PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Cross-sectional and prospective associations of neighborhood environmental attributes with screen time in Japanese middle-aged and older adults
AUTHORS	Liao, Yung; Shibata, Ai; ISHII, Kaori; Koohsari, Mohammad; OKA, Koichiro

VERSION 1 – REVIEW

REVIEWER	Erin Bouldin Department of Health and Exercise Science, Appalachian State University, North Carolina, United States
REVIEW RETURNED	26-Oct-2017

GENERAL COMMENTS	This study evaluates the relationship between perceived and objective measures of five dimensions of neighborhood environment and self-reported screen time among middle-aged and older adults in Japan. Overall, this manuscript is clear and the methods are sound. Some additional clarifications and details would be helpful in interpreting the results, however. My specific questions and suggestions follow. Abstract (1) Under Results, I would not say that screen time decreased slightly since the p-value is >0.05. Please change to indicate no significant difference, e.g., "On average, participants' screen time was similar over 2 years (2.3 hours/day at baseline and 2.2 hours/day at follow-up; p=0.24). Materials and Methods (2) Line 115: Please discuss whether people who did not respond to the survey differed substantially from those who did. Also, it would be useful to know whether the final sample was representative of the populations of Nerima City and Kanuma City. (3) Line 121: Please include more details about the items – the name of the tool(s) if available, the specific questions, and the validity and reliability estimates. (4) Line 131: It is nice that the perceived and objective measures cover the same 5 areas, and I recommend editing the language in this section to highlight that. I suggest changing the first sentence to list the 5 areas then talking about the ways in which they were measured:

"The exposure variables of this study were five environmental attributes – population density, sidewalk availability, access to public transportation, access to destinations, and street connectivity – measured both subjectively and objectively at baseline. These domains were selected based on…"

(5) Write out IPAQ-E the first time it appears. Also, please include more details about the measure itself, preferably the specific questions it includes related to the 5 domains.

(6) Line 144: How much variability was there in objectively-measured population density within the 2 cities? It seems like there would not be much difference across participants. Given that city is also included in the regression models I wonder if a lack of variation and a strong association between density and city is part of the reason there were no significant differences for the density domain.

(7) Line 172: Write out MVPA. Also, it is not described earlier in the methods and should be.

(8) Line 180: I find this explanation (which also appears in the tables) confusing. Do you mean that the exponentiated beta estimates represent the proportional increase (for values >1) or decrease (for values <1) in the hours per day of screen time comparing people who live in an environment that is supportive of physical activity?
(9) Please add some details about how you selected covariates for the model. (I assume you made decisions a priori based on the literature but it would help to state explicitly.)

Results
(10) Line 193: As in abstract, please say there was no difference in screen time over 2 years.
(11) Table 1: Error in the Age row for the cross-sectional sample; perhaps it should be 55.8 (4.3)?

(12) Table 1: Remove the "0" in the Household income row.

(13) Table 1: There is no description of physical function in the methods; please add. (Same for MVPA, as noted above.)
(14) Tables 2 & 3: Please add a column for p-values rather than only indicating p<0.05.

(15) Tables 2 & 3: I would like to see crude associations reported since, as noted earlier, I have some concerns about collinearity in the models.

(16) Table 3: "Leisure-time sitting for transport" not described in methods or discussed in text. It also would be helpful to discuss whether this overlaps with screen time and therefore could explain some associations. In other words, don't people frequently use screens (phones) while waiting for and riding the bus? If that is included as a covariate it would dilute any association between environmental factors and screen time.

Discussion
(17) Please address whether these results are generalizable to the populations from which the sample was selected (related to comment 2 above – did the study sample reflect the source population?).

REVIEWER	Adrijana D'Silva
	University of Calgary, Canada
REVIEW RETURNED	13-Nov-2017

GENERAL COMMENTS	1) Please state whether there are any differences (i.e. age, marital status) between participants who completed the follow-up, and those who did not.
	2) Please state how MVPA was defined to the participant. Reporting average daily MVPA of 9.3 hours seems extremely high. Perhaps this time also included all intensities of physical activity, including light physical activity. If MVPA is to be reported it should be objectively measured, rather than using self-report as we often see overestimations of MPVA time.
	3) Table 3: Why did the authors chose to use covariates measured at baseline for screen time at 2-year follow-up? Since these covariates were also measured at follow-up, it would make more sense to use those values instead.
	4) In the Discussion, please elaborate further on what is a better predictor of screen time, perceived or objective environmental attributes.
	5) Line 268/269: What do the authors mean by "home environment", and if it is considered as a potential predictor of screen time, why was it not assessed? I would add this point to the limitations.
	6) Remove ";" in line 71.
	7) Line 116 should read "two years".

VERSION 1 – AUTHOR RESPONSE

Responses to the Reviewer #1
General comments
This study evaluates the relationship between perceived and objective measures of five dimensions of neighborhood environment and self-reported screen time among middle-aged and older adults in Japan. Overall, this manuscript is clear and the methods are sound. Some additional clarifications and details would be helpful in interpreting the results.
Response: We thank the Reviewer for this positive comment.

However, my specific questions and suggestions follow.
Abstract
Query 1: Under Results, I would not say that screen time decreased slightly since the p-value is >0.05. Please change to indicate no significant difference, e.g., "On average, participants' screen time was similar over 2 years (2.3 hours/day at baseline and 2.2 hours/day at follow-up; p=0.24).
Response: Thank you for your comments. We have revised the results of Abstract accordingly. (page 2, line 36-37)

"On average, participants' screen time was not statistically different over 2 years (2.3 hours/day at baseline and 2.2 hours/day at follow-up; p=0.24)."

Materials and Methods
Query 2: Line 115: Please discuss whether people who did not respond to the survey differed substantially from those who did. Also, it would be useful to know whether the final sample was representative of the populations of Nerima City and Kanuma City.

Response: Thank you for your suggestions. We have further conducted a Chi-square test for comparing with the sociodemographic differences between follow-up and non-follow-up respondents. We found the participants who responded the follow-up survey were more likely to have higher educational levels (58.1% vs. 47.4%, p =0.002) and have higher income (53.4% vs. 43.9%, p =0.01) than those who did not. No significant difference were observed in gender, age, marital status, working status and BMI. In addition, since it is difficult to obtain the official data on sociodemogrphic attributes (i.e educational level, marital status, work status) of whole populations aged 40-69 years in Nerima City and Kanuma City. Thus, we agree with you that the final sample may not be representative of the populations of Nerima City and Kanuma City. We have added these as limitations of the present study. (page 16, line 317-321)

"Finally, the participants who responded the follow-up survey were more likely to have higher educational levels (58.1% vs. 47.4%, p =0.002) and have higher income (53.4% vs. 43.9%, p =0.01) than those who did not. Thus, the final sample may not be representative of the populations of Nerima City and Kanuma City."

Query 3: Line 121: Please include more details about the items – the name of the tool(s) if available, the specific questions, and the validity and reliability estimates.
Response: We have added the detailed descriptions of the items accordingly. (page 6, line 120-129)

"Outcome variable
Participants reported their time spent in the television viewing and leisure-time internet use over a usual week (screen time). Participants were asked, "On how many days did you do the activity during leisure time in the past 7 days?" and "On average, how many minutes did you do the activity during leisure time on the days that you did it?" Using this format, we identified time spent sitting in screen time by multiplying the number of days participants watched television and used internet during leisure time by the average amount of time spent doing so per day. The scale was previously shown to have reasonable reliability and validity [16]. The test–retest reliability of the items was moderate (range 0.6–0.8) and the validity, defined as correlations with 3-day behavioral log data was also moderate (range 0.3–0.6) [17]. For cross-sectional associations, the outcome variable was baseline screen time per day. For prospective associations, the outcome variable was change of screen time per week from baseline to follow-up survey."

Query 4: Line 131: It is nice that the perceived and objective measures cover the same 5 areas, and I recommend editing the language in this section to highlight that. I suggest changing the first sentence to list the 5 areas then talking about the ways in which they were measured:"The exposure variables of this study were five environmental attributes – population density, sidewalk availability, access to public transportation, access to destinations, and street connectivity – measured both subjectively and objectively at baseline. These domains were selected based on…"
Response: We have added this sentence in "Exposure variables" section accordingly (page 6, line 135-138)

"The exposure variables of this study were five environmental attributes – population density, sidewalk availability, access to public transportation, access to destinations, and street connectivity – measured both subjectively and objectively at baseline. These domains were selected on the basis of walkability components and other environmental attributes from previous reviews"

Query 5: Write out IPAQ-E the first time it appears. Also, please include more details about the measure itself, preferably the specific questions it includes related to the 5 domains.
Response: We have added the detailed information of International Physical Activity Questionnaire Environmental Module (IPAQ-E). (page 7, line 140-155)

"The perceived measures were identified using the Japanese version of the International Physical Activity Questionnaire Environmental Module (IPAQ-E) with a 4-point Likert scale (strongly agree, somewhat agree, somewhat disagree, and strongly disagree). The scale has been shown to have good reliability [20]. Five items of IPAQ-E were included: (1) population density ("What is the main type of housing in your neighborhood?" For this question, the five options were detached single-family housing; apartments with 2–3 stories; mix of single-family housing and apartments with 2–3 stories; condos with 4–12 stories; and condos with >13 stories); (2) sidewalk availability ("There are sidewalks on most of the streets in my neighbourhood"); (3) access to public transportation ("It is less than a 10–15 min walk to a transit station from my home"); (4) access to destinations ("There are many places to go within easy walking distance of my home"); (5) street connectivity ("There are many 4-way intersections in my neighbourhood"). Population density was divided into "lower (detached single-family housing)" and "higher (others)". Other four perceived environmental attributes were categorized into "agree" (strongly agree and somewhat agree) and "disagree" (somewhat disagree and strongly disagree)."

Query 6: Line 144: How much variability was there in objectively-measured population density within the 2 cities? It seems like there would not be much difference across participants. Given that city is also included in the regression models I wonder if a lack of variation and a strong association between density and city is part of the reason there were no significant differences for the density domain.
Response: Based on your comments, we have performed an Independent-Sample T Test to compare the mean of objectively-measured population density between Nerima City and Kanuma City. The results showed a significant differences between the two cities (Nerima City vs. Kanuma City: 16015 vs. 2100 km2, $p < 0.001$). Furthermore, Levene's test also showed that the variances between two cities are significantly different ($p < 0.001$). Thus, it may not be the reason that there were no significant differences for the density domain.

Query 7: Line 172: Write out MVPA. Also, it is not described earlier in the methods and should be.
Response: We apologize for this mistake and have described the details of moderate-to-vigorous physical activity. (page 8, line 181 to page 9, line 191)

"Covariates
The selection of covariates was based on previous studies [22, 23]. Data on respondents' gender (men, women), age (40–49, 50–59, or 60–69 years), current marital status (married, unmarried), educational level (less than 13 years, 13 years or more), employment status (full-time employment, not full-time employment), household income (less than 5 million yen, or 5 million yen or more), body mass index (less than 25kg/m2, 25kg/m2 and higher) and residential area (Nerima city and Kanuma city), physical function and moderate-to-vigorous physical activity (MVPA) were included. Physical function was measured by The Japanese version of the Medical Outcomes Study (MOS) Short Form 8-Item Health Survey (SF-8) [24]. Participants were ask "During the past 4 weeks, how much did physical health problems limit your physical activities (such as walking or climbing stairs)?". MVPA was measured by the self-administered, short Japanese version of the International Physical Activity Questionnaire (IPAQ-SV). The test-retest reliability (r = 0.72-0.93) and criterion validity (r = 0.39) of the version of the IPAQ-SV are good and acceptable, respectively [25]. The total number of minutes per week in vigorous-intensity physical activity, moderate-intensity physical activity, and walking was computed."

Murase N, Katsumura T, Ueda C, Inoue S, Shimomitsu T:International standardization of physical activity level: reliability and validity study of the Japanese version of the International Physical Activity Questionnaire (IPAQ) (Kosei no Shihyo). J. Health Welfare Statistics2003,49:1–9. in Japanese.

Query 8: Line 180: I find this explanation (which also appears in the tables) confusing. Do you mean that the exponentiated beta estimates represent the proportional increase (for values >1) or decrease (for values <1) in the hours per day of screen time comparing people who live in an environment that is supportive of physical activity?

Response: We have added explanations for clarifying the coefficients of our results. We have added the explanations both in "Statistical analysis" section (page 9, line211- page 10, line 217) and footnote of Table 2 & 3.

"For cross-sectional analysis, coefficients less than 1 denote proportionally less time spent in screen time (e.g. Exp (B)=0.95 means 5% less time), whereas coefficients more than 1 denote proportionally more time spent in screen time, relative to the reference category. (e.g. Exp (B)=1.06 means 6% more time). For prospective analysis, coefficients less than 1 denote proportionally decreased time spent in screen time, whereas coefficients more than 1 denote proportionally increased time spent in screen time, relative to the reference category."

Query 9: Please add some details about how you selected covariates for the model. (I assume you made decisions a priori based on the literature but it would help to state explicitly.)

Response: The selection of covariates was based on previous studies examining the associations between environment and screen-based sedentary behavior (Ding et al., 2012; Shibata et al., 2015). The covariates basically included gender, age, current marital status, educational level, employment status, household income, body mass index and physical activity (Ding et al., 2012; Shibata et al., 2015). We have added this information in the "Covariates" section. (page 8, line 175)

"The selection of covariates was based on previous studies [22, 23]."

[Reference]
22. Ding D, Sugiyama T, Winkler E, Cerin E, Wijndaele K, Owen N. Correlates of Change in Adults' Television Viewing Time: A Four-Year Follow-up Study. Med Sci Sports Exerc. 2012;44(7):1287-92.
23. Shibata A, Oka K, Sugiyama T, Ding D, Salmon J, Dunstan DW, Owen N. Perceived neighbourhood environmental attributes and prospective changes in TV viewing time among older Australian adults. Int J Behav Nutr Phys Act. 2015;12:50.

Results
Query 10: Line 193: As in abstract, please say there was no difference in screen time over 2 years.
Response: Again, thank you for your comments. We have revised the results of Abstract accordingly. (page 10, line 223-225)

"On average, participants' screen time was not statistically different over 2 years (2.3 hours/day at baseline and 2.2 hours/day at follow-up; p=0.24)."

Query 11: Table 1: Error in the Age row for the cross-sectional sample; perhaps it should be 55.8 (4.3)?
Response: Thank you very much for your comments. We apologize for the mistake and have revised the mean age (SD) in Table 1.

Query 12: Table 1: Remove the "0" in the Household income row.
Response: We apologize for the mistake. We have removed "o" from the Table 1.

Query 13: Table 1: There is no description of physical function in the methods; please add. (Same for MVPA, as noted above.)
Response: We have added the detailed information of "physical function" in "Covariates" section. (page 8, line 182-185)

"Physical function was measured by The Japanese version of the Medical Outcomes Study (MOS) Short Form 8-Item Health Survey (SF-8) [22]. Participants were ask "During the past 4 weeks, how much did physical health problems limit your physical activities (such as walking or climbing stairs)?"."

Query 14: Tables 2 & 3: Please add a column for p-values rather than only indicating p<0.05.
Response: We have added the p-value of each variable in Table 2 & Table 3 accordingly.

Query 15: Tables 2 & 3: I would like to see crude associations reported since, as noted earlier, I have some concerns about collinearity in the models.
Response: We have added the unadjusted model to show the crude association in Table 2 & Table 3 accordingly. In addition, regarding your concern about collinearity in the models, we have entered each environmental factor separately in each model and thus collinearity is not a problem for our study.

Query 16: Table 3: "Leisure-time sitting for transport" not described in methods or discussed in text. It also would be helpful to discuss whether this overlaps with screen time and therefore could explain some associations. In other words, don't people frequently use screens (phones) while waiting for and riding the bus? If that is included as a covariate it would dilute any association between environmental factors and screen time.
Response: We apologize for this mistake. We have confirmed our analyses again and found that "leisure-time sitting for transport" was not included as a covariate in this study. We have removed "leisure-time sitting for transport" from the Table 3.

Discussion
Query 17: Please address whether these results are generalizable to the populations from which the sample was selected (related to comment 2 above – did the study sample reflect the source population?).
Response: As our responses of your Query 2, we have added that the final sample may not be representative of the populations of Nerima City and Kanuma City as a limitation of the present study.

Responses to the Reviewer #2

Query 1: Please state whether there are any differences (i.e. age, marital status) between participants who completed the follow-up, and those who did not.
Response: Thank you for your suggestions. We have further conducted a Chi-square test for comparing with the sociodemographic differences between follow-up and non-follow-up respondents. We found the participants who responded the follow-up survey were more likely to have higher educational levels (58.1% vs. 47.4%, p =0.002) and have higher income (53.4% vs. 43.9%, p =0.01) than those who did not. No significant difference were observed in gender, age, marital status, working status and BMI. We have added this as a limitation of the present study. (page 16, line 317-321)

"Finally, the participants who responded the follow-up survey were more likely to have higher educational levels (58.1% vs. 47.4%, p =0.002) and have higher income (53.4% vs. 43.9%, p =0.01) than those who did not. Thus, the final sample may not be representative of the populations of Nerima City and Kanuma City."

Query 2: Please state how MVPA was defined to the participant. Reporting average daily MVPA of 9.3 hours seems extremely high. Perhaps this time also included all intensities of physical activity, including light physical activity. If MVPA is to be reported it should be objectively measured, rather than using self-report as we often see overestimations of MPVA time.

Response: Firstly, we apologize for the mistake of MVPA. We have confirmed our data and found the 9.3 hours was the average weekly MVPA. We have revised the Table 1 accordingly. In addition, we have added the detailed descriptions of MVPA in covariates section (page 8, line 185 to page 9, line 191).

"MVPA was measured by the self-administered, short Japanese version of the International Physical Activity Questionnaire (IPAQ-SV). The test-retest reliability (r = 0.72-0.93) and criterion validity (r = 0.39) of the version of the IPAQ-SV are good and acceptable, respectively [25]. The total number of minutes per week in vigorous-intensity physical activity, moderate-intensity physical activity, and walking was computed."

Finally, we have also added the self-reported MVPA could be overestimated in the limitation (page 16, line 315).

"Second, the use of the IPAQ-SV may have overestimated time spent in MVPA."

Query 3: Table 3: Why did the authors chose to use covariates measured at baseline for screen time at 2-year follow-up? Since these covariates were also measured at follow-up, it would make more sense to use those values instead.

Response: The selection of covariates was based on previous studies examining the associations between environment and screen-based sedentary behavior (Ding et al., 2012; Shibata et al., 2015). The covariates basically included gender, age, current marital status, educational level, employment status, household income, body mass index and physical activity (Ding et al., 2012; Shibata et al., 2015). We have added this information in the "Covariates" section. (page 8, line 175)

"The selection of covariates was based on previous studies [22, 23]."

[Reference]
22. Ding D, Sugiyama T, Winkler E, Cerin E, Wijndaele K, Owen N. Correlates of Change in Adults' Television Viewing Time: A Four-Year Follow-up Study. Med Sci Sports Exerc. 2012;44(7):1287-92.
23. Shibata A, Oka K, Sugiyama T, Ding D, Salmon J, Dunstan DW, Owen N. Perceived neighbourhood environmental attributes and prospective changes in TV viewing time among older Australian adults. Int J Behav Nutr Phys Act. 2015;12:50.

In addition, the reason we adjusted baseline covariates because these baseline covariates are expected to have an important influence on the primary outcome. This method is also consistent with above-mentioned prospective studies (Ding et al., 2012; Shibata et al., 2015).

Query 4: In the Discussion, please elaborate further on what is a better predictor of screen time, perceived or objective environmental attributes.

Response: We have added this comparisons in the Discussion section (page 15, line 289-294)

"First of all, the perceptions of environmental attributes should be considered to be predictors of screen time for future studies. The present results indicate that perceived environmental attributes might be better predictors of screen time than objective ones. It is possible how middle-to-older-aged adults perceive and understand their neighbourhood environment might be more important for their decision on spending time in screen time in their home."

Query 5: Line 268/269: What do the authors mean by "home environment", and if it is considered as a potential predictor of screen time, why was it not assessed? I would add this point to the limitations.
Response: We have added not accessing home environment as a limitation of this study (page 16, line 316).

"Second, potential confounders such as self-selection of neighborhoods and home environment were not examined in this study."

Query 6: Remove ";" in line 71.
Response: We have removed ";" from the manuscript accordingly.

Query 7: Line 116 should read "two years".
Response: We have revised this from "two year" into "two years" accordingly.

"After two years, 533 (52.7 % of the baseline respondents) completed the follow-up survey."

VERSION 2 – REVIEW

REVIEWER	Erin D. Bouldin, MPH, PhD Assistant Professor, Public Health Program, Department of Health and Exercise Science, Appalachian State University, United States
REVIEW RETURNED	02-Jan-2018

GENERAL COMMENTS	Thank you for your thorough response to our comments. I have no additional concerns or suggestions.

REVIEWER	Adrijana D'Silva University of Calgary, Canada
REVIEW RETURNED	04-Jan-2018

GENERAL COMMENTS	Thank you again for the opportunity to re-review this article. I am happy to see that the reviewer comments and suggestions have been addressed by the authors. I further suggest three very minor changes for the authors. The first is Line 159: "Objective environmental attributes was measured..." should be changed to "were measured". The second is Line 186: "Participants were ask.." to "Participants were asked...". The third is Line 314: "Another novel finding is that no prospective associations.." should be changed to "Another novel finding is that there were no prospective associations...". Thank you.