ABSTRACT
The dog park going experience has the potential for many positive experiences for dogs. Through observations, interviews and focus groups, we designed Barks & Rec, a cooperative system that encourages community connections and behaviors awareness in dogs park goers through interweaving the dog park community. With activity tracking integration, our design allows for owners to keep tabs on their dog’s activity while contributing to community goals and encourages pet awareness.

ACM Classification Keywords
H.5.m. Information Interfaces and Presentation (e.g. HCI): Miscellaneous

Author Keywords
weight management, animal wellbeing, community-based intervention

INTRODUCTION
For many dog guardians, dog parks provide a multitude of benefits for canine wellness. First and foremost, the park environment allows for unleashed socialization for both canine and human companion. Dogs can encounter a wide variety of playmates to explore the park with, as well increased exposure to other humans. Increased socialization is linked to less anxiety and improved confidence [9], which can lead to improved overall wellness for canines.

Engaging in an active lifestyle with a dog can have a positive impact on health (for canine and human). Dog parks provide an environment encouraging play and exploration that can result in increased physical activity, which is an important factor in weight management [4]. The Association for Pet Obesity Prevention (APOP) estimates that in the United States in 2018, 56% of dogs were considered to be overweight or obese and the number continues to climb each year [1]. Obesity can make dogs more liable to a variety of health complications such as diabetes, cardiovascular and joint problems, and is associated with a shortened lifespan [22].

Lastly, the park gives human companions a new view into their dog’s world. The dog-centric quality time can strengthen the human-dog bond through actively focusing and engaging with one’s dog. This also extends to learning different dimensions of a dog through observing social interactions and being mindful of how the dog is experiencing the park.

The focus of this paper is creating a socio-technical system for park goers that provides attendance information, encourages physical activity, and promotes pet awareness.

RELATED WORKS

Dog Park
Visiting the dog park can be exciting for humans and dogs alike. For humans, park visits have a positive impact on health through engaging in moderate physical activity [21]. Dog guardians perceive the dog park to be a positive physical activity for their dogs as well [14]. Social activities such as playing and greeting other dogs is highest at the beginning of a visit, and gradually tapers off [10, 11].

Most dog parks are public, and welcome all dogs during open hours. These public parks have a few guidelines (such as minimal age and spay/neutered status), which allows many dog guardians to introduce their dogs. This can be a very stimulating time for a canine, with new smells and sounds that are abundant in the park, on top of new playmates. When determining if two unfamiliar dogs will get along, there are many attributes such as age and extroversion level that should be considered for a positive experience [5, 10, 11].

Dog Walking
Along with attending the dog park, walking a dog has been shown to have a positive impact on both human and dog health [7, 8, 13, 20], including the increase in overall physical activity [6, 25]. While not as social as the dog park, walking a dog allows individuals to engage with others during the walk [15] and may help dog walkers cope with their anxiety [26].

When encouraging humans to be more active, interventions have been shown to have a positive impact. This includes...
Dog Tracking Technologies
For tracking canines activity and health, commodity products are available and technical designs that have been presented. From canine bathroom break social media [2] to collar based activity tracking [24], new technologies are being explored to collect and analyze activity information about pets. Using tracking technology, higher activity has been correlated with a lower body condition score (BCS) [23] and human motivations for using pet trackers can be attributed to curiosity and increasing physical activity. [27]

METHODS
We explored the relationship between engaging the dog park community socially and increasing canine physical activity within the context of a design course project. We started by creating a scenario based on informal observations and interviews at a public Midwestern dog park with the goal of identifying areas that may be improved through technology. From these preliminary observations and interviews, design opportunities were identified. These findings were iterated on with participant feedback from focus groups. Finally, we crafted a prototype based on the improved design opportunities uncovered, and received preliminary feedback from dog park goers and guardians, which is explored in this paper.

Dog Park Observation and Interviews
Observations were conducted by a single researcher (KK) for approximately an hour and a half twice a week for 8 weeks (for a total of 16 sessions). These observations were mostly carried out at peak park times during the evening, also including two sessions in the morning before the workday and three in the early afternoon to potentially identify differing perspectives, behaviors, and situations.

<table>
<thead>
<tr>
<th>#</th>
<th>Location</th>
<th>Gender</th>
<th>Dog Breed</th>
<th>Size</th>
<th>Age</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Park</td>
<td>Female</td>
<td>Mix</td>
<td>Small</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>Park</td>
<td>Male</td>
<td>shepherd Mix</td>
<td>Large</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>Park</td>
<td>Male</td>
<td>Beagle Mix</td>
<td>Small</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>Park</td>
<td>Female</td>
<td>Lab</td>
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<tr>
<td>5</td>
<td>Campus</td>
<td>Male</td>
<td>Mix</td>
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<tr>
<td>6</td>
<td>Campus</td>
<td>Female</td>
<td>Labradoodle</td>
<td>Large</td>
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</table>

Table 1. This table shows the makeup of the prototype feedback participants. Participant age and race was not collected. Dog breeds were self reported by the dog’s guardian. Dog size was broken into 3 groups: Small ( < 30 lbs), Medium ( 30 - 60 lbs), and Large (>60 lbs). Age is an approximate in years.

These observations were discussed with a design team, and a design scenario was crafted.

Design Scenario
To gauge the usability of our design, we prompted 24 individuals for feedback from a short comic (see Figure 1) for 20 minutes. These individuals came from a range of expert experiences including mobile app development, human-centered design, and microcontroller development. The participants also self-reported an affection for dogs, with six being dog guardians. Participants were organized into six groups based on their expert area, with each group having two design experts and two technology experts to ensure both perspective were included at each session. An accompanied prompt was given as a handout as well as spoken. Feedback was received both verbally through the discussions and individually written at the end of the sessions. Participants were not compensated. This information was collected and thematically analyzed through affinity diagramming to identify crucial design improvements [3].

Prototype Feedback
After receiving the focus group feedback, we crafted a working prototype for further feedback. Feedback was gathered from in-person interviews at the local dog park, and interviews with dog guardians on a university campus (See Table 1). Participants were recruited in-person, and interviews lasted about 10 minutes on average. Participants were not compensated for these interviews.

RESULTS
From our first observations and interviews, we identified that dog park goers above all wanted their canines to have a positive experience at the dog park followed by the desire to know real-time park attendance. Our observations also uncovered human behaviors present at the park that may impact the park experience for both dog and humans alike.

These findings led to a mobile system design that presented dog park goers with the current attendance at the dog park. The focus group discussions highlighted the importance of going beyond an attendance system and designing for enhancing the dog park experience in general through community features that encourage physical activity and socialization for dogs and humans.
From this, we created a system designed to be integrated into the dog park going experience. Focusing on community bonding and canine wellness, the system encourages physical activity as well as mindfulness about a dog’s behavior.

**Dog Park Observations**

The humans in the park usually congregated underneath the shaded shelter, with a few venturing to the center of the field to throw a ball for the dogs. The shelter had two picnic tables diagonally placed underneath along with large water buckets for the dogs from the washing station that were filled on an unspoken, socially pressured basis by any dog park goer. For example, a Newfoundland puppy guardian was almost constantly refilling the buckets as their puppy tended to knock all the water out in an exciting game of water fun. While most of the park was covered in short, rough grass, the immediate area around the shelter was bare earth. The dusty tan flooring filled the area with debris each time a pack of dogs rushed by. Most of the humans stayed within 20 feet of the shelter and held light conversations (see Figure 2). Some were familiar with each other, as they are regulars to the park, and they expressed delight at seeing not only the humans but the familiar dogs too. Others stood silently nearby, slowly pacing near the shelter with a close eye on the canines. Most hands contained a smart phone at some point that were periodically checked to find and stay in contact with other users’ whose dogs get along well. These hands also held the leashes used to bring the dogs to the park, with the gentle cling of metal ringing out as individuals slowly moved about the dusty area.

The dogs drastically contrasted this behavior, as they made full use of the field space, running together in small groups (around 3-4 dogs) that dynamically changed, each pack gracefully colliding with one another. Some dogs habitually checked in with their guardian, taking breaks for water and ensuring their companion was still present. Others rarely glanced toward the shelter, preferring to examine the far reaches of the field, free of a leash. These free spirit dogs were also keenly aware of avoiding their guardians once approached with a leash in hand, beginning the commonly seen game of chase many attendees experience.

As with any grouping of animals, negative behaviors were noted. Those familiar with the park were vocal through whis-
Figure 3. On the left is the home screen for the app that displays a local park with activity information as well as if a known dog is currently checked in. Individual information about a dog is found in the "My Pet" tab, and park specific information such as events and goals is accessible through the "my park" tab. The right side shows the app screen for when a user is at the park (based on location information).

Increased activity as the primary motivation. Some examples given were group step count and distance goals.

Privacy Concerns
The subsequent discussed item was complex concerns regarding the information tracked by the design and who would have access to these data. Participants were comfortable with sharing general information (such as canine age, activity level, and breed) with other users, but preferred more detailed information (such as contact information) to be only seen by approved users. However, this was paired with a desire to see the detailed information of other users.

From the above feedback, we shifted our original design and crafted a physical representation.

Barks & Rec Mobile Application
Our prototype is designed for the android platform and is supported by Google Maps and Firebase, as well as optional FitBark (a commodity dog physical activity tracker) integration. We display real-time data in our app, with all current users being able to see any updated information almost instantly with a wifi or cellular connection.

Before attending the park, our system can begin to aid the potential park experience. A human user can log in to their account, and see the current attendance of the their dog park (see left screen of Figure 3). If a user has chosen to connect with another dog park goer, the screen will also display if a known dog is present.

Once a potential park goer decides to attend the park, the app allows them to ‘check in’ once they arrive (See Figure 3 right screen). This is to preserve the privacy of dog park goers to the current accepted level, as park goers can only know who is present once they are co-located. This allows their dog’s name to appear on the screen of connected user’s homepage (and potentially notify them if they set notifications active).

If a dog park goer chooses to not check in, they will be added anonymously to the total number of current dog park attendees for those viewing the park attendance.

While at the park, park goers can choose to participate in different park physical activity goals, both at an individual level and a community level. For individual goals, the human can opt into a goal with a recommended style of physical activity for that goal (e.g., 500 activity points from playing fetch). At the community level, dog park goers can choose to contribute the activity points registered by a fitbark to the community’s activity goal (which can be set to last for a week).

Once the dog and human have completed their park trip, the human can rate their perceived dog’s experience on a five point scale. While not shown in the prototype, this data would be collected and analysed to inform the user of patterns that may contribute to their rating (e.g., higher rating being common with smaller park attendance). This information can then assist the guardian in making more informed decisions on park attendance, based on their dog’s wellbeing.

Prototype Feedback
After creating our prototype, we interviewed participants to elicit feedback regarding what they liked about the system and potential improvements. Participants were able to handle a smartphone with the app installed. All logged in using a preset account and could view real-time data, facilitated by a researcher manipulating the database values manually to present the functionality of having multiple users active.

The first critique was for more information about other dogs in the app, similar to the findings of the focus group. Participants inquired about accessing more information about other dogs at the park, such as biographic information (e.g., Breed) and contextual information (e.g., current length of visit).

"What about breeds? I want to see breeds, like, what if there’s a I don’t know, a golden retriever. I want to know." (P1)

"What about how long the dogs have been in the park?" (P2)

This desire for more information extended to include data about the park itself. They wanted more specific information about the park, such as amenities available.

"What about a map of the actual park, like where different areas are. Like with symbols for water or shelters" (P1)

"This would be great, you should have options for the parks, so like there is, um, more information about what the park has, like poop bags or different size areas. That would be good" (P6)

Lastly, participants wanted a stronger connection with others. This includes communicating with other users as well as being able to share information with friends and family.
"I like that I can put my own dog pictures in, can I put multiple in? I want to show all his good pictures" (P5)

"Can I message others in the app? Like to see if they will be going to the park later? [Dog’s name] loves this little terrier that comes. I’d love to have them play more" (P4)

Overall, the layout of the app was well received. Participants liked being able to check-in and appreciated the dynamic change in layout based on proximity to the park. They wanted more information about other dog park goers and dogs, as well as connect with them through the app itself.

DISCUSSION

From this design journey, we reflect on the key points discussed by participants as well as improvements we would make to the system.

We were able to identify a specific need that technology could aid with for the dog park. We started with intentions of informing park goers of general attendance, but through observations and discussions it became clear the real motivating factor for many of the humans was to provide the best experience they could for their dogs as supported by previous work [14]. While the dog park allowed for pleasant social interaction between attendees, the focus was always on the dogs. From excitedly reminiscing on the joys of puppyhood to mutual rants around tick season, the humans connected about their dogs with a watchful eye on their canine experiencing the park. When negative dog-dog or dog-human interactions occurred, the park goers immediately addressed the situation highlighting the priority of canine safety.

This leads to the first change to our design, of documenting a dog’s behavior during the visit. In a future system, we can see the potential positive impact of quick check-ins during a park visit of dog behavior. This would allow park goers to track their dog’s experience of the park throughout the visit, as well as educate less informed park goers of dog behaviors (particularly those that are stress and anxiety signs). Park goers can be prompted on a few quick questions with pictured examples. This could be asking how a dog is currently holding their tail (if applicable) and ears, their current activity (running, sniffing, laying down), and the current size of their "pack" (solo, paired, trio, or more). Because park goers already check their devices relatively frequently when at the park, this would be a low burden check-in for them to be able to collect data to increase their pet wellness awareness. This can be paired with the option for a more in-depth post-park survey, encouraging a park goer to take notes about the trip (such as positive playdates or scuffles) and reflect on the overall experience in context of the check-in points data.

Secondly, we realized while addressing rule breaking is a complex issue, we can be adamant about ensuring the rules are visible. When visiting the park, the first thing that can appear on the screen is the list of rules at the park for an attendee to review before entering.

We also examined some of the complexities of data privacy for socio-technical systems with the mismatched participant views of wanting access to a large amount of data while only giving access to a little of their own. This can pose a problem to application design, as finding the line between comfortable self disclosure and sufficient profile information to create a connection. This is particularly involved when a park goer may wish to avoid a certain dog. On one hand, the system could have a "blacklist" mechanism to inform the user when another dog park goer on the list is currently at the park, regardless of if they checked in or not. We worked with the idea of simple displaying the number of "blacklisted" attendees present, however quickly realized this can have a privacy concern. If the list only contains one entry, then the anonymity of that attendee is taken away without them checking in. Future work will need to be conducted to carve out this line.

Lastly and most importantly, any system must be evaluated from the dog’s perspective. Using recommendations from the ACI community [18], future designs and deployments should include evaluations to ensure a positive impact for all stakeholders and allow the dogs a voice in the design. Because the goal of this system is to improve a dog’s experience, such evaluations may use physical activity, cortisol levels, and body language to get a glimpse into how the canine experience changes and ensure a positive impact. Special care needs to ensure increases in physical activity are not due to stress or negative interactions (Like pacing and fighting).

LIMITATIONS

Interviews were conducted at a dog park located in a midwestern rural area in the United States and may not be generalizable to other dog park communities. Along with this, the feedback received was from a small group of participants which may not include all perspectives from this community.

CONCLUSION

We identified an area for technology to be integrated into the dog park community utilizing guardian park going motivations. From preliminary discussions we crafted a socio-technical system and talked with the dog owner community to see how the system would fit into their own expectations and wants. Overall, we found the focus should be placed on the social components, and the physical activity can be woven into those components to encourage a healthy lifestyle. We discussed opportunities to increase pet awareness through the dog park going experience. Future work in this area should examine the impact of deploying similar systems and ensure a positive impact for dogs and humans alike.

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References


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