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Systematic Observation of Physical Distancing Behaviors of Trail Users During the COVID-19 Pandemic

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Abstract

During the early months of the COVID-19 pandemic, opportunities for indoor and sometimes outdoor recreation were restricted across the world. Despite restrictions, many greenways and rail-trails saw increased use. Messaging from the federal and state public health authorities stressed the importance of social distancing and other preventive measures in reducing spread of the coronavirus. Little is known about actual behaviors of individuals and groups using these outdoor recreational opportunities. This study used passive infrared cameras to systematically observe physical distancing behaviors on multi-user trails in Boone, North Carolina, and Morgantown, West Virginia, to assess safety implications of trail use during June 2020. Most interactions (72.2%) occurred with the recommended six feet of distance between users. Maintaining six feet of distance is more likely to occur when a single individual passes another single individual (88.2%), users pass while traveling in opposite directions (75.9%), and trails are wider (76.8% on 12 ft width trail vs. 62.6% on a 10 ft width trail). Messaging on multi-user trails should target how groups pass other groups, such as “keep six feet” and “pass single file.”

Keywords: built environment, greenways, rail-trails, social distancing

During the early months of the coronavirus disease 2019 (COVID-19) pandemic, governing bodies around the world used various strategies to mitigate the spread of the disease such as stay-at-home orders, mandatory mask wearing, and rules for physical distancing (University of Oxford's Blavatnik School of Government, 2020). Several of these policies restricted access to indoor and outdoor places that promote physical activity, including the closure of parks, trails, and fitness facilities, along with the cessation of recreational programming (Shahidi et al., 2020).

Although restrictions may have limited physical activity in many settings, greenways and multi-use trails in the United States were particularly busy after COVID-19 restrictions were instituted in March 2020. According to publicly available trail counts from 31 rail-trails across the United States, weekly trail traffic increased by roughly 56% in 2020 compared with the same weeks in 2019 (Rails-to-Trails Conservancy). Corresponding to this increase, Freeman and Eykelbosh (2020) noted the benefits of using outdoor spaces for physical and mental health and social well-being, while also acknowledging the potential detrimental effect of increased risk of community spread of COVID-19 when these resources are heavily used. Strategies to reduce risk include both individual behavior (physical distancing, quarantining, handwashing, and respiratory etiquette) and community strategies (carefully managed opening and closure of parks and greenways; limiting some services) (Slater et al., 2020). The latter are complicated by tension between the need to manage outdoor recreational facilities for public health and safety, on the one hand, and the possibility of closures driving physical activity into less suitable or more congested public spaces, on the other.

While national organizations recommend maintaining six feet of distance while active outdoors (Centers for Disease Control and Prevention), the physical distancing practices of people engaging in outdoor physical activity and the factors influencing those practices are not yet known. This study reports observations of multi-use trails to describe physical distancing behaviors by trail users during interactions amid the 2020 COVID-19 pandemic. Behaviors are characterized based on trail width, the number of trail users interacting with each other, and direction of travel of groups during an interaction. The results offer insights into the potential for trails as places for physical activity while maintaining physical distance.

Methods

Data Collection

Researchers installed four passive infrared cameras in different locations on a greenway trail in Boone, NC, (population 19,667) and four passive infrared cameras on a rail-trail in Morgantown, WV, (population 30,712) during June 2020 (Moultrie XV7000i and M40i in Boone and Morgantown, respectively). Both locations are home to universities located within the Appalachian Mountain region with predominantly white (93.4% and 87.9%, respectively), educated (89.2% and 93.6% with at least a high school diploma, respectively) populations. Six passive infrared cameras observed 12 foot wide paved trail sections and two observed 10 foot wide paved trail sections. Over one week, the passive infrared cameras recorded short 30–90 second videos each time motion was detected by the camera. A team of ten coders were trained on the coding procedures and tested for inter-rater reliability. A trained coder viewed each video, verified whether there was an interaction (users who passed each other) between more than one individual who did not seem to be part of the same group, and coded the distance between the closest person in each group (<6 ft or ≥6 ft). The following variables of each interaction were coded: (a) trail width (10 ft or 12 ft); (b) group passing direction (same or opposite direction); and (c) size of each group (number of people). A variable was then created to delineate the size of groups during the interaction (Figure 1 illustrates the size of groups during interactions). Groups with three or more participants (n = 13, 0.8%), were omitted from the analysis to ensure statistical assumptions for chi-square were met, such as the expected cell counts should be at least five within a minimum of 80% of the cells (McHugh, 2013). Ten percent of interactions were randomly selected and then double coded to establish inter-rater reliability prior to analysis; these suggest moderate reliability (κ= 0.67, *SE*=0.06, 95% CI: [0.54, 0.80]).

Data Analysis

Odds ratios with 95% confidence intervals were used to determine the likelihood of not maintaining six feet of distance during an interaction (i.e., groups passing within six feet of each other) with the predictors of (a) trail width (10-ft vs. 12-ft); (b) groups passed in the same or opposite direction; and (c) size of groups during the interaction (1x1, 1x2, or 2x2).

Results

Data coders observed 1,709 group interactions from PIC videos. The average duration of time taken to code observations was 7 minutes (median 4, mode 2) with a maximum of 60 minutes (n = 1) and minimum of 53 seconds (n = 1). Table 1 provides descriptive frequencies and valid percentages. Most group interactions maintained at least six feet of distance (72.2%), passed while traveling in opposite directions (80.0%), and were observed on 12 ft trail sections (67.2%). Single group interactions (1x1) were the most common (59.8%). Group interactions with two people per group (2x2) were less frequent (9%) than other interaction group sizes.

Table 1. Descriptive Frequencies and Valid Percentages for Variable Characteristics

Variable	*n*	%
Maintained 6 ft of distance		
Yes	1,234	72.2
No	475	27.8
Pass direction		
Same	342	20.0
Opposite	1,367	80.0
Trail width*		
10 ft	559	32.8
12 ft	1,145	67.2
1 x 1 interactions		
Yes	1,022	59.8
No	687	40.2
1 x 2 interactions		
Yes	620	36.3
No	1,089	63.7
2 x 2 interactions		
Yes	155	9.1
No	1,554	90.9

Note. *n* = number of observations, % = total percentage, * = trail width reported 5 missing observations, *n* = 1,704. Figure 1 illustrates differences in 1x1, 1x2, and 2x2 interactions.

Table 2 shows associations between passing direction, trail width, and group size with maintaining at least six feet physical distance. Interactions where trail users passed while traveling in the same direction were twice as likely to not maintain six feet of distance compared to users traveling in the opposite directions (*OR* = 2.31, 95% CI [1.80, 2.96]). Not maintaining six feet of distance was almost twice as likely on 10 ft wide vs 12 ft wide trail sections (*OR* = 1.97, 95% CI [1.58, 2.45]). Group interactions that included more than one person in one or both groups were four times as likely to not maintain six feet of distance (*OR* = 4.69, 95% CI [3.60, 6.11]) than 1x1 interactions. Sample group observations showed no trail users wearing a face covering (i.e., mask). Within the sample, five interactions (0.3%) were observed to last more than five seconds with a maximum of 90 seconds for one interaction.

Table 2. Chi-Square Associations and Odds Ratios of the Likelihood of Not Maintaining Six Feet of Physical Distance During Trail Interactions Based on Pass Direction, Trail Width, and Size of Groups in the Interaction.

	Maintained 6 ft distance					
Variable	No (%)	Yes (%)	χ^2 (df)	*OR* (95% CL)	1/*OR*	ϕ
Pass direction						
Same	145 (42.4)[R]	197 (57.6)	45.4 (1)[a]	2.31 (1.80, 2.96)	0.43	0.16
Opposite	330 (24.1)	1,037 (75.9)				
Trail width						
10 ft	209 (37.4)[R]	350 (62.6)	37.4 (1)[a]	1.97 (1.58, 2.45)	0.51	0.15
12 ft	266 (23.2)	879 (76.8)				
1 x 1 interactions						
No	394 (38.5)[R]	628 (61.5)	146.6 (1)[a]	4.69 (3.60, 6.11)	0.21	0.29
Yes	81 (11.8)	606 (88.2)				
1 x 2 interactions						
No	296 (27.2)[R]	793 (72.8)	0.56 (1)	0.91 (0.73, 1.14)	1.09	-0.02
Yes	179 (28.9)	441 (71.1)				
2 x 2 interactions						
No	391 (25.2)[R]	1163 (74.8)	59.2 (1)[a]	0.28 (0.20, 0.39)	3.57	-0.18
Yes	84 (54.2)	71 (45.8)				

Note. N = 1,709. a = $p < 0.01$, R = reference group, n = number of observations, % = row percentage, χ^2 = chi-square test of independence, df = degrees of freedom, *OR* = odds ratio, 95% CL = confidence limits, ϕ = phi-coefficient. Figure 1 illustrates differences in 1x1, 1x2, and 2x2 interactions.

Trail user behavior varied by activity type. For example, 32% of interactions involved only trail users who were walking. One trail user walking and at least one other running made up 19% of interactions. Other activities, such as biking, were moderately mixed with 60% of all interactions including at least one trail user walking. Descriptive findings suggest 81% of group interactions involved only adults, children with an adult included 17%, and 2% were children only. Trail users' biological sex was relatively mixed with 12% of interactions male only and 13% female only. The remaining 75% of interactions showed a range of combination of trail users such as a man passing a woman or family. Of note, coding a trail user as an adult or child, as well as coding biological sex, poses challenges based on video observation alone, so there is room for potential error in these descriptive findings.

Discussion

The study's results provide support for multi-use trails as viable places for physical activity while following physical distancing guidelines. The data show that most interactions on multi-use trails occur with more than the recommended six feet of distance between users. Violations of six feet of distance are more likely to occur with trail users in groups (group interactions are greater than 1x1), trail users passing while traveling in the same direction, and on 10 foot wide trails versus 12 foot wide trails. Additionally, the larger the group sizes during an interaction the greater the likelihood of violating six feet of distance with 1x1, 1x2, and 2x2 interactions violating 12%, 29%, and 54% of the time, respectively. The length of time that trail users were less than a distance of six feet apart was relatively short, with only 0.3% of interactions lasting longer than five seconds. The short length of time within close proximity suggests a lower risk of coronavirus spread between groups based on current guidelines (Centers for Disease Control and Prevention, 2021).

Executive orders were in place at the time of data collection in both North Carolina and West Virginia, mandating that people in outdoor activities maintain six feet or greater distance and groups be limited to 10 persons or fewer (State of North Carolina; State of West Virginia). While no trail users were observed wearing a face covering or mask, it is notable that neither state mandated the wearing of face coverings or masks in outdoor spaces at the time of this study. A potential limitation to this study is that data could only be collected in two states. Behaviors could be different in states with other legal mandates or recommendation adherence rates. Additionally, recommended and observed behaviors may change rapidly based on updated CDC and state health department guidance, especially with the increase in vaccination rates.

Questions for Future Research

Public health organizations at the federal, state, and local levels within the United States have provided mixed messages about how best to reduce the transmission of COVID-19 in outdoor settings, including the distance required for physical distancing, the benefit of mask-wearing outdoors (especially during the earlier months), and ease of transmission in outdoor situations (Lindsey, 2020). Most of the data being used for this messaging is from hospital or in-patient settings, which may be adding to the variable messaging (Bahl et al., 2020). Furthermore, in an attempt to stop COVID-19 infections, the University of California, Berkeley, has instituted a ban on outdoor physical activity among students living on campus (Associated Press, 2021). This mixed messaging may have resulted in individuals experiencing confusion about the safety of engaging in physical activity in outdoor places even once restrictions began to be lifted. For this reason and due to the broad geographic reach and popularity of greenways and rail-trails during the COVID-19 pandemic, more research is needed on how individuals in different states practice physical distancing while using trails during the pandemic. Using videos from passive infrared cameras in the current study to systematically observe physical distancing provided valuable insight and in-depth context to physical distancing behaviors of trail users that may be missed using in-person observational techniques.

Trails in our study were either 10-feet or 12-feet wide. While the wider trails seemed to enable more physical distancing behavior, future research could look at varying widths. For instance, could trails larger than 12-feet wide promote more physical distancing while trails less than 10-feet wide cause more interactions closer than 6-feet?

Based on our findings, research is needed to develop consistent salient messaging for multi-use trails related to keeping group sizes small and practicing proper passing behaviors, particularly when passing while traveling in the same direction and when group sizes are larger. A key strategy to employ would be point-of-decision prompts, such as those used to encourage stair use (Soler et al., 2010) or walking rather than inactive transportation in an airport (Fulton et al., 2017) with consideration given to tailored messaging, particularly to encourage single-file passing when overtaking another group or when passing while traveling in opposite directions on narrower trails.

Conclusions

While multi-use trails may be places for physical activity where physical distancing can be maintained, there is a need for consistent messaging related to physical distancing behaviors that are specific to outdoor contexts. Messaging should be tailored to trail users to limit group size and to be mindful when passing other trail users, particularly when passing in the same direction (such as “keep six feet when passing” and “pass single file”). It may be helpful to spread messaging throughout the length of a trail or path in order to catch users who have entered at various locations or who have traveled some distance since seeing the initial guidance. Further, messaging around mask-wearing as a prevention tool may be useful to increase the use of masks in situations where individuals briefly come within six feet of distance during trail use. These messages should underscore both national recommendations and state and local policies targeted at reducing the spread of disease.

Author Contributions

Conceptualization, T.B., S.M.D., C.G.A., H.V., E.S., A.H., V.H., A.D., R.B., and R.W.C.; Methodology, T.B., S.M.D., C.G.A., H.V., E.S., A.H., V.H., A.D., R.B., and R.W.C.; Investigation, T.B., C.G.A., E.S., S.I.M., A.H., V.H., and R.W.C.; Formal Analysis, S.M.D; Writing—Original Draft, T.B., S.M.D., C.G.A., E.S., A.H., V.H., A.D., and R.W.C.; Writing—Review & Editing, T.B., S.M.D., C.G.A., H.V., E.S., S.I.M., A.H., V.H., A.D., R.B., and R.W.C.; Funding Acquisition, T.B., E.S., R.W.C.; Resources, T.B., C.G.A., E.S., V.H., and R.W.C.; Supervision, T.B., C.G.A., and R.W.C.

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Conflict of interest statement:

We have no conflicts of interest to disclose.

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