Investigating the Social Benefits of Natural Turfgrass in Urban Areas

Full Report Year 1

Eric Watkins PI, Michael Barnes Co-PI
Department of Horticultural Science, University of Minnesota Twin Cities

Introduction: Natural turfgrass lawns in both home yards and public green spaces have been a source of contention in recent years as both homeowners and municipalities struggle to balance a strong desire for natural turf in those spaces alongside environmental and budgetary concerns. In this environment artificial turf has grown in popularity across public and private land applications especially within the sports field context. Despite this growth however, research is severely lacking on both human health and well-being and ecological impacts of artificial turf surfaces.

Our two related objectives of this project were to (1) understand perceptions of the health, well-being, and recreational benefits between artificial and natural turfgrass lawns among users of those surfaces and (2) examine perceptions around sustainability and environmental aspects between the two surfaces.

Executive Summary

The current project utilized an online survey of nearly 1,000 individuals across the United States to understand their perceptions towards artificial turf compared to natural turfgrass related to likelihood of use, sustainability, and well-being. First, likelihood of use was higher for natural turfgrass across all but one use case (organized sports). These differences were statistically significant and small to moderate in effect size, meaning they may impact individuals future use of a surface. Additionally, differences were substantially impacted by the turf surfaces inherent qualities rather than labeling of surfaces as artificial or natural. This means that individuals are more inherently aware of at least a handful of the qualities of each type of surface without the need for outright labeling. Second, natural turfgrass was seen as more favorable related to an index of sustainability questions, meaning that individuals saw natural turfgrass as generally more sustainable than artificial turf. This difference occurred without impact of information about each surface presented to participants. Third, participant responses contained no differences on well-being measures. This could be related to the focus on the surface types themselves rather than the broader landscapes which are more commonly used to assess well-being.

Taken together these findings present preliminary information that natural turfgrass is a) slightly more likely to be used more than artificial turf surfaces across a broad range of use cases and b) that individuals view natural turfgrass as moderately more sustainable than artificial turf. This work should be continued and expanded upon by including in-person surveys alongside interviews. These can be used to assess specific characteristics of each surface type that are more or less favorable to individuals as well as to understand if the existing differences persist and possibly increase when individuals are exposed to artificial and natural turf in-person.

Methodology

An online survey was conducted in September of 2020 which was designed on Qualtrics™ and distributed via Amazon Mechanical Turk (MTurk). Respondents had to be located in the United States, be 18 years of age or older, and consent to participate in the study. A national sample was used to ensure diverse

representation across the country and not to limit findings to specific park/green space types that might be more or less common in different regions of the United States. Respondents were randomly put into one of two groups receiving a survey with either labeled photos of artificial and natural turfgrass or unlabeled ones. Respondents completed the survey which took on average about 5 minutes to complete, and answered questions about themselves, how they might use turfgrass lawns, and their perceptions of artificial and natural turfgrass surfaces related to their likelihood of use, feelings of well-being, and attitudes towards the sustainability of each type of turfgrass surface.

Results

In total we received 1,012 responses to the survey, after data cleaning a total of 931 surveys were included for analysis. Results are broken down into the main question categories, beginning with the sample sociodemographics, then the uses of lawns, use differences between artificial and natural turf, sustainability beliefs between artificial and natural turf, and finally well-being differences between artificial and natural turf.

Sociodemographics

Sample sociodemographics are in Table 1. Broadly the sample was representative of racial diversity within the United States with moderate underrepresentation of Caucaisan/White, Hispanic/Latino, and Mixed/Biracial individuals by a range of 2-9% compared to census data. There was also an underrepresentation of female individuals, and the sample was slightly younger than the national average. Additionally, the current study had younger participants than many previous surveys which is a benefit in terms of looking at a broader range of individuals. Regional differences were also generally in line with the population, with the West being moderately overrepresented compared to other regions. Most of the individuals in the sample had children, and also had pets.

Table 1. *Sample Sociodemographics*

Variable	**n**	**%**	**Variable**	**n**	**%**
*Race/Ethnicity**			*Geographic Region****		
Caucasian/White	513	57.8	South	314	33.7
African American/Black	189	21.3	West	291	31.3
Asian American/Asian	115	13.0	Midwest	165	17.7
Hispanic/Latino	55	6.2	Northeast	161	17.3
Native American/Indigenous	10	1.1	*Have Child(ren)*	692	74.3
Mixed/Biracial	5	0.6	Younger than 5 yrs. old	263	38.0
*Gender***			Child(ren) 5 - 11 yrs. old	348	50.3
Male/Masculine	619	66.6	Child(ren) 12 - 17 yrs. old	146	21.1

	Female/Feminine	310	33.3	Older than 17 yrs. old	95	13.7
	Non-binary	1	0.1	*Have Pet(s)*	748	80.5
		Mean	**SD**	Dog(s)	631	84.3
Age		35.6	10.6	Cat(s)	258	34.4

**Race/Ethnicity categories were created from terms used by survey respondents.*
***Gender categories were created from terms used by survey respondents*
****Geographic region designations follow US census regions as follows. South: AL, AR, DC, DE, GA, FL, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, WV. West: AK, AZ, CA, CO, HI, ID, MT, NM, OR, UT, WA, WY. Midwest: IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, WI. Northeast: CT, MA, ME, NH, NJ, NY, PA, RI, VT.*

Sociodemographic takeaways

- Racially and regionally generally representative of the US population
- Lower female representation then would be expected
- Younger age group of respondents compared to both the population and previous studies
- Majority of individuals have children and pets

General Turfgrass Lawn Uses

Respondents were asked generally how they used areas of turfgrass and were presented with 10 different options as well as the ability to specify another use if they wanted to.. This question didn't specify the specific surface types to obtain a baseline of activities that each individual might use one of these spaces for. Overall, respondents used turfgrass surfaces for a variety of activities as seen in Figure 1.

Figure 1. *Percentage of combined sample that utilized a turfgrass area for various activities*

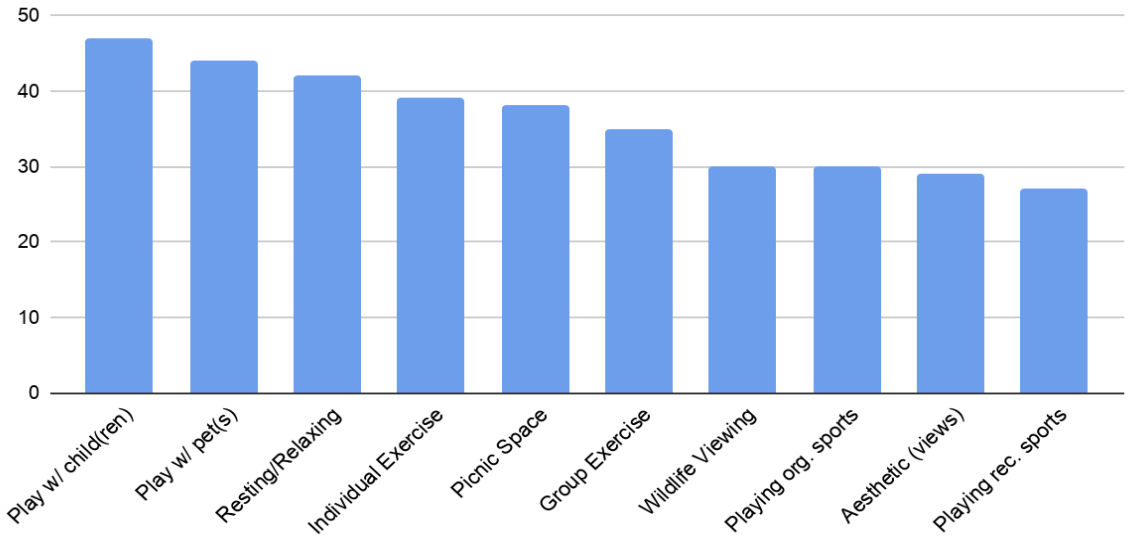


Figure 1 presents combined sample data, as the only significant correlations to use were individuals having a child or a pet and the related uses, (e.g., someone that has a child is more likely to use a turfgrass space to play with a child). There were not any other significant regional or specific sociodemographic relationships to use found. Playing with a child and a pet were the most common uses of turfgrass spaces with 47% and 44% of the total sample respectively. Less common uses were related to playing recreational sports (27%) and aesthetics or viewing (29%). If we look across the range of activities there is a wide utilization of turfgrass surfaces that encompass individual activities and activities with others. The less common utilization of turfgrass for sporting activities could be due to individuals thinking of open areas of turf as opposed to more structured athletic fields (e.g., baseball diamond). The lower rating for aesthetics could be due to individuals' thoughts of turfgrass spaces as being more utilitarian than picturesque, especially in the context of public green spaces.

Lawn use takeaways

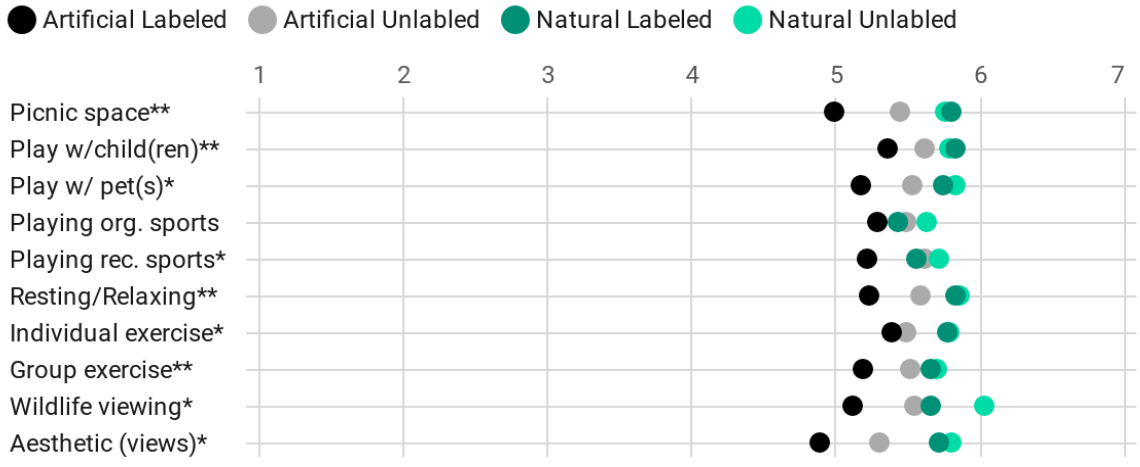
- No use case was utilized by a majority of respondents
- Playing with one's children and pets were the most common uses
- Playing recreational sports and viewing (aesthetics) turfgrass lawns were the least common uses
- Individuals with children and pets were significantly more likely to utilize turfgrass surfaces for those respective reasons.

Likelihood of Use Differences between Artificial and Natural Turfgrass Lawns

Respondents were asked how likely they would be to use their previously selected uses on each type of surface to see if differences emerged between them; this was also compared to the groups established earlier to see if labeling the surfaces created further differences between artificial and natural turf. The scale was a 1-7 Likert type scale ranging from 1 being ‘Extremely unlikely’ to 7 being ‘Extremely likely’. Overall, we see a consistently lower rating for artificial turf surfaces compared to natural turf surfaces across all use cases especially in the labeled artificial group (see Figure 2). Two statistical procedures were conducted to see if such differences were significant.

Figure 2.

Dot plot of mean scores of four study conditions. Dots farther to the right indicate more likely.



**Significant difference between lawn type conditions **Significant difference between both lawn types and label conditions*

Activities with a single asterisk identify where there were significant differences between an individual's likelihood of use only based upon the photo being artificial turf or natural turf. Activities with double asterisks identify significant differences for both turf type and labeling of the photos. Generally, we found that there is a more robust effect of the type of turf itself rather than the labeling. This suggests that individuals were less positive about artificial turf surfaces just through viewing them without the need for them to be labeled. It's important to note that while significant differences were found, the practical effects were small. The interpretation of this is that people were 'Moderately likely' to use natural turfgrass lawns and 'Slightly likely' to use artificial turfgrass lawns across most activities. The only use with no difference between all conditions was playing organized sports. This could be due to the high level of adoption of artificial turf surfaces for organized sports at many levels of competition, and individuals are used to both experiencing them directly and seeing them in use in person or on TV.

Use differences takeaways

- In 9 out of 10 use cases individuals were more likely to use natural turfgrass lawns than artificial
- Significant differences were found in 9/10 use cases favoring natural turfgrass lawn use
- Labeling surfaces had a minor effect compared to the surface type itself
- Playing organized sports had no differences between surfaces most likely due to its common adoption for formal sporting events.

Sustainability Beliefs Pre-Post

Respondents answered 5 sustainability questions in a pre-post fashion, meaning they answered 5 questions about artificial and natural turf then they were presented with information about both surfaces, and then answered the same questions again to see if any differences appeared before and after and between surface types. Scale items were measured on a 1-7 Likert scale with 1 = strongly disagree and 7 = strongly agree. All items were averaged together to create a sustainability index, item means are presented in Table 2. Generally, you can see small differences between the surface types, especially in the items 'environmentally friendly' and 'contributes to ecosystem health'. Additionally, the pre-post means are generally the same across all items.

Table 2. *Pre-post sustainability items beliefs*

	Artificial		Natural	
	Pre *M(SD)*	Post *M(SD)*	Pre *M(SD)*	Post*M(SD)*
Made of sustainable materials	5.09(1.52)	5.02(1.51)	5.32(1.50)	5.30(1.55)
Environmentally friendly	5.13(1.55)	5.05(1.58)	5.55(1.39)	5.54(1.41)
Uses less natural resources	4.88(1.59)	5.01(1.61)	4.81(1.67)	4.96(1.67)
Contributes to human health	4.93(1.56)	4.92(1.55)	5.36(1.43)	5.37(1.42)

Contributes to ecosystem health	4.92(1.66)	4.79(1.66)	5.39(1.51)	5.38(1.49)

When analyzed as a complete index a significant difference was found between artificial turf and natural turf across the types, this effect was small to moderate for natural turfgrass being more favorably viewed related to sustainability than artificial turf. There was no significant difference between the pre and post conditions, meaning that the information presented to participants did not impact their ratings of the surfaces in a meaningful way.

Sustainability beliefs takeaways

- Individuals broadly held more positive views of natural turfgrass as related to sustainability across multiple items compared to artificial turf
- An overall significant difference was found whereby natural turfgrass was rated as more favorability on the sustainability index than artificial turf
- No differences were found between pre-post measures, no effect of information on respondents' views.

Well-being

Respondents were asked to reflect on how experiencing each surface might make them feel towards a series of responses related to aspects of well-being (e.g., *This is a place which is away from everyday demands and where I would be able to relax and think about what interests me*), each item was measured on a Likert scale of 1 = not at all and 7 = a great deal. The items in this section were indexed in the same way as the sustainability items. The indexed mean for artificial was 4.02, and 4.09 for natural turf. No significant differences were found between the two surface types or between individual items. This could be due to the similarity of the scenes and the focus on the turf surfaces rather than the broader vegetative landscape.

Well-being takeaway

- Both items and index were not found to contain any significant differences between artificial and natural turf surfaces.

Future Research Needs: Although this project provided a wealth of new information regarding social perceptions of the benefits of natural turfgrass significantly more work needs to be conducted to narrow in on: a) specific characteristics of each type that individuals find favorable or unfavorable b) if the significant differences found via an online survey increase when participants interact with such surfaces in-person and c) how natural turfgrass relates to other types of common urban vegetation related to individuals perceptions of both use, as well as well-being.