第 IV 部門　The Effect of the Improvement in Walking Space to Leisure Walking Activity of Residents

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1. Introduction

The pandemic of COVID-19 enlarged the gap in the amount of walking activity (WA) among the population since the opportunities for utilitarian walking were deprived [1]. This is a concern because high level of WA is associated with a reduced risk of the development of certain diseases [2]. Therefore, promotion of leisure walking activity (LWA) is a key for the recovery of WA of a community. Improvement of a walking space is expected to promote WA of residents in the neighborhood. However, the effect varies to projects, and the distance decay of the effect is not well understood.

This study aims to assess the effect of the opening of Kusatsu River Park (KRP), a vast walking space in Kusatsu city, Shiga, to LWA of residents living close to and further away from the park. In addition, the distance decay of this effect is studied in terms of residential proximity to the park.

2. Methods

This study used data from the questionnaire regarding WA conducted around KRP [3]. KRP was constructed in the massive, abandoned area which used to be Old Kusatsu River (**Fig. 1**). The park opened in April 2017 and has been served as a high-quality pedestrians-cyclists-exclusive greenway and a place of relaxation for residents.

The questionnaire took place in October 2017, aiming to study the influence of the opening of KRP to WA of residents living within approximately 800 m from the park. 2 pieces of the questionnaire were distributed to each of 1,100 randomly selected households. No reference to the objective of the questionnaire was provided in the questionnaire to avoid the bias of respondents.

The respondents were asked the frequency (days/week) and time (minutes/day) of their LWA in their neighborhood in a past week while promenade or running were provided as examples of LWA in the questionnaire. Subsequently, LWA of the same period in the previous year were asked those who lived in their residence more than a year. Respondents also reported their age group, gender, marriage status, health condition, post-secondary educational attainment, employment status, driving status, and cycling status as personal attributes. Respondents were also asked to self-evaluate the effect of the opening of KRP, on change in their WA on 5 point-scale (1 to be the maximum effect).

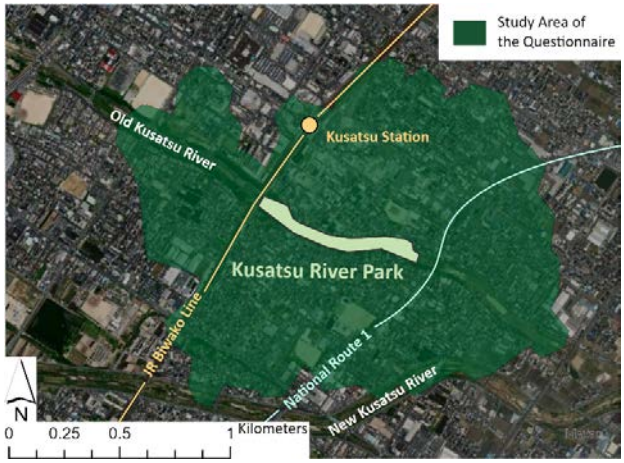

Fig. 1. *A map of the study area in Kusatsu, Shiga*

A total of 538 households, 765 residents answered the questionnaire (48.9% response rate), then the respondents whose answers were inappropriate or inadequate (n=140) were excluded from the sample. From the final sample, *sample (a)* (n=625), those who recognized the effect of KRP (3 or less in 5 point-scale) and experienced the change in the amount of their LWA were classified as *sample (p)* (n=230).

Network distance to the closest park entrance from each residence was calculated on ArcGIS Pro 2.7.4. The sample was divided into experimental

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and control group using four residential distance thresholds (200, 400, 600, and 800 m) to KRP. The dummy variables for park exposure (PE) were created and set as 1 for those who belong to the experimental group in each distance threshold. The dummy variable for time was created to distinguish WA of residents before and after the project and set as 1 for WA after the project.

Logistic regression models were used to estimate the effect of the distance-based accessibility to KRP on LWA of residents. The model estimates the odds ratio for engaging into LWA at least once a week as a dependent variable. The interaction term of PE and time was regressed with personal attributes as a predictor variable to evaluate the temporal change of LWA of residents related with their accessibility to KRP. The regression analyses were performed using R 4.1.2.

3. Results and discussions

The logistic regression results are shown in **Table 1**. While no significant association between the interaction term (PE×Time) and the high LWA group was observed for *sample (a)*, the positive association was observed with significance at 400 m for *sample (p)*. The odds of engaging into LWA increased by 14% after the opening of KRP. Furthermore, this effect showed a declining trend with distance away from KRP (**Fig. 2**).

The study found that the improvement in KRP made a positive impact on LWA of those living within 400 m from KRP and recognizing the effect of KRP on their WA. The distance decay effect was observed for this effect and these results were consistent with other urban planning projects such as greenway retrofit [4]. However, the significant effect on the whole sample was not observed. This may be due to the short follow-up period. The longer follow-up period would help residents realize the improvement of the walking space.

4. Conclusion

The study revealed the extent of the effect of the improvement of an urban park to neighbors' LWA. The evidence obtained by this study will support and encourage urban planning projects of creating walking spaces for public health.

Table 1. *Logistic regression results*

	Odds ratio for engaging into LWA (95% CI)			
	200 m	400 m	600 m	800 m
	Sample (a)			
PE	1.00 (0.91, 1.09)	0.94 (0.87, 1.02)	1.01 (0.93, 1.09)	1.06 (0.93, 1.20)
Time	1.01 (0.95, 1.08)	1.00 (0.93, 1.08)	1.02 (0.93, 1.11)	1.02 (0.86, 1.21)
PE×Time	1.01 (0.89, 1.15)	1.03 (0.92, 1.14)	0.99 (0.89, 1.11)	1.00 (0.83, 1.19)
	Sample (p)			
PE	0.95 (0.84, 1.07)	0.90** (0.81, 0.99)	1.02 (0.92, 1.14)	0.92 (0.78, 1.09)
Time	1.05 (0.97, 1.13)	1.01 (0.92, 1.11)	1.04 (0.92, 1.17)	1.04 (0.84, 1.29)
PE×Time	1.11 (0.94, 1.31)	1.14* (0.99, 1.31)	1.05 (0.90, 1.21)	1.03 (0.82, 1.30)

*p<0.1; **p<0.05; ***p<0.01

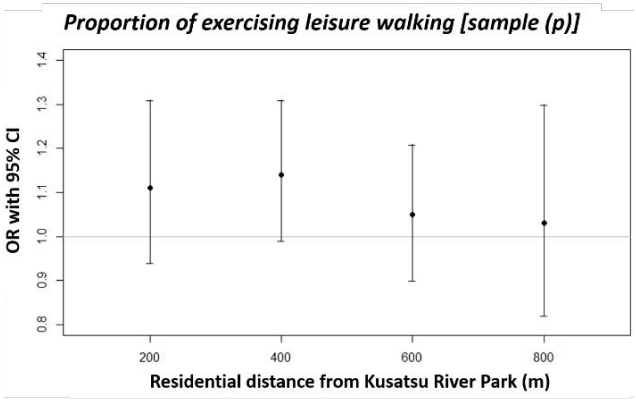

Fig. 2. *Distance decay effect from KRP*

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