future work and help Seattle Parks and Recreation address and reduce these barriers, thereby promoting more equitable access to park space.

Introduction

For the purpose of this research, we define barriers to parks as anything that prevents an individual from spending time in city-managed urban greenspace. As observed in other studies, barriers are not just physical in nature (e.g., proximity), but can be economic, social, or cultural as well (Cronin-de Chaves et al., 2019). All of these barriers interact to influence the degree to which greenspace is accessible within a given community. Unfortunately, many of these barriers are often distributed inequitably throughout a city—lower-income and ethnically minority neighborhoods tend to not only have lower quality greenspaces compared to other neighborhoods, but less overall greenspace per person as well (Rigolon, 2016). Greenspaces within these neighborhoods are also more likely to experience crime, discouraging residents from using them due to safety concerns (Roe et al., 2016). Furthermore, greenspace use in more deprived areas has also been shown to be influenced by a number of other cultural factors, including perceived benefits of the space, feelings of inclusion, and language barriers (Das et al., 2017).

While these trends have been observed across multiple cities in several countries, for a city to implement equitable solutions, an in-depth understanding of the barriers specific to its residents is required. Therefore, this research aims to build upon this knowledge and provide specific insights for the City of Seattle. While Seattle has a rich history and commitment to park space, it has grown increasingly economically segregated in recent years, and to date there has

not been an in-depth independent analysis into barriers to greenspace for lower income or ethnically minority communities.

This research is a first step in understanding these barriers using the best practices in community-based participatory research (CBPR). CBPR is the gold standard approach for conducting research in a community that emphasizes collaboration, skillset sharing, building partnerships and cultivating trust to ensure communities are not being exploited for the sake of research (Wallerstein et al. 2017). In addition to being a more equitable and just approach than simply entering a community and surveying them for their data, CBPR has been shown to result in higher community involvement and improve research outcomes (Cyril et al., 2015; Balazs & Morello-Frosch, 2013). Our CBPR approach is meant to help Seattle Parks and Recreation (SPR, hereafter) craft more community-driven solutions, and thereby allow it to better achieve its mission to “promote healthy people, a healthy environment, and strong communities.”

Methods

From January-April 2019, we conducted semi-structured, open-ended phone interviews with community organizers and leaders that are active throughout Seattle. Rather than simply using these interviews to validate a set of pre-determined research hypotheses, our primary objective was to listen to respondents share what barriers were most pressing in their community and invite them to join in the research process by identifying community-driven solutions. For our initial outreach, we identified organizations that had a strong history of community engagement and represented diverse parts of the city. From these initial interviews, we then utilized a snowball sampling technique, a form of network sampling where we solicited additional qualified contacts from people with whom we spoke (Thompson, 2002). Due to the expertise of those we spoke with, this report focuses primarily on barriers within South Seattle neighborhoods.

We conducted open ended interviews, whereby interviewees were asked to identify what barriers were preventing members of their community from spending more time out in park space. We intentionally avoided providing a concrete definition of what constituted a barrier to avoid the risk of restricting our interviewees’ responses and missing barriers that might be specific to certain communities. For each barrier that was identified, we followed up and asked what could SPR do to help address the barrier and what would be the best approach for doing so.

We concluded each interview by asking each respondent if there was any additional information or concerns the respondent would like SPR to know about. Interviews notes were compiled and analyzed for common themes.

Individuals we spoke with represented a diverse set of organizations, including: Seattle Neighborhood Greenways, Seattle Parks Foundation, Seattle Parks & Recreation, Rainier Beach Action Coalition, Roxhill Park Champions, Seattle Public Schools, Duwamish River Cleanup Coalition, Concord International Elementary School Parent Teacher Association, and Rainier Beach FC. We spoke with two additional organizations that are not listed at the request of the interviewees; in total we spoke with eleven individuals active within the city.

Given that one of SPR's priority areas is to identify barriers that youth specifically face to accessing greenspace, we include in this report preliminary results from an ongoing survey of Seattle parents and high school students. The survey is currently being conducted as part of the University of Washington's State of Play initiative and seeks to better understand how youth recreate and use parks.

Barriers

From our interviews, we identified four broad categories of barriers to park space. These are physical access, safety, political process, and engagement. Each of these barriers are discussed in greater detail below, accompanied by case studies brought forth by the community. The case studies highlight barriers in specific parks and pose questions brought up during our interviews and theme analysis. These questions are meant to help SPR address these barriers more broadly by providing a launching point into a discussion around them.

Physical Access

In the context of our analysis, physical access involves both the ability of a community to travel to a park and utilize the space once they are there. A common theme that emerged throughout our interviews is that communities would utilize greenspace more if the city did a better job of prioritizing walking and biking. Community leaders expressed that while lacking a car or infrequent bus routes can limit access to certain parks around the city such as Discovery, a greater issue is the perceived notion in many communities that the city still prioritizes driving as

the main mode of transportation getting in and around parks. Olmstead Parks such as Colman, Frink, and Interlaken all of which have roads cutting through them by design, were cited as problematic for walkers and bikers within the park. Restricting car access through these parks or prioritizing more multi-use lanes so bicyclists do not need to share the roads with cars were suggested as possible solutions. Another potential change would be to ensure that all multi-use paths are clearly labeled, not just out in the space, but on city maps and online resources as well (Case Study: Jefferson Park).

We also heard from individuals that a park was only as accessible as its entrance was welcoming. Specifically, park entrances need to not only be maintained and appear inviting, but also well-marked. The entrance to Be'er Sheva Park, for example, was identified as difficult to find as a pedestrian, meaning that if community members did not already know about the park, they were not likely to use it. Having clear, updated signage has the dual purpose of making an entrance to a park more visible, as well as conveying to the community that SPR considers the space worth advertising.

Case Study: Jefferson Park

There is a well-maintained paved path that goes through Jefferson Park that allows for pedestrian and bicycle use. However, Seattle Department of Transportation (SDOT) does not have this lane show up on a number of their transportation maps. The result is that if an individual is biking and looking for the best route, the bike route appears to dead-end in Jefferson Park and then continue on the other side of the park, effectively removing it as an access point unless the individual knows exactly where it is.

Questions:

Is there a system in place where SPR or SDOT can be notified about inaccurate or outdated trail or route access to prevent instances like this in the future?

How can SPR promote accurate and up-to-date maps indicating best routes?

What type of partnership can SPR continue to foster with SDOT to prevent this type of misinformation about routes?

A promising and insightful observation is that no one we spoke with identified lack of park space as a dominant barrier for their community, suggesting that proximity is not as much

an issue. This is reflected in preliminary results from the ongoing State of Play survey run by the University of Washington’s Center for Leadership in Athletics. The survey asked high school students and their parents to evaluate various recreation opportunities in their community. As can be seen in Figure 1, an impressive 95% of parents reported having greenspace near their home. While not a representative sample of Seattle parents, these preliminary findings provide an interesting snapshot into access to park space and are validated by an independent analysis conducted by the Trust for Public Land’s which found that 96% of Seattle residents live within a ten-minute walk to a park.¹ Taken together, these statistics lend support to the idea that quantity of parks is not a major barrier Seattle residents experience. Quality is a separate issue, (and discussed further in the *Safety* section) but it is important to recognize that the City has done a good job of prioritizing the saving of land for park space.

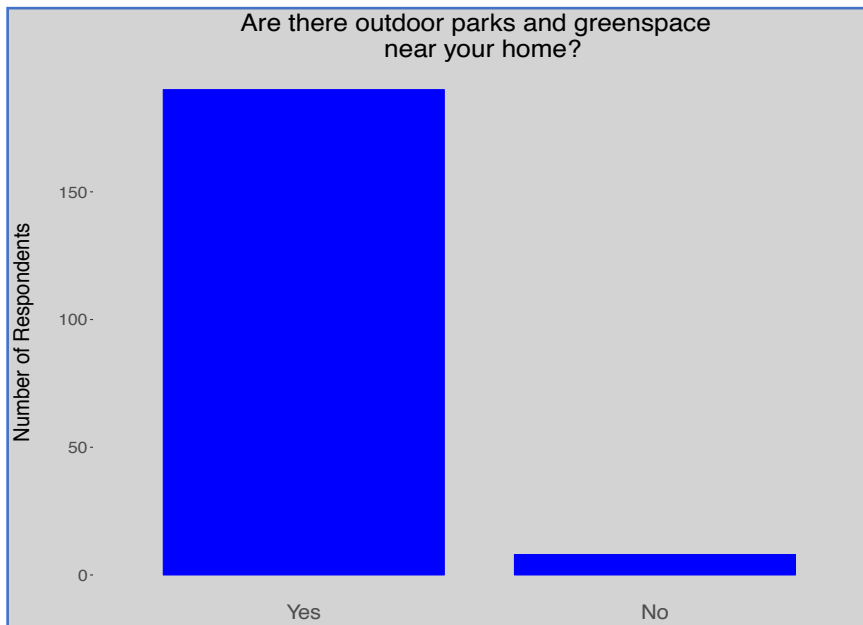


Figure 1. Responses from parents of students at Ballard High School (n=198). Preliminary results from State of Play Survey conducted April 2019 by UW Center for Leadership in Athletics.

Even if a park is nearby however, actually using the space can still be challenging depending on the community member’s intended use. For organized sport practice for example, we heard how it was unnecessarily difficult to schedule a time to reserve field space around the city. Specifically, the old SPR reservation system made it difficult see what spaces are available and when. This resulted in individuals showing up to a park and discovering they were unable to use the facilities, leading to frustration and feelings that they were not welcome in the space.

¹ Similarly, SPR’s own analysis has found that 94% of Seattle’s Housing Units are within a 10-minute to a SPR park (2017 Parks and Open Space Plan).

This is an issue SPR was aware of for some time and last year upgraded the software system for scheduling to make it more user friendly.

We learned that feeling unwelcomed can arise from other situations as well, especially for youth. This is due to the fact that it can be difficult for kids in certain communities to congregate in large groups at parks due to their perceived threat to the community. One respondent we spoke with has witnessed the police being called to break up larger gatherings of youth in Rainier Beach parks on more than one occasion, simply because it made someone uneasy.

Key Quotes

“SPR place way too much emphasis on driving”

“[A park is] not a walled garden you drive up to and park”

“Parks have soft edges that [Seattle Parks & Recreation] needs to work with”

“[Parks] don’t show you the schedule to see what’s available...I had to think outside the box.”

“[I] struggle to find out what’s available [at parks].”

Safety

While resources are increasingly becoming available to promote physical access to parks (e.g., The Trust for Public Land’s 10-Minutes to a Park tool), our interviews reinforced the idea that proximity to a park is not an accurate proxy for access if people do not feel safe spending time there. While there are a number of factors that can cause someone to feel unsafe, homelessness and crime were the two concerns brought up most in our interviews. This echoes findings of two recent surveys of recreation opportunities in Seattle. One survey, sponsored by SPR found homelessness and illegal activities to be the leading causes for low-ratings of safety at parks and community spaces (Table 1). This is echoed in the preliminary results from the State of Play survey, where parents reported these issues to be common occurrences around parks near their home (Figure 2).

Table 1. Perceived Safety in Seattle Parks and Recreation Facilities. Data taken from SP&R Survey, 2017

| 10. What are the main reasons for the grade you gave for the safety of Seattle parks and recreation facilities? (multi response) | |
|--|-----|
| Positives | |
| I feel safe | 16% |
| Non-specific positive | 4% |
| Parks are clean/well maintained | 3% |
| Negatives | |
| Homelessness/camping | 31% |
| Illegal activities (drugs, theft, assault, guns, graffiti, alcohol, etc.) | 31% |
| Non-specific negative | 9% |
| Inadequate lighting/overgrown, dark areas | 9% |
| I don't feel safe/I don't feel safe after dark/dusk | 7% |
| Other people (aggressive people/mentally ill/harassment) | 7% |
| Cleanliness/maintenance issues (litter/broken glass/bathrooms/feces) | 7% |
| Absence of police/park staff | 4% |
| Dogs off leash | 2% |
| Female safety issues | 2% |
| There is always room for improvement | 1% |
| Depends on the park/some are safe and some are not | 1% |

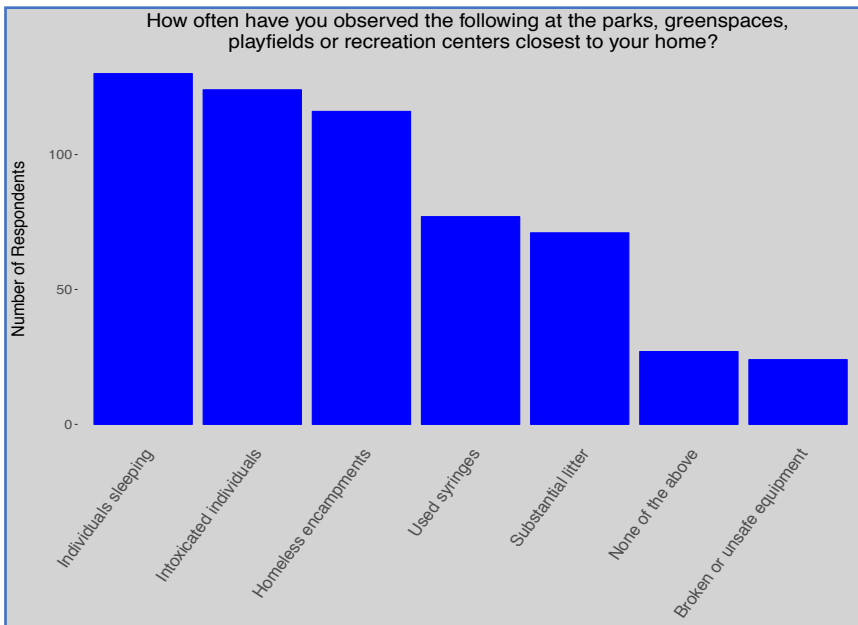


Figure 2. Responses from parents of students at Ballard High School (n=198). Preliminary results from State of Play Survey conducted April 2019 by UW Center for Leadership in Athletics.

While these are not new concerns, respondents suggested that the City try and rethink how it goes about interacting with the community to try and address these issues. One promising approach is for SPR to foster stronger partnerships with neighborhood associations who are already actively engaged in promoting safe parks and support them in their mission (Case Study: Roxhill Park).

Case Study: Roxhill Park

The Roxhill neighborhood is located in south-west Seattle. The neighbors around Roxhill Park noticed that how the City manages the vegetation of the adjacent wetland has a direct impact on the perceived safety of the space. We heard from multiple residents that years of improper vegetation management of the wetland has not only degraded trail quality but inadvertently created a convenient location for people to drink and camp in the park. This has given rise to safety concerns and a diminishing use of the park by its neighbors.

A neighborhood led group called Roxhill Park Champions is actively working to combat this decline in perceived safety. This group puts on a number of community events, including park clean-ups, neighborhood walks and summer movie nights out in the park to try and improve perceptions of safety and build a greater sense of community. While SPR has been an engaged partner in many of these events, according to an active member of the Roxhill Park Champions there is more that the community needs from SPR. For several months the community has asked SPR to develop a proper vegetation restoration strategy that takes into account the unique ecosystem surrounding the park, however due to administrative turnover this has been significantly delayed. This not only hinders bringing positive change to the park, but fosters feelings of frustration in trying to work with SPR.

Furthermore, Roxhill Park Champions has found it difficult to sustain its community engagement around the park without a community center where the neighborhood can come together and share resources. The closest resource available is the Southwest Teen Life Center, which is not open to serve all ages and, according to a Roxhill resident, is geographically and culturally isolated from the Roxhill neighborhood. Members of the community have approached SPR multiple times about this issue and have been told repeatedly that for the city to dedicate resources to a community center there needs to be clear support of it from the community itself. This is problematic however, as it can be difficult to rally a community around this issue without a space to share ideas in the first place, especially in a community as diverse as Roxhill. This cycle of needing assistance from SPR to demonstrate that the community needs assistance results in additional frustration on behalf of community organizers and is a missed opportunity to improve the community.

Questions:

What events could SPR sponsor to help groups such as Roxhill Park Champions maximize their impact?

Is there a forum in place where community members can comment or make suggestions about vegetation management decisions that impact their parks?

What vegetation management decisions can SPR rethink to cut back on issues such as this?

What creative opportunities can SPR pursue to provide additional resources for neighborhoods? For example, in Roxhill the former Elementary School adjacent to Roxhill Park rests on a large lot that would be a perfect gathering space for the community. Only a small portion of the lot is currently being used (for an adult education program) and the city has not put forth any public facing plans for redevelopment. What would it take to repurpose a section of this lot as a pop-up community center for the neighborhood?

It is important to clarify that perceived safety as a barrier extends beyond the park perimeter to the route itself. Busy streets that are difficult to cross, such as the freeway off-ramp near Georgetown Playfield, as well as concerns about crime and homelessness along the route impede access to parks. Community leaders acknowledged this is a difficult jurisdictional problem, as it is an issue that clearly impacts park use but is outside SPR's traditional domain. One community member suggested looking for inspiration from other successful City initiatives that improved safety on the streets. Specifically, we heard that given the success of "Safe Routes to Schools", what would it take to establish an equivalent "Safe Routes to Parks"? Although not explicitly acknowledged by this community member, this comment serves as validation for continued investment in the city's Greenways Initiative which aims to achieve just that—safer routes to parks for pedestrians and cyclists. Considering this initiative was not actively mentioned in any of our conversations, it would be worthwhile as SPR continues to expand the number of greenways to look for ways to expand the marketing of the initiative as well. For example, while the signage along the actual Greenways are prominent and well-marked, does SPR have signage up in the parks themselves to reach residents who may have driven there?

Key Quotes

"Is the park that is 10 minutes away the one you want to go to?"

"We have Safe Routes to Schools, why doesn't SPR partner with SDOT to create Safe Routes to Parks?"

Political Process

We found issues related to the political process to be the most often cited barrier in our interviews. Community leaders expressed how there is sometimes confusion and frustration around how parks are managed around the city. For example, we heard how it is not necessarily a straightforward process for a neighborhood to work with SPR to renovate a greenspace in their community, primarily due to a lack of transparency within the department. This was illustrated in an anecdote when a greenspace with no community behind it was recently added to the department's list of parks to renovate (the name of the space was not provided), while several locations with strong voices fighting to get them listed were overlooked. We were unable to verify this claim, but chose to include it in this report to highlight the concern we heard that how these greenspaces are chosen to be renovated can be political and not community-driven. This issue of transparency can make SPR appear to be a difficult partner to work with and potentially discourage communities from getting involved in the process (Case Study: Rainier Beach Urban Farm & Marra Farm).

Case Study: Rainier Beach Urban Farm & Marra Farm

Despite being a well-established site that is highly valued and utilized by the community, the Rainier Beach Urban Farm has been unable to close its lease with SPR for years now. It is unclear to community members why the process has taken so long and results in a lack of clarity because the farm is unsure as to what their responsibilities are under the lease. This hinders management decisions about what can be done in the space and creates uncertainty about the site's future.

In 2008 SPR employees met with the neighborhood around Marra Farm in South Park to collect input on what park attributes they would like to see in their neighborhood. After multiple three-hour meetings, the community identified several high priority items, including a farm-themed playground and amphitheater for live music. However these amenities were never provided. When the city came around again in 2016 trying to engage the community because of a new initiative, there was frustration and skepticism in the process because their priorities hadn't changed from before and they still had little to show for it. Despite this skepticism, they sat down with SPR officials once more through multiple three-hour meetings and arrived at many of the same amenities they identified in 2008.

Unfortunately, at the end of the process, the community found that the vast majority of the budget set aside for park improvements (including the priorities they were interested in) had been taken up by administrative overhead. The end result was SPR settling for an ADA

accessible walkway and some minor changes, while ignoring the high priority amenities the community spent hours conveying.

Questions:

What steps can SPR take to streamline land leases and promote transparency?

How can SPR ensure that feedback from the community is actually incorporated?

According to one respondent who is familiar with how SPR operates, the single greatest step the department could take to improve equity is for it to do an entire overhaul on the design process of parks. This respondent told us that there is little opportunity for equity or community engagement in how the system operates. This is because once a design process is initiated, designers are under such time pressure to get a design in place and out to bid that they completely rush through any community input stages. This is a fundamentally flawed approach that has significant negative downstream consequences. When the community is not engaged in the design process, they are less happy with the final product because it is not what they wanted, resulting in a less activated park. A less activated park is one that is not fully utilized by community members for a diverse range of activities. This lack of utilization decreases the likelihood of communities developing feelings of stewardship towards it, decreasing the overall quality of the space. This in turn can lead to safety concerns due to increased crime in the park, which makes people less likely to use the space, thereby further reinforcing the problem all because the current system in place does not prioritize community involvement.

Another common theme that arose in our conversations was the potential for SPR to build more partnerships with other city departments or strengthen preexisting ones, and subsequently increase transparency and outreach regarding the communities with which they are working, and what they have accomplished. As discussed above, one such partnership would be with SDOT to improve safe routes to parks. Another opportunity that community leaders identified was the potential for stronger collaboration with the city's Department of Neighborhoods to better streamline the process by which parks are improved. Currently there is a single SPR staff serving as Community Liaison that works with the Department of Neighborhoods to oversee Matching Funds from which groups can win money for park improvements. This staff deficiency creates a tremendous bottleneck in the process and fosters frustration with the system. Interviewees

repeated numerous times that SPR needs to allocate more staff resources in this position because it is incredibly ineffective as it currently stands.

It is not enough to simply ensure the funds are distributed quickly however, they need to be able to be implemented in a timely fashion as well. We heard that even when neighborhoods get funding from the Department of Neighborhoods, they can have difficulty spending that funding on their project. For example, residents in the Georgetown and South Park neighborhoods received a grant in 2015 for a new playground but have not been able to use that money due to reasons that were unclear to our respondent. As a possible interim solution in the meantime, the City placed several recycled play parts in one of the neighborhood parks. However, this was not the playground the neighborhood asked for, and there were additional complications such as one of the play pieces—a large silver dome—getting too hot to play on in the summer. Even though the City had very good intentions, it is this delay in the process and decisions that do not involve the community that can lead to resentment. As one respondent put it, “something like this would never have happened in Magnolia.” Instances like this provide an opportunity for SPR to help streamline the political process by working with the Department of Neighborhoods to ensure communities are getting the parks and playgrounds they want in a timely manner.

This desire to see SPR cultivate more partnerships extends beyond other city departments, but to community organizations and events as well. This will help the perceived lack of engagement from SPR staff by making personnel more visible in the community (see *Engagement* section) while simultaneously ensuring SPR is aware of what events are taking place in the community and how different spaces are being used (Case Study: Be’er Sheva Park).

Case Study: Be’er Sheva Park

Since 2003, Be’er Sheva Park has held the Back 2 School Bash which gets over 1,200 people out in the park each fall. Unknown to the event’s organizers however, in 2014 Seattle Public Utilities decided to daylight a creek through part of the park right in the area where Back 2 School Bash usually occurred, forcing them to relocate a community-wide tradition. According to one of the individuals who helped organize the Back 2 School Bash that we spoke with, they did not have an opportunity to be involved in the decision process of when and where this daylighting would occur.

It is important that the city is aware of discrepancies between how it believes people use park space, and the “natural use” of the area, or what people actually use it for. This awareness doesn’t need to come from community surveys or focus groups, instead it can arise from paying attention to amenities requests. For example, when Be’er Sheva began to have a huge backlog of reservations to use the barbeque pit, that should be treated as a helpful indicator as to what the natural use of the area is, which is information the city can then act upon.

Questions:

Does SPR or another department closely monitor these natural uses, and how does it use this information?

Can SPR streamline the process to allow park users to indicate what amenities they would like to see more of?

Another barrier to getting involved in the political process is the meeting times and locations for park decisions. If the meetings are difficult to get to from certain neighborhoods or at inopportune times, then certain neighborhoods and communities will be systematically excluded from the process and miss out on funding opportunities. This can exacerbate the issue as well, as residents of these neighborhoods might feel intentionally left out of the process and begin to cultivate feelings that parks are not for them. One respondent shared how she had been looking forward to attending a Park’s public meeting but discovered just how difficult it was to get to the meeting on Denny Way from South Seattle during rush hour. The ways in which SPR currently operates was referred to multiple times as the “squeaky wheel getting the oil”, and the perception is that there is currently not a good system in place to allow for equity in the process when communities with more resources are able to attend these meetings and have their needs met. One possible solution is to cycle the meetings around to multiple different locations, and inquire within the community about convenient locations and times to hold them.

Because a number of these barriers were observed several years ago, we wanted to investigate SPR’s current protocol around engaging residents in the political process. To do this, we spoke with a public engagement SPR employee and consulted the Current Project page of the department’s website to look at on-going community outreach. We found a strong commitment to both engage the public during the design process and to look for ways to improve this engagement (Case Study: 48th & Charlestown Street Park). Interestingly, many of SPR’s current

engagement initiatives failed to come up in our interviews despite being part of the department's official public involvement policy. This suggests that as the department continues to hone its approach it should simultaneously work on better promoting all that it is doing.

Case Study: 48th and Charlestown Street Park

SPR is currently wrapping up the design and community engagement phase for a new park located in West Seattle on 48th and Charlestown Street. In partnership with community leaders in West Seattle and particularly the Genesee-Schmidt neighborhood, SPR has held three public meetings over the course of six months (February-July 2019) to solicit feedback from residents on what the park should look like. To ensure residents were aware of the meetings, SPR put up signs in the neighborhood, issued a press release, and mailed postcards to homes within a ¼ mile of the project site. SPR consulted with West Seattle neighborhood groups to identify when and where the meetings should be scheduled, making sure to pick different locations and days of the week each time in order to accommodate a greater number of residents. SPR also provided food and engagement activities for children during the meeting to minimize the burden of attending.

In addition to these meetings, SPR conducted multiple online surveys and a social media campaign to reach additional community members. As part of a new initiative, residents could use Instagram to tag photos of park amenities they would like to see. Throughout the process a project website has been maintained with updates along with the project planner's name and contact information should community members have questions or concerns.

The third public meeting that took place in July marked the end of the design phase. The design consultant will spend the next several months detailing the project, during which the project will undergo four in-house technical reviews and one City of Seattle contracting review before it is advertised for bid. Bids are typically due three weeks from initial advertisement and are usually awarded to the lowest responsible bidder.

Questions:

What systems are in place to ensure the community feedback that is collected is turned into the park that the neighborhood wants to see?

Have new outreach efforts such as social media campaigns helped reach previously unengaged residents? Does the city have a system in place to track this or other success metrics to inform future efforts?

What is SPR's current strategy to advertise how its public engagement efforts have improved over time, and how can this be strengthened?

What type of community feedback does SPR collect regarding the engagement process of park design, and in what ways is this being used to inform future work?

What opportunities are there for the public to get involved in the bidding process and how can these be expanded?

What ways can Parks incentivize bidders to work closer with communities?

Key Quotes

"Right now, unless a community has a lot of retired volunteers or stay at home moms, it is difficult [to attend meetings]"

"A park is only as active as the people who want to be there"

Engagement

It was clear from our interviews that several communities want and expect SPR to do more than simply maintain nice facilities. Specifically, they are interested in SPR's level of engagement and amount of programming in their community. While the consensus was that SPR has been doing better in recent years, there were still barriers identified that could be addressed.

A high-priority best practice for SPR to embrace is that engagement activity in a community "should be on [the community's] own turf in their own languages." Many of the communities represented by our respondents want more outreach from the City promoting and advertising community events, but they don't want city employees such as SPR staff doing the outreach. Instead, they would prefer that the City train local community members in outreach techniques and have them serve as liaisons between the City and neighborhood. This lends support to the idea of expanding the current system of Community Liaisons and community contractors that work with the Department of Neighborhoods and SPR. This would be a good long-term investment for the City that strengthens the impact of the outreach because the community members know the issues and how to speak with their neighborhood.

When conducting other outreach events, such as social media postings, it is crucial that the City is reaching the intended neighborhoods and its message is understood. One community leader pointed out that many parks-related events in the Duwamish Valley and International District (not necessarily just events put on by SPR, but those occurring in parks) are translated into Spanish, but the next three biggest languages—Cambodian, Vietnamese, and Somali—often get overlooked. This is an especially determinantal oversight, as some of these minority communities often lack the knowledge that SPR work for them and therefore do not know to ask for something or realize they are missing out. This puts the responsibility more on SPR to be a resource for these communities. Providing language resources whereby community members can help translate their events or posting and retweeting events to spread the word and thereby reach a greater portion of the neighborhood represents a quick yet impactful opportunity for SPR to get involved. This could be as simple as helping point residents to pre-existing resources, such as the “Neighborhood Snapshots” organized by the Department of Neighborhoods that identify the primary languages spoken in each neighborhood. SPR and other city departments should continue to look for these low-cost ways to help residents engage with their own community, opportunities for which many people are already looking.

There is also a desire for more cultural awareness from city officials that do work in the community. Currently, there is the perception that the people that SPR hires to engage the community often lack the historical and cultural information of the community in which they are working. This has been observed when the employees are recently out of school and too inexperienced or have been with SPR for years and have strong opinions of how things should be run.

Another barrier that interviewees identified is a lack of activities and events put on in parks and community centers. There is a feeling that SPR has shifted away from being an active presence in the community, to the point where it is strange to see a SPR employee interacting with community members in a park. This lack of activities put on by SPR not only hinders the community from getting to know its parks department, but disincentivizes people, especially youth, from using the spaces. According to preliminary results from the State of Play survey, over $\frac{3}{4}$ of parents reported their child using community or recreation centers less than once a month, and over a third of youth respondents not going out to parks as much as they would like. (Figure 3 and Figure 4). When asked to elaborate, youth reported that lack of things to do as the

third greatest barrier to spending more time in parks, behind lack of free time and having no one with whom to go. Together, these three reasons account for 2/3 of all barriers cited (Figure 5). While these results are only from students attending Ballard and Cleveland High and are not necessarily representative of Seattle youth as a whole, they nonetheless provide good insight into ways SPR could consider new engagement opportunities. Short activities offered in parks that do not take a lot of time out of busy school schedules or that help youth meet each other could go a long way to overcoming the main barriers identified by Seattle youth.

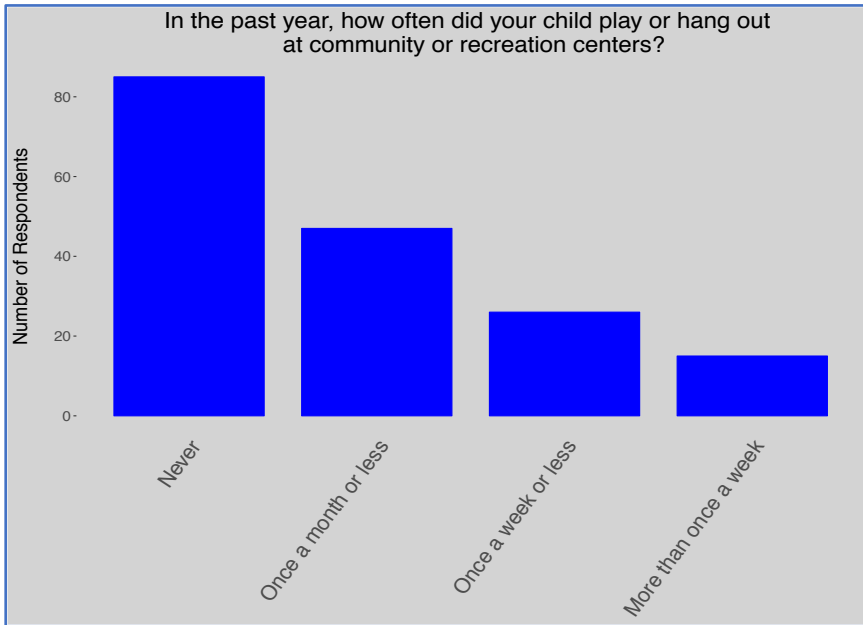


Figure 3. Responses from parents of students at Ballard High School (n=198). Preliminary results from State of Play Survey conducted April 2019 by UW Center for Leadership in Athletics.

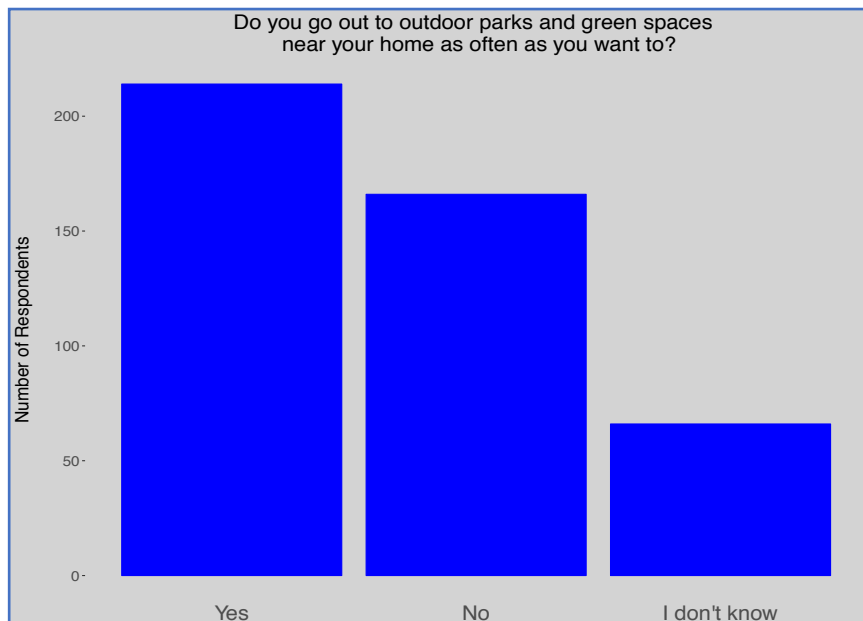


Figure 4. Responses from students at Ballard High School and Cleveland High School (n=446). Preliminary results from State of Play Survey conducted April 2019 by UW Center for Leadership in Athletics.

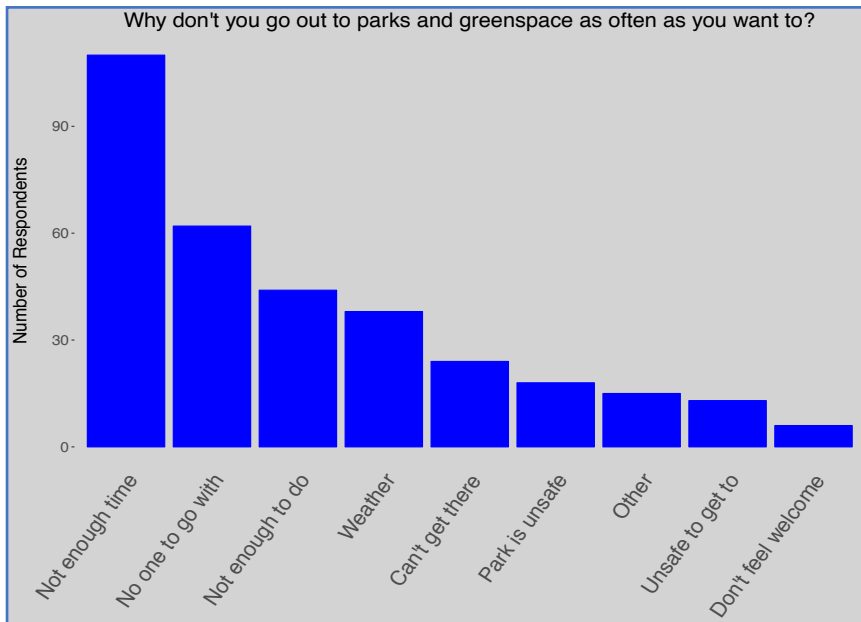


Figure 5. Responses from students at Ballard High School and Cleveland High School (n=330). Preliminary results from State of Play Survey conducted April 2019 by UW Center for Leadership in Athletics.

The current lack of activities creates a void of programming that needs to be filled, which includes both one-off events such as movie nights, and routine activities, such as organized sport leagues. Rainier Beach, which one respondent familiar with the community described as having an “appetite for soccer”, has no soccer programming offered at its community center, forcing kids to look elsewhere. The issue is compounded because there is the feeling that there is little to no infrastructure in place for residents to request things such as more soccer programming. This has forced a community member to start up an independent soccer league, but this comes with its own hurdles such as trying to reserve field space (discussed above) or paying to play elsewhere. Another option, in addition to offering more programming that would attract people to parks, would be for the City to lower hurdles for these leagues by prioritizing field space or even sponsoring a team. Tukwila Park’s Department sponsors a youth soccer team to cover the venue fees at Starfire Sports—what would it take for Seattle to do something similar?

Key Quotes

“The main thing that would help would be for [SPR] to conduct outreach in neighborhoods in native language”

“Since I was a kid, [SPR] has shifted practice to being facilities managers”

“You never see SPR staff outdoors interacting with the community.”

“It comes down to expectations. Middle income folk have the perception parks ‘work for me’ and are comfortable asking for certain things. Immigrants don’t think like this, and so it’s hard to know what they should be expecting.”

“Anytime there is park programming there should be money set aside to fund translated materials or training community members to spread the word. They are the ones who know the people and area but don’t have resources.”

Community-oriented Solutions

The spatial distribution of barriers identified in our interviews can be seen in Figure 6.

This is not an exhaustive list and should be interpreted as the distribution of concerns and issues brought up in our interviews, rather than the sole barriers to equitable access in these spaces.



Figure 6. The distribution of parks and specific barriers identified in our interviews. These are not meant to serve as exhaustive summaries of barriers at park locations.

Throughout our interview process, we asked respondents to not just identify barriers, but also suggest solutions they thought would help address those barriers. Below, we have consolidated the feedback we received into a number of actionable steps SPR could take to improve equity and access to park space. Each step is framed using a CBPR approach, meaning that they focus on how SPR can engage with communities effectively and thereby produce solutions most meaningful to them. These steps include:

- Restructure how the park design process is conducted.** This is a core issue that is fundamental to developing equitable parks. SPR does an incredible job involving the community during the design phase, but this should be carried on throughout the entire lifecycle of the park. Give designers more time to work with communities before the bids are due, and factor in the extent to which designers successfully do this as criteria for selecting winning bids.

- **Continue to promote new ways for communities to be involved in the political process.** This includes more flexible times and locations for public SPR meetings or alternative modes of collecting community feedback. Most importantly, SPR should find ways to guarantee that communities' input will be listened to and going to the meetings will not be a waste of time. While we acknowledge that more engagement will require more staff time, it is important to ensure budgets are not spent on overhead of SPR staff at the expense of amenities the community would like to see.
- **Rethink how park renovations are conducted.** Because it is typically wealthier communities that have the time, resources, and available pathways to vocalize their concerns and get involved in the process, parks in these communities are perceived to disproportionately receive improvements. SPR should investigate past renovations and how community need is assessed to determine if such an inequity exists and use this information to inform future practices. Additionally, SPR should increase its transparency of how locations are selected for renovations to help address the perceived inequity present in the process.
- **Identify and address bottlenecks in the political process that hold up or hinder community participation.** Things like slow distribution or implementation of funds are readily identifiable problems that have a large impact on how welcomed community members feel in the process.
- **Improve transparency of partnerships.** Many of the people we spoke with were unsure who SPR was working with, or often wondered why SPR was not pursuing certain opportunities. Identifying community organizations and determining what is preventing them from having a bigger impact and what role SPR can play in addressing this should remain a high priority.
- **Highlight current park initiatives on equity and engagement.** There is a disconnect between how much some community members feel SPR is addressing issues of equity or engagement in park design and how much SPR is actually doing. This information is not readily available or marketed by the department currently—for example, the rigorous engagement protocol for park design is currently buried in a public involvement policy document on SPR's website that is difficult to find. Highlighting recent engagement initiatives, such as a park design case study showcasing all the community groups that

SPR partnered with, will help address this disconnect by showcasing all the hard work SPR does that is currently unnoticed. Making this information more publicly available has the additional benefit of allowing the community to more easily provide feedback on it, thereby strengthening and improving policy as a whole.

It is possible that SPR is already making progress towards these steps, in which case this list should serve as a reinforcement of their importance and a reminder of the support they have from the community organizations with whom we spoke. It is clear from this research that Seattle is not lacking for engaged communities and organizations invested in equitable access to park space. Therefore, the main challenge and opportunity lies in finding ways to help communities get involved early and stay involved throughout the process.

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III. Does nature-based physical activity confer benefits above and beyond equivalent physical activity in nature-free settings?

A randomized cross-over study assessing the impact of environment on affect and connectedness to nature in children with Attention-Deficit/Hyperactivity Disorder (ADHD) and Autism Spectrum Disorder (ASD)

Table of Contents

| | |
|---|-----------|
| Introduction..... | 61 |
| Methods | 62 |
| Outcomes..... | 64 |
| Ethics Statement..... | 66 |
| Data Collection..... | 66 |
| Statistical Analyses | 66 |
| Results..... | 67 |
| Descriptive Statistics | 68 |
| Model Results..... | 70 |
| Discussion..... | 71 |
| Conclusion | 73 |
| References..... | 73 |
| Appendix A: Additional Figures | 77 |
| Appendix B: Questionnaire..... | 79 |

Introduction

There is a growing scientific interest in the benefits of nature contact for human health and well-being. A review of the literature reveals a broad range of potential benefits, including reduced stress, increased life-satisfaction, reduced obesity, and greater social connectedness (Nielsen and Hansen 2007; Fleming et al. 2016; Dadvand et al. 2014a; de Vries et al. 2013). While many of these health outcomes have been well-documented, the actual mechanism responsible for linking nature contact and human health is still only partially understood, and there is consensus within the scientific community of the need for greater understanding of potential mediators (Dadvand et al. 2016; de Vries et al. 2013).

One proposed pathway linking nature contact and health is physical activity (Bancroft et al. 2015; Bowler et al. 2010; Hunter et al. 2015; Pretty et al. 2015). Natural surroundings are generally associated with greater levels of physical activity, which has been shown to result in a number of health outcomes including lower blood pressure, reduced risk of obesity, depression, and diabetes, and greater quality of life (Warbuton et al. 2006; Jansen & LeBlanc 2010; Penedo & Dahn 2005). To better understand the ways in which physical activity within natural settings (i.e., “green exercise”) may play a causal role for health, researchers are investigating the health benefits that result specifically from this type of nature-based physical activity, above and beyond equivalent physical activity in nature-free settings (Frumkin et al. 2017). Preliminary studies suggest that such additional benefits may exist, including greater improvements in mood and lower feelings of depression and stress (Hartig et al. 2003; Berman et al. 2008; Thompson Coon et al. 2011; Roe and Aspinall, 2011). While these studies provide important evidence to aid in our understanding of the link between physical activity, nature contact, and health, to date they have primarily been restricted to healthy adult populations.

This paper seeks to expand this knowledge base by investigating health outcomes of physical activity across different environments in children diagnosed with Attention-deficit/Hyperactivity Disorder (ADHD) and Autism Spectrum Disorder (ASD). This is a population that has received increased attention from nature contact and health researchers in recent years; spending time in natural spaces has been found to improve symptoms of ADHD, and prevalence of greenspace has been shown to be inversely associated with prevalence of ASD in children (Amoly et al. 2014; Taylor & Kuo 2009; Wu and Jackson 2017). To our knowledge however, no study has yet to compare the effects of physical activity in nature and nature-free settings through an experimental design for this population.

Methods

For this research we partnered with a summer camp located in Seattle, Washington. The camp is a five-week program based out of the University of Washington's Autism Center that aims to provide behavior and social skills through peer-to-peer experiences for children diagnosed with ADHD/ASD. While the name and exact location of the camp is not provided to respect attendees' confidentiality, we have provided relevant details of the camp's structure as they relate to our study.

Camp ran Monday-Friday from 9:00-3:00 pm for five weeks during the summer of 2019. Campers were divided up into groups, or bunks, of 12-14 based on age and each day participated in a rotating set of activities that include board games, 'Counselor's Choice', skills drills, and a sports game activity. For this study, we randomly assigned bunks to one of three different treatment conditions during the skill drills and sports game activities each week. These treatments took the form of three different environments:

- Gymnasium ("Indoor")

- Terrace asphalt (“Outdoor, minimal nature”)
- Field surrounded by trees (“Nature”)

A schematic of the three environments is provided below in Figure 1.

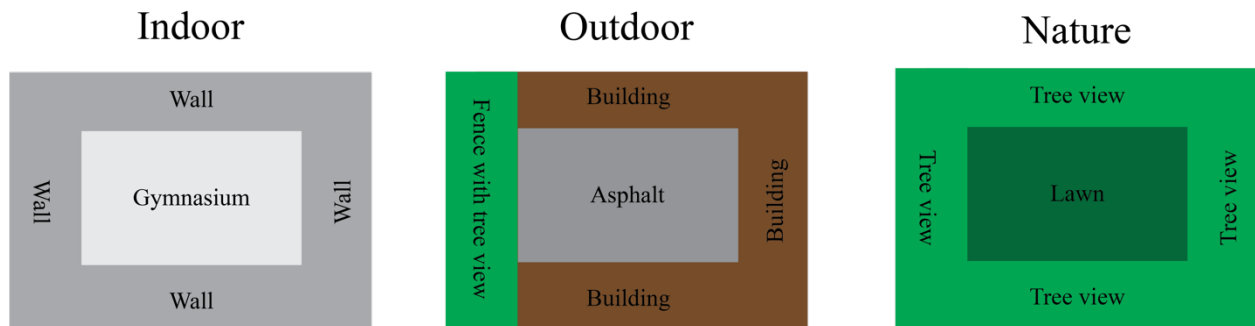


Figure 1. Visualizations of our three treatment conditions.

Bunks were randomly assigned to the order in which they received each treatment and maintained that treatment for the entire week. By utilizing a crossover design, bunks experienced all three treatments over the course of the study in a randomized order.

The treatment conditions were administered during the skills drills and sports game activities in which participants in bunks would practice and play a different sport each week in the gymnasium, terrace, or field. Bunks participated in these activities Monday-Thursday daily for 80 minutes, resulting in 320 minutes of treatment exposure per week. While the sports varied by bunk for any given week, they were always a team-oriented sport (dodgeball, soccer, kickball, etc.). It is important to note that the treatments only were in effect during the skills drill and sports games—other activities including board games, lunch, Counselor’s Choice, and recess took place in whatever space was available to the camp.

Campers were assessed at four separate time points throughout the study. To ensure we had information on participants’ psychological well-being and connectedness to nature prior to our study, we collected baseline data on each participant during the first week of camp before the randomized treatments began. On Thursdays of each subsequent week, our team reassessed all

participants. Due to camp logistics we assessed participants at the beginning of week 1 as opposed to the end of the week. This resulted in the time between Periods 0 and 1 being greater than the subsequent assessments. A schematic of the study design can be found in Figure 2.

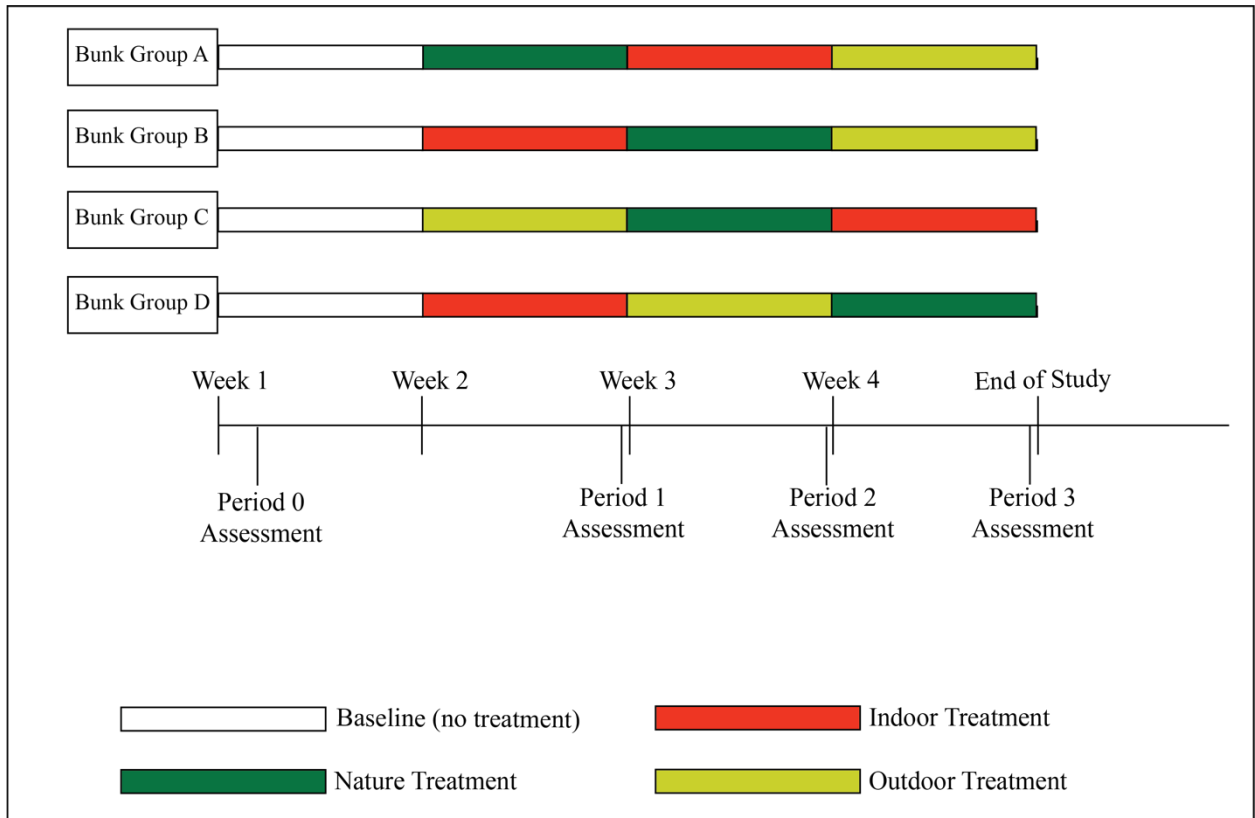


Figure 2. Schematic of study cross over design. Period 0 assessment occurred during Tuesday of Week 1, every subsequent assessment occurred on Thursday.

Outcomes

Our outcomes of interest were campers’ state psychological well-being and connectedness to nature. To assess psychological well-being, we relied on the 10-item Positive and Negative Affect Schedule for Children (PANAS-C short) developed by Ebesutani et al. 2012. The PANAS-C short is a modification of the original 20-item PANAS-C created to assess positive and negative affect in children aged 6-18 (Laurent et al., 1999). Studies have found that spending time in nature can both increase positive affect and decrease negative affect relative to

non-nature settings (Berman et al. 2008; Bratman et al. 2015; Nisbet & Zelenski 2011, Brooks et al. 2017).

The PANAS-C short consists of five items that relate to positive affect and five that relate to negative affect. Respondents are asked to indicate how often they have felt the given emotion (e.g., ‘Sad’ or ‘Happy’) over the past week using a 5-point Likert scale ranging from ‘very slightly’ to ‘Extremely.’ Responses are summed to produce two total scores; higher scores indicate greater levels of positive and negative affect. The scale was internally consistent across all four time points (positive affect $\alpha_{1=}.72, \alpha_{2=}.78, \alpha_{3=}.83, \alpha_{4=}.87$, negative affect $\alpha_{1=}.84, \alpha_{2=}.85, \alpha_{3=}.84, \alpha_{4=}.82$).

Connectedness to nature was assessed using the Connection to Nature Index (CNI) developed by Cheng & Monroe 2012. The CNI was designed to assess children aged 8-12 across a number of environmental metrics including enjoyment of nature, empathy for creatures, sense of oneness, and sense of responsibility (Cheng & Monroe 2012). Due to time restrictions during the data collection period of the summer camp, we limited our data collection to the enjoyment of nature subscale, which consists of 7 questions using a 5 point Likert scale ranging from ‘Strongly disagree’ to ‘Strongly agree’. The scale was also found to be internally consistent across all four time points ($\alpha_{1=}.81, \alpha_{2=}.81, \alpha_{3=}.84, \alpha_{4=}.86$).

Because neither of these scales were originally designed for children with ADHD/ASD, we piloted both the PANAS-C and CNI prior to implementation. Our team attended an afterschool program in the spring and administered both questionnaires to children enrolled in the summer camp. We determined from this pilot that it was best to administer the questionnaires verbally and provide visual aids to assist with the Likert Scales. Both scales and the visual aids used can be found in Appendix B.

Ethics Statement

We worked with the Institutional Review Board (IRB) at the University of Washington to ensure we were collecting and storing data appropriately and that participants were aware of any potential risks of being involved study. Both parental consent and child assent were obtained prior to any data collection and participants had the option to opt out of the study at any time. Our IRB approval number is #52244.

Data Collection

We worked with a dedicated research team hired by the summer camp to collect our data. Prior to the start of the study we coordinated with the team to develop a standardized protocol of data collection, including how to read the questionnaires to the participants, how to answer questions participants had, and how to score and enter the data. All data were deidentified and stored on a secure HIPAA compliant database to ensure participant confidentiality. All responses were double scored and double entered to ensure consistency.

Statistical Analyses

We used a multilevel linear model (MLM) to assess what affect our treatments had on our three outcomes of interest (positive affect, negative affect, and connectedness to nature). An MLM approach was preferred over a linear model because of the nested structure of our study design. Studies with nested data violate the assumption of a linear model that the data points are independent, which leads to inappropriate estimates of the model's standard errors, unless this nesting is accounted for (Finch et al. 2016). Our nested design had two components because we 1) collected data at multiple time points on the same individual and 2) individuals were clustered into bunks. The result was a three level MLM in which responses were nested within participants, who were nested within bunks.

Our model incorporated fixed effects for Treatment (Indoor, Outdoor, Nature), Baseline scores for each outcome, the Period each treatment was administered (1, 2, 3), along with Age, Gender, Ethnicity, and whether the participant has been diagnosed with ASD/ADHD. Bunk (B_i) and Subject (S_{ij}) were added as random effects.

Model 1:

$$\begin{aligned} Outcome = & \beta_0 + \beta_1 Outdoor + \beta_2 Nature + \gamma_0 Baseline + \gamma_{1k} Period_k + \gamma_2 Age \\ & + \gamma_3 Gender + \gamma_4 Ethnicity + \gamma_5 ASD + \gamma_6 ADHD + B_i + S_{ij} \end{aligned}$$

The intercept β_0 in the model can be interpreted as the treatment effect of Indoor. β_1 and β_2 represent the pairwise comparison of treatment effects, essentially: “Is Outdoor better than Indoor?” and is “Is Nature better than Indoor?”. To account for order effect, we assumed a correlation structure between adjacent periods which accounts for the fact that measurement occasions close in time often have a stronger relationship than those further apart (Finch et al. 2016).

The Outcome variable in this model represents the difference between a respondent’s score for a given outcome at a time period and that respondent’s baseline response. Responses from the prior week were treated as baseline values for the subsequent week. This is illustrated in Table 1.

Table 1. Mock dataset for illustrative purposes. The baseline of 3.5 for Period 1 indicates the participant’s score prior to any treatment. The participant’s score of 4 during Period 1 served as the baseline score for period 2. The outcome of the model is represented in the final column titled “Difference”.

| <i>Participant</i> | <i>Period</i> | <i>Baseline</i> | <i>Score</i> | <i>Difference</i> |
|--------------------|---------------|-----------------|--------------|-------------------|
| <i>A-01</i> | 1 | 3.5 | 4 | 0.5 |
| <i>A-01</i> | 2 | 4 | 3 | -1 |
| <i>A-01</i> | 3 | 3 | 5 | 2 |

Results

Descriptive Statistics

We collected data on 79 participants nested within 6 bunks. Because each participant had three outcome scores we were interested in, this study generated 237 relevant data points. One participant was excluded from our analysis due to reliability concerns and eight campers were absent during our assessment days, bringing the final count to 70 participants, or 210 data points. Demographic information of these final participants can be seen in Table 2.

Table 2. Demographic information of participants. Standard deviations are reported in parentheses.

| | <i>Number</i> | <i>Average Age</i> | <i>Percent ADHD</i> | <i>Percent ASD</i> | <i>Percent White</i> |
|---------------|---------------|--------------------|---------------------|--------------------|----------------------|
| <i>Male</i> | 53 | 8.7 (1.17) | 54% | 51% | 62% |
| <i>Female</i> | 17 | 8.82 (1.26) | 65% | 35% | 71% |

The 10 items from the PANAS-C (five positive affect, five negative affect) and 7 items from the CNI were averaged to create composite scores for our three outcomes of interest. The average scores of all participants across each treatment are presented in Table 3. These values are also visualized in Figures 3-5.

Table 3. Average and standard deviation of composite scores of all participants by treatment.

| | <i>Positive Affect</i> | | <i>Negative Affect</i> | | <i>Connectedness to Nature</i> | |
|-----------------|------------------------|----------------|------------------------|----------------|--------------------------------|----------------|
| | Mean | St. Dev | Mean | St. Dev | Mean | St. Dev |
| <i>Baseline</i> | 3.88 | 0.94 | 2.05 | 0.83 | 3.62 | 0.80 |
| <i>Indoor</i> | 3.81 | 0.96 | 1.93 | 0.89 | 3.78 | 0.81 |
| <i>Outdoor</i> | 3.92 | 0.95 | 1.91 | 0.88 | 3.65 | 0.90 |
| <i>Nature</i> | 3.72 | 1.04 | 1.94 | 0.96 | 3.70 | 0.86 |

Distribution of Positive Affect Scores By Treatment

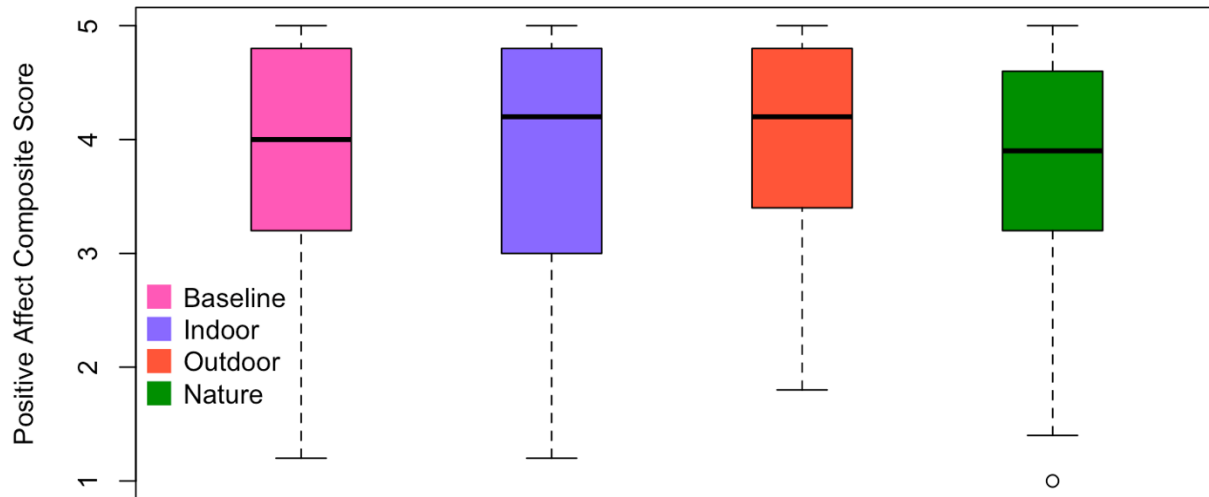


Figure 3. Distribution of positive affect scores by treatment for all participants (n=70).

Distribution of Negative Affect Scores by Treatment

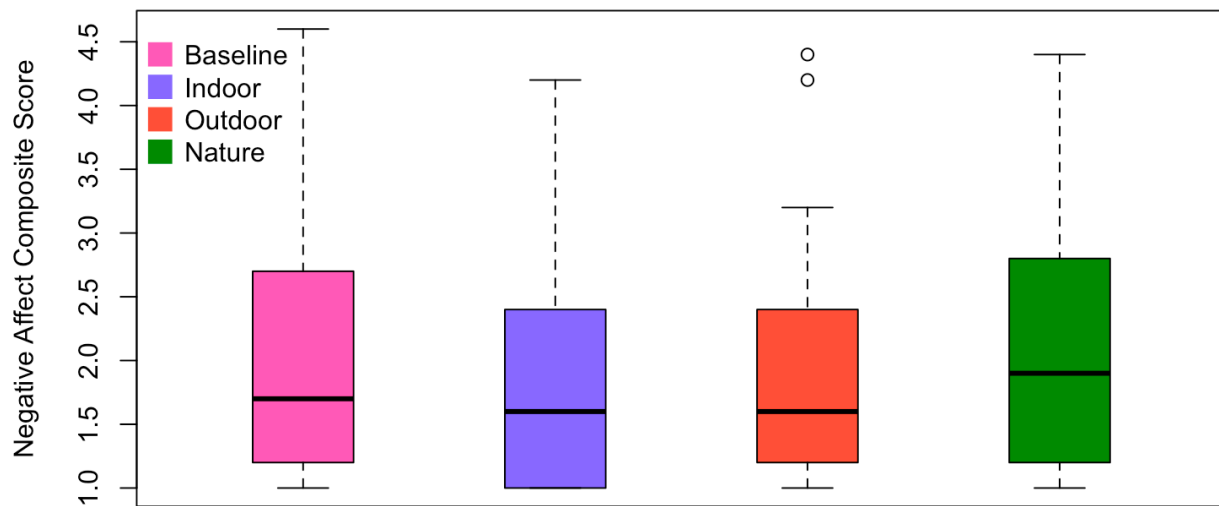


Figure 4. Distribution of negative affect composite scores by treatment for all participants (n=70).

Distribution of Connectedness to Nature Scores By Treatment

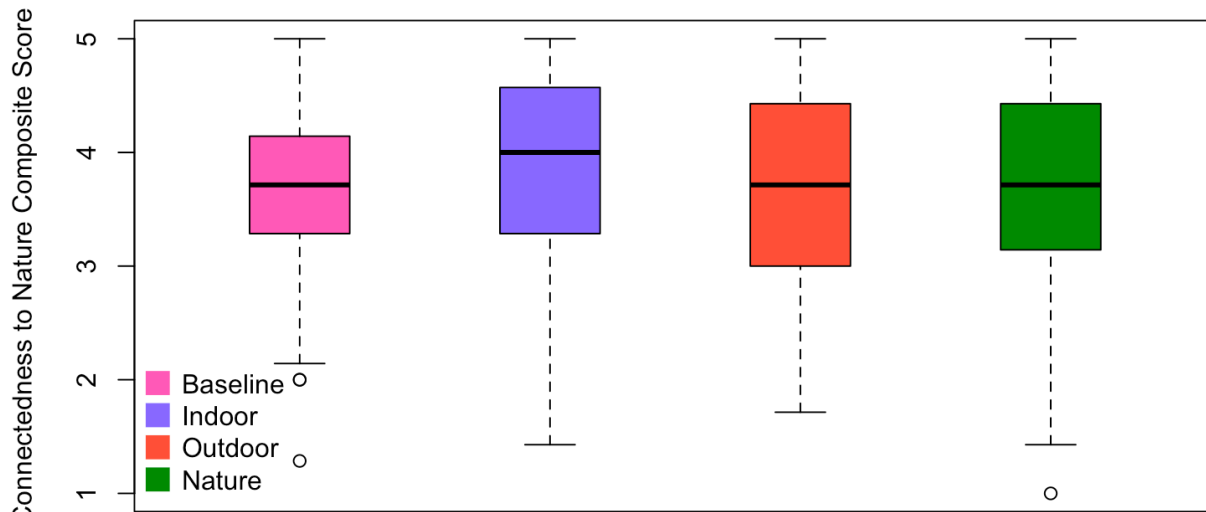


Figure 5. Distribution of connectedness to nature composite scores by treatment (n=70).

Model Results

The results of our model can be seen in Table 4. In addition to this model, we tested simplified versions of our model by removing each of the covariates and observed no significant difference between treatments across any of the models. We also modeled participants’ raw outcome scores (as opposed to the difference between their score and baseline), as well as using a different treatment as our reference (intercept) category and found no difference between treatments.

Table 4. Model outputs for each outcome of interest.

| | <i>Positive Affect</i> | | | <i>Negative Affect</i> | | | <i>Connectedness to Nature</i> | | |
|---------------------------|------------------------|-----------|---------|------------------------|-----------|---------|--------------------------------|-----------|---------|
| | Estimate | St. Error | P value | Estimate | St. Error | P value | Estimate | St. Error | P value |
| <i>Intercept (Indoor)</i> | 3.00 | 1.16 | <0.05 | -0.23 | 0.37 | .55 | 2.48 | 0.91 | <0.05 |
| <i>Treatment- Outdoor</i> | 0.13 | 0.10 | .18 | -0.16 | 0.11 | .13 | -0.09 | 0.08 | .26 |
| <i>Treatment- Nature</i> | -0.11 | 0.10 | .26 | -0.10 | 0.11 | .33 | -0.03 | 0.08 | .66 |
| <i>Baseline</i> | -0.89 | 0.06 | <0.001 | -0.15 | 0.04 | <0.001 | 0.79 | 0.05 | <0.001 |
| <i>Age</i> | -0.03 | 0.09 | 0.75 | -0.00 | 0.29 | .98 | 0.02 | 0.07 | .77 |
| <i>Period</i> | 0.05 | 0.05 | .34 | 0.01 | 0.05 | .81 | 0.03 | 0.04 | .49 |
| <i>Gender (Male)</i> | -0.20 | 0.25 | .43 | 0.13 | 0.08 | .11 | 0.42 | 0.20 | <0.05 |
| <i>ASD (Yes)</i> | 0.24 | 0.25 | .35 | 0.07 | 0.08 | .39 | 0.19 | 0.20 | .35 |

| | | | | | | | | | |
|-----------------------------|-------|------|-----|-------|------|-------|------|------|-----|
| <i>ADHD (Yes)</i> | -0.18 | 0.23 | .45 | -0.00 | 0.07 | .99 | 0.03 | 0.18 | .87 |
| <i>Ethnicity (White)</i> | 0.37 | 0.54 | .49 | 0.41 | 0.17 | <0.05 | 0.44 | 0.42 | .31 |
| <i>Ethnicity (Asian)</i> | 0.33 | 0.64 | .60 | 0.45 | 0.21 | <0.05 | 0.44 | 0.50 | .38 |
| <i>Ethnicity (Latino)</i> | 0.11 | 0.85 | .90 | 0.46 | 0.27 | <0.05 | 0.66 | 0.67 | .32 |
| <i>Ethnicity (Multiple)</i> | 0.39 | 0.61 | .53 | .045 | 0.19 | <0.05 | 0.22 | 0.48 | .65 |
| <i>Ethnicity (Other)</i> | 0.47 | 0.73 | .52 | 0.36 | 0.23 | .12 | 0.01 | 0.58 | .99 |

Discussion

We did not observe any significant differences across our treatment groups. This held true for simplified models we ran as well. As can be seen by our full model outputs, participants' baseline scores were significantly associated with all three outcomes. This was expected, as each camper's outcome was directly calculated using their starting baseline value—the fact that this relationship is significant serves as an important data quality check. While we observed a number of significant associations with participants' ethnicity and their negative affect, these results should be interpreted with caution: several of our ethnicity categories included fewer than four children, including African American (our reference category for the model), Latino, and Other.

This study had a number of limitations that may help explain why we failed to observe a treatment effect. Due to camp logistics, we collected our baseline data on the second day of camp after which there was a full six days before the randomized treatments began. This large gap in time between baseline and the treatment randomization may have negated any noticeable effect the environment had in our outcomes of interest, especially if participants were adjusting to camp during the first week.

Additionally, as stated earlier, due to space restrictions of the site and camp protocol, our treatment conditions were not in effect throughout the entire camp day, but rather only during the skills drills and sports game activities. This means that the 80 minutes a day our participants spent in their treatment condition may have been negated by where they spent the rest of the

camp day. Similarly, we also had no control over where and how campers spent their time when at home, which could have further negated any impact our treatment conditions might have otherwise had.

The nature of the physical activities campers participated may have influenced our findings as well. While all bunks participated in the same activities over the course of the study, we were unable to standardize where the activities occurred because of camp logistics. This means that one bunk may have played soccer out in the field one week, while another bunk played dodgeball in the field the following week. Although each sport activity was chosen to foster similar skills, physical activity, and teamwork, it is possible that the different sports impacted our outcomes in ways that our model was unable to account for.

Another possibility worth noting is that the scales we used may have failed to meaningfully capture our outcomes of interest in this specific population of children. This could have resulted from insufficient comprehension or lack of attention when responding. While this is a possibility, the internal consistency of our scales was found to be consistent with other studies that have used the PANAS-C in children diagnosed with ADHD/ASD (Baldwin & Dadds 2008; Kovac et al 2016). To our knowledge, no study has administered the CNI to this population of children so we are unable to provide a comparison.

One of our study's main strengths came from its partnership with a preestablished summer camp. While operating within a laboratory setting would have allowed us to control for more relevant variables, our approach provided an experimental randomization without interrupting any of the children's camp experience. This allowed us to evaluate our participants in their regular day to day activities, something not many studies are able to accomplish. Moving forward however, it would be worthwhile to investigate our outcomes of interest in a more

controlled setting, as this may be better at detecting smaller environmental differences.

Additionally, future studies should consider investigate other outcomes as well such as stress, anxiety, or other health benefits associated with physical activity. Our findings should encourage researchers to continue investigating the role of physical activity in nature and nature-free settings in non-adult populations.

Conclusion

This study is the first to examine the difference between physical activity in nature and nature-free environments in an experimental context for children diagnosed with ADHD/ASD. The evidence to date suggests that physical activity in natural settings may provide benefits above and beyond equivalent activity in nature-free settings, however this trend was not replicated in our study. We did not observe any differences in children's psychological well-being or connectedness to nature across any of our environments of interest. Further work is needed to determine what benefits arise in this population due to physical activity in nature and nature-free settings.

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Appendix A: Additional Figures

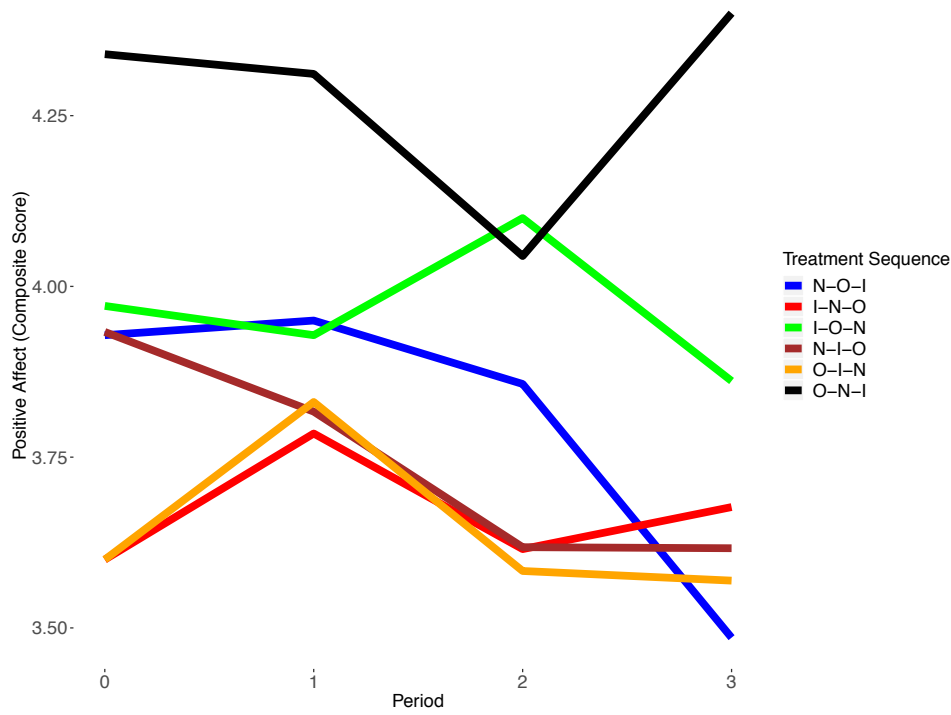


Figure 1A. Composite positive affect scores averaged across each bunk. Each bunk experienced a different sequence of treatments, where N=Nature, O=Outdoor, I=Indoor

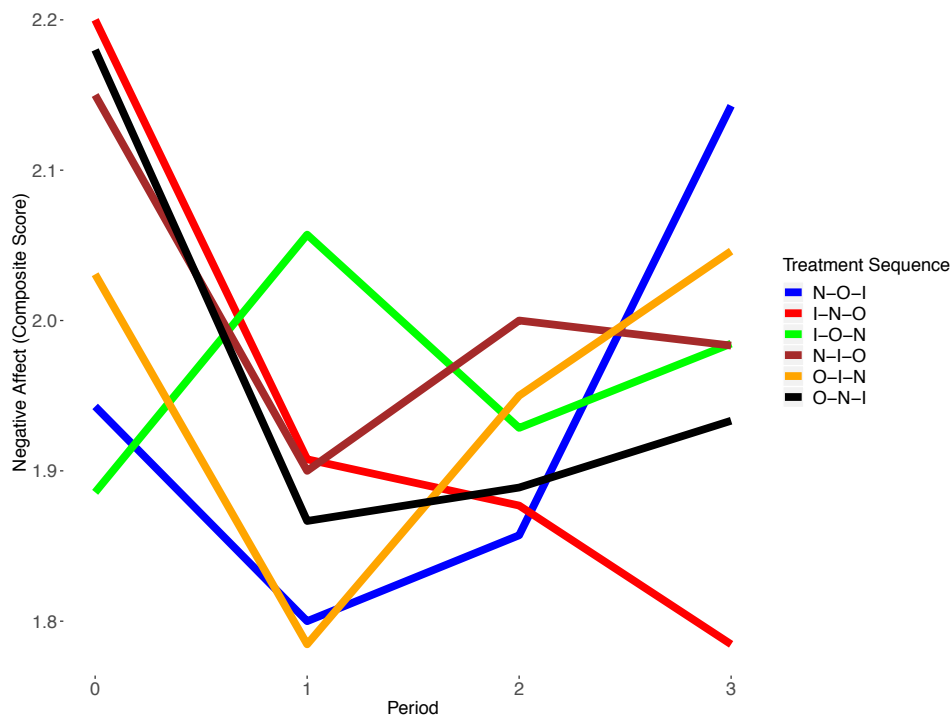


Figure 2A. Composite negative affect scores averaged across each bunk. Each bunk experienced a different sequence of treatments, where N=Nature, O=Outdoor, I=Indoor

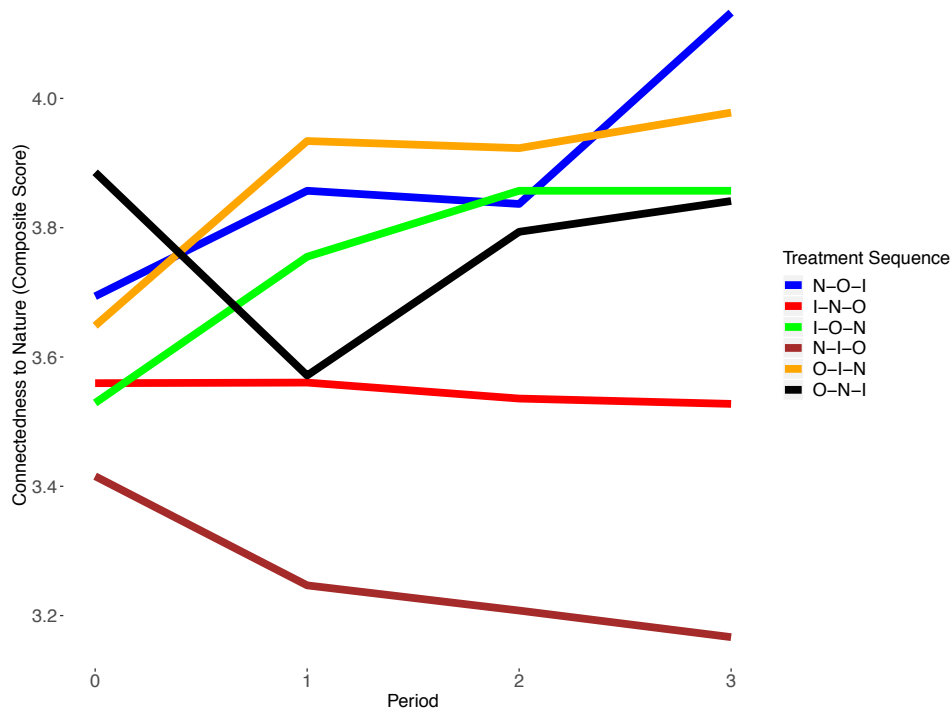
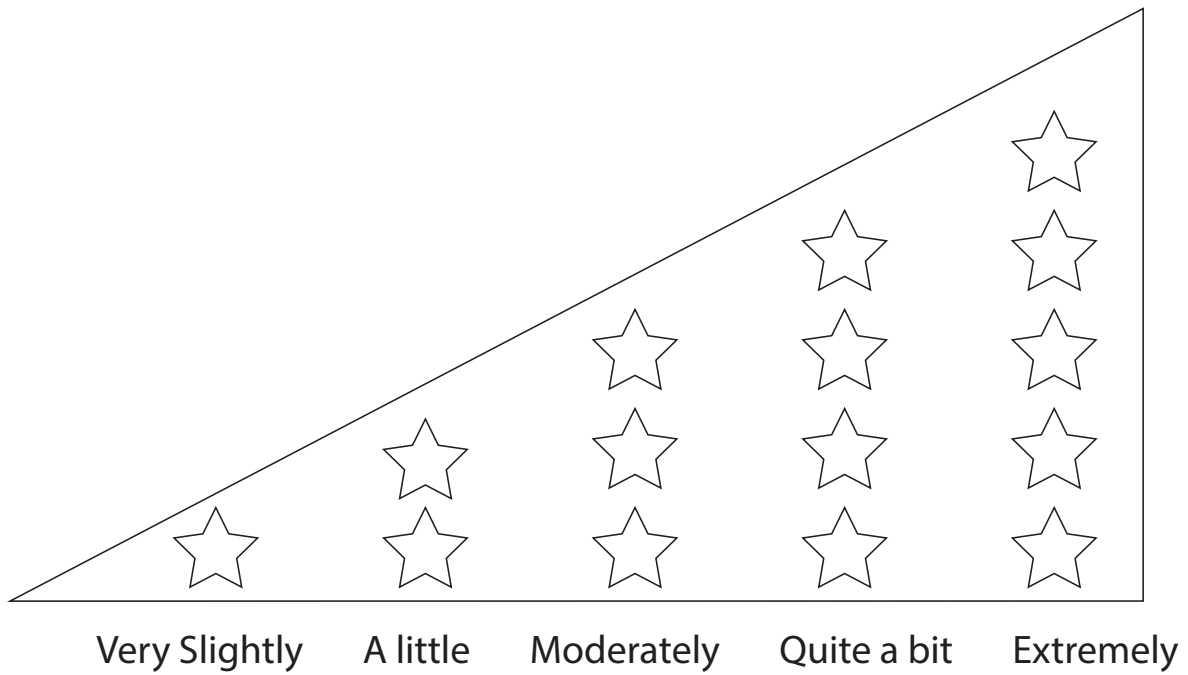


Figure 3A. Composite connectedness to nature scores averaged across each bunk. Each bunk experienced a different sequence of treatments, where N=Nature, O=Outdoor, I=Indoor.

Appendix B: Questionnaire

PANAS-C 10-ITEM

| | 1 = Very Slightly | 2 = A little | 3 = Moderately | 4 = Quite a bit | 5 = Extremely |
|-----------|-------------------|--------------|----------------|-----------------|---------------|
| Miserable | 1 | 2 | 3 | 4 | 5 |
| Joyful | 1 | 2 | 3 | 4 | 5 |
| Mad | 1 | 2 | 3 | 4 | 5 |
| Lively | 1 | 2 | 3 | 4 | 5 |
| Proud | 1 | 2 | 3 | 4 | 5 |
| Afraid | 1 | 2 | 3 | 4 | 5 |
| Scared | 1 | 2 | 3 | 4 | 5 |
| Happy | 1 | 2 | 3 | 4 | 5 |
| Sad | 1 | 2 | 3 | 4 | 5 |
| Cheerful | 1 | 2 | 3 | 4 | 5 |



Connection to Nature Index

1 = Strongly disagree 2 = Disagree 3 = Neither agree nor disagree 4 = Agree 5 = Strongly Agree

1. I like to hear different sounds in nature _____
2. I like to see wildflowers in nature _____
3. When I feel sad, I like to go outside and enjoy nature _____
4. Being in the natural environment makes me feel peaceful _____
5. I like to garden _____
6. Collecting rocks and shells is fun _____
7. Being outdoors makes me happy _____

