Associations of Physical Activity and Television Viewing Time with Retinal Vascular Caliber in a Multiethnic Asian Population

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PURPOSE. The aim of this study was to examine the relationship of physical activity and television (TV) viewing time with retinal vascular caliber in a multiethnic Asian population.

METHODS. Chinese, Indian, and Malay participants (n = 3866) were examined cross-sectionally in the Singapore Prospective Study Program (2004–2007). Leisure-time physical activity and TV viewing time were assessed by the use of an interviewer-administered questionnaire. Retinal arteriolar and venular calibers were measured from digital retinal photographs.

RESULTS. After adjusting for demographic, behavioral, and medical factors, those in the lowest quartile of leisure-time physical activity had a wider venular caliber (by 1.51 μm; 95% confidence interval [CI], 0.01–2.92) compared with those in the highest quartile. Using sex- and ethnicity-specific quartiles, stronger associations were noted in males (2.23 μm; 95% CI, 0.10–4.38) and Chinese (2.52 μm; 95% CI, 0.44–4.59) participants. Females who watched >2 hours of TV per day had a narrower arteriolar caliber (by 1.28 μm; 95% CI, −2.56–0.03), compared with the arteriolar caliber of those who watched less TV.

CONCLUSIONS. Lower physical activity and higher TV viewing time (in females) were adversely associated with retinal microvascular caliber among Asian adults. Additional cross-sectional and longitudinal studies are needed to further clarify the potential mediating role of the microvasculature in the relationship between these behavioral risk factors and poor cardio-metabolic health outcomes. (Invest Ophthalmol Vis Sci. 2011; 52:6522–6528) DOI:10.1167/iovs.11-7324

Microvascular changes of the retina that are directly visible are thought to represent a phenotype of endothelial dysfunction1 and systemic inflammation.2 As such, studies on the retinal vascular caliber provide insights into the contribution of subclinical vascular processes to the development of systemic disease.3 There is growing evidence that the caliber of retinal vessels is a marker of cardiovascular health and mortality and is predictive of stroke, diabetes, hypertension, and obesity.3–9 However, little is known about the links of the retinal microvascular caliber with lifestyle factors that influence cardiometabolic health.10

Leisure-time physical activity is a well-known protective cardiovascular disease risk factor,11 whereas physical inactivity (not meeting the physical activity guidelines for moderate-to-vigorous intensity activity) is associated with increased cardiometabolic risk.12,13 More recently, the independent contribution of sedentary behaviors (behaviors that involve sitting and low levels of energy expenditure) to poor cardiometabolic health has been recognized.14 Television (TV) viewing time, a highly prevalent leisure-time sedentary behavior15 has been detrimental associated with abnormal glucose metabolism, insulin resistance, obesity, diabetes, and premature mortality in cross-sectional and longitudinal studies.13,14,16–19 These associations have been observed even in those who are physically active.13,16 The underlying mechanisms for the effects of physical inactivity and sedentary behavior on cardiometabolic health are not fully understood, although vascular factors of endothelial dysfunction and raised inflammatory markers have been implicated.20–24

Although adverse associations of these behavioral risk factors with the retinal microcirculation have been previously explored,25–27 little evidence is available on these links among Asians who account for two thirds of the world’s population.28 There are well-defined variations in cardiovascular risk factors between racial/ethnic groups arising from genetic and environmental influences.29 However, whether the associations of physical activity and sedentary behavior with the microcirculation are similar across racial/ethnic groups remains unclear.

We examined the associations of physical activity and TV viewing time with retinal vascular caliber in a population of Chinese, Malays, and Indians who are the three major ethnic groups in Asia.

METHODS

Study Participants

The Singapore Prospective Study Program (2004–2007) invited participants from one of four previous cross-sectional studies: Thyroid and...
Heart Study 1982–1984, National Health Survey 1992, National University of Singapore Heart Study 1993–1995, and National Health Survey 1998. In all four studies, a random sample of participants ranging in age from 24 to 95 years was included from the Singapore population, with disproportionate sampling stratified by ethnicity to increase the proportion of those minority ethnic groups (Malays and Asian Indians).

All of the 10,080 eligible participants were contacted first by mail, then by telephone to set an appointment to complete the questionnaire. Of the 7,774 interviewed, 5157 attended a health examination that included systemic and ocular assessment, retinal photography, and laboratory investigations. Excluding participants whose photographs were unavailable (n = 46) or ungradable (n = 105) and those with missing information on glucose, C-reactive protein, and other relevant variables, 3866 were available for the final analysis.

Tenets of the Declaration of Helsinki were followed and ethical approval was obtained from two institutional review boards (the National University of Singapore and the Singapore General Hospital). Written informed consent was obtained from all participants. Detailed methodology for the Singapore Prospective study has been previously described.29

Measurement of Physical Activity and TV Viewing Time

The leisure-time physical activity components were adapted from the validated Minnesota leisure-time activity questionnaire.30–32 These were grouped into four general categories covering 48 popular activities: (1) walking and miscellaneous such as bicycling, dancing, hiking; (2) conditioning exercise such as home exercise, health club exercise, jogging, running; (3) water activities such as water skiing, swimming, sailing; and (4) sports such as rowing, tennis, badminton, soccer. Participants were asked if they performed any of the activities under these four categories or any other leisure-time activities during the past 4 weeks. A metabolic equivalent (MET) was assigned to each duration of each activity in minutes and the number of times they did it during the week. A metabolic equivalent (MET) was assigned to each reported activity based on the compendium reported by Ainsworth et al.33 and the MET values associated with all the leisure-time physical activity questions were summed. Quartiles of physical activity were calculated and sex- and ethnicity-specific measures were used for subgroup analyses. For TV viewing time, participants were questioned about the number of hours per day that they spent watching TV or calculated and sex- and ethnicity-specific measures were used. Quartiles of physical activity were summed. Quartiles of physical activity were used for subgroup analyses. For TV viewing time, participants were questioned about the number of hours per day that they spent watching TV or playing computer/handheld video games on the TV screen. Three categories of TV viewing time (measured in hours per day [h/d]; ≤1, >1 to ≤2, and >2) were derived based on the distribution of the data. Because the distribution was similar when analyzed by sex and ethnicity, the same categories of TV viewing time were used for the stratified analyses.

Measurement of Retinal Vascular Caliber

A 45° digital retinal camera (Canon CR-DGII with a 10D SLR back; Canon, Tokyo, Japan) was used to take fundus photographs. Two retinal images of each eye were obtained, one centered at the optic disc and another centered at the fovea. The right eye images were graded by trained graders masked to the participant characteristics at the University of Melbourne Retinal Vascular Imaging Center, using computer-assisted software (IVAN program; University of Wisconsin, Madison, WI). All arterioles and venules crossing through a specified zone 0.5- to 1-disc diameter away from the optic disc margin were measured and summarized as the central retinal artery equivalent (CRAE) or central retinal vein equivalent (CRVE). Reproducibility of measurements was high with intragrader intraclass correlation coefficients of 0.99 (95% confidence interval [CI], 0.98–0.99) for CRAE and 0.94 (95% CI, 0.92–0.96) for CRVE.33

Measurement of Other Covariates

Data on demographic and lifestyle factors as well as medical history were collected through interviewer-administered questionnaires. Dietary data were collected using a food frequency questionnaire validated for use among adult Singaporeans.34 Height (cm) was measured using a wall-mounted measuring tape; weight (kg) was measured using a digital scale for the calculation of body mass index (BMI; kg · m⁻²). Blood pressure (BP) was evaluated with a digital automatic BP monitor (Dinamap model Pro100V2; Criticon, Norderstedt, Germany). Total cholesterol and fasting plasma glucose were measured using enzymatic assays (Advia 2400 Chemistry System; Siemens Medical Solutions Diagnostics, Deerfield, IL). C-reactive protein was measured using a highsensitivity immunoturbidimetric method (Roche Integra 400 analyzer; Roche Diagnostics, Mannheim, Germany), using frozen plasma that had been stored at −80°C. The presence of hypertension was defined as systolic BP (>140 mm Hg) or diastolic BP (>90 mm Hg), on more than one measurement, or history of hypertension or present use of hypertensive medication. The presence of diabetes mellitus was defined as fasting plasma glucose level ≥ 7.0 mM or a known history of diabetes mellitus or present use of antidiabetic agents.35–37

Statistical Analysis

Baseline characteristics of participants across the sexes and ethnic groups were compared by ANOVA or x² tests as appropriate. Retinal vascular calibers were examined as continuous measures. General linear modeling was used to determine the associations of physical activity and TV viewing time with retinal vascular calibers. All analyses were performed using statistical analysis/predictive analytics software (SPSS version 17.0.1 for Windows; SPSS Inc., Chicago, IL). Three models were constructed. Model 1 was adjusted for age (in years), sex, ethnicity, and the other vascular caliber (CRAE/CRVE, as appropriate). Model 2 was further adjusted for level of educational attainment (measured in years: <7, 7–10, >10), smoking status (current/ex/never), and the three categories of TV viewing time in models that examined physical activity and quartiles of leisure-time physical activity (MET minutes per week [MET-min/wk]) in models that examined TV viewing time. Model 3 was additionally adjusted for systolic BP (mm Hg), fasting glucose (mM), serum triglycerides (mM), high-density lipoprotein cholesterol (HDL-c; mM), low-density lipoprotein c (LDL-c; mM), BMI, C-reactive protein, presence of hypertension, presence of diabetes, present alcohol intake (yes/no), total calorie intake (kcal/d), and percentage saturated fat intake. In females, this model was also adjusted for menopause (yes/no) and present use of hormone replacement therapy (yes/no). These had previously been identified by a backward-elimination process as specifically relevant for at least one of the outcomes at the P < 0.2 level. Multicollinearity between covariates was quantified using variance inflation factor and values > 5 were used as a cutoff to eliminate variables. Interactions examined whether associations varied by sex or ethnicity with stratification by sex and ethnic group (Chinese, Malay, and Indian) as appropriate. In ethnicity comparisons, the “Other” ethnic group was excluded because the small sample size precluded meaningful interpretation. Because the use of both CRAE and CRVE in the models is likely to induce errors attributed to refraction,35–37 and in the light of recent evidence on the association of refractive error on retinal vascular geometry measurements,37 Model 3 was also adjusted for refractive error, using the spherical equivalent of the right eye. This was carried out for the overall and subgroup analyses of associations of physical activity and TV viewing time with CRAE/CRVE.

RESULTS

Table 1 shows baseline characteristics of all participants and across the sex and ethnic groups. The sample (47.8% males; 52.2% females) had a mean age of 49.7 years (SD, 11.4 years). Males had significantly higher leisure-time physical activity than that of females, whereas females had significantly higher TV viewing time. CRAE was significantly higher in females than that in males, whereas CRVE was similar.
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Sex-Specific Comparisons</th>
<th>Ethnicity-Specific Comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All</td>
<td>Males</td>
</tr>
<tr>
<td>n</td>
<td>3866</td>
<td>1848</td>
</tr>
<tr>
<td>Age, y</td>
<td>49.7 (11.4)</td>
<td>50.3 (11.6)</td>
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<tr>
<td>Education, %</td>
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<td></td>
</tr>
<tr>
<td>&lt;7 y</td>
<td>25.0</td>
<td>19.2</td>
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<tr>
<td>7–10 y</td>
<td>38.6</td>
<td>39.3</td>
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<tr>
<td>&gt;10 y</td>
<td>36.4</td>
<td>41.6</td>
</tr>
<tr>
<td>Smokers, %</td>
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<td></td>
</tr>
<tr>
<td>Current</td>
<td>12.5</td>
<td>23.4</td>
</tr>
<tr>
<td>Ex</td>
<td>8.7</td>
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</tr>
<tr>
<td>Non</td>
<td>78.8</td>
<td>60.3</td>
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<td>Physical activity, MET-min/wk</td>
<td>906 (1437)</td>
<td>1164 (1725)</td>
</tr>
<tr>
<td>TV viewing time, h/d</td>
<td>1.96 (1.36)</td>
<td>1.86 (1.29)</td>
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<td>TV time categories, %</td>
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<tr>
<td>&lt;1 h/d</td>
<td>38.9</td>
<td>42.0</td>
</tr>
<tr>
<td>&gt;1 to ≤2 h/d</td>
<td>33.2</td>
<td>33.5</td>
</tr>
<tr>
<td>&gt;2 h/d</td>
<td>27.9</td>
<td>24.5</td>
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<td>Current alcohol, %</td>
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<td>31.7</td>
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<tr>
<td>SBP, mm Hg</td>
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<td>135 (18)</td>
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<tr>
<td>FPG, mM</td>
<td>5.2 (1.7)</td>
<td>5.3 (1.7)</td>
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<td>HDL-c, mM</td>
<td>1.39 (0.34)</td>
<td>1.26 (0.28)</td>
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<td>LDL-c, mM</td>
<td>3.21 (0.84)</td>
<td>3.23 (0.81)</td>
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<td>Triglycerides, mM*</td>
<td>1.17 (0.88)</td>
<td>1.34 (0.96)</td>
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<td>Body Mass Index</td>
<td>24.2 (4.4)</td>
<td>24.2 (3.8)</td>
</tr>
<tr>
<td>HT present, %</td>
<td>36.0</td>
<td>38.9</td>
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<tr>
<td>DM present, %</td>
<td>9.3</td>
<td>13.3</td>
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<tr>
<td>C-Reactive Protein*</td>
<td>1.2 (2.5)</td>
<td>1.1 (2.0)</td>
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<tr>
<td>Calorie intake, kcal/d</td>
<td>1967 (791)</td>
<td>2124 (847)</td>
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<tr>
<td>Percentage saturated fat</td>
<td>25.2 (14.6)</td>
<td>27.4 (15.8)</td>
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<tr>
<td>Spherical Equivalent</td>
<td>-1.10 (2.68)</td>
<td>-1.08 (2.62)</td>
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<td>Right eye</td>
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<tr>
<td>CRAE, μm</td>
<td>143.5 (14.4)</td>
<td>140.9 (14.6)</td>
</tr>
<tr>
<td>CRVE, μm</td>
<td>220.8 (20.9)</td>
<td>220.6 (21.1)</td>
</tr>
</tbody>
</table>

Values are mean (SD) for continuous variables and percentages for categorical variables. *P*-value for the difference in characteristics between the sexes and the ethnic groups based on χ² or ANOVA, as appropriate.

* Values are median (interquartile range).
The majority of the participants were Chinese (58.6%), with Malays (21.8%), Indians (19.5%), and others (0.1%) making up the rest. Among the ethnic groups, Chinese participants had the lowest leisure-time physical activity and TV viewing time. Malays had higher CRAE and CRVE compared with those of the other ethnic groups.

**Physical Activity and CRAE/CRVE**

Table 2 shows associations of leisure-time physical activity with CRAE and CRVE for all participants and stratified by sex and ethnicity (Model 3). There were no significant associations of physical activity with CRAE, although males tended to have a narrower CRAE with lower levels of physical activity (P for trend = 0.05). In contrast, there was a statistically significant association of leisure-time physical activity with CRVE, where those in the lowest quartile of physical activity had 1.51 μm wider CRVE (95% CI, 0.01–2.92) than that of those in the highest quartile, after adjustment for demographic, behavioral, and biomedical risk factors (Model 3).

Statistically significant interactions of physical activity with sex (P = 0.09) and physical activity with ethnicity (P = 0.02) were noted for CRVE. A significantly wider CRVE (by 2.23 μm; 95% CI, 0.10–4.38) was noted in males who were in the lowest quartile of physical activity compared with that of the highest quartile. Chinese and Indian participants who were in the lowest quartile of physical activity had a wider CRVE compared with that of the highest quartile, although statistically significant results were noted only in the Chinese (wider by 2.52 μm; 95% CI, 0.42–4.59).

**TV Viewing Time and CRAE/CRVE**

Table 2 shows associations of the three categories of TV viewing time with CRAE and CRVE for all participants and stratified by sex and ethnicity (Model 3). Significant interactions of TV viewing time with sex (P = 0.01) and TV viewing time with race/ethnicity (P = 0.1) were observed. However, the association reached statistical significance only in females, for whom CRAE was narrower by 1.22 μm (95% CI, −2.43 to −0.02) in those who watched between 1 and 2 hours of TV per day and by 1.28 μm (95% CI, −2.56 to −0.03) in those who watched >2 h/d of TV compared with those who watched TV for ≤1 h/d.

In analyses stratified by diabetes or hypertension status, associations of physical activity or TV viewing time with CRAE/CRVE were similar to those in the whole population.

**DISCUSSION**

In this cross-sectional study of three ethnic groups of Asian adults, we found significant associations of lower levels of physical activity with wider retinal venular caliber and higher levels of TV viewing time with narrower retinal arteriolar caliber. These associations were independent of several well-documented cardiovascular and metabolic risk factors. The magnitude of the association of physical activity and venular caliber was much stronger in males and Chinese, whereas for TV viewing time, associations were observed with arteriolar caliber in females only.

Associations of physical activity with venular caliber noted in our study are consistent with those of other large population-based studies, including the Multi-Ethnic Study of Atherosclerosis (MESA), which reported lower physical activity levels to be associated with wider venules in nearly 6000 participants from a multicentric, although predominantly Caucasian, background23; and the Atherosclerosis Risk In Communities (ARIC) study where higher sport-related physical activity was associated with significantly reduced odds of having a wider venular caliber.24 A recent controlled trial in males, examining the effect of a 10-week exercise intervention on retinal vascular calibers in obesity, has shown wider arterioles among obese athletes and narrower venules among lean athletes (controls) on completing the program.25 Higher levels of physical activity are known to be associated with improvements in endothelial function and anti-inflammatory markers.20–22,39,40 Several epidemiologic studies have shown associations of wider retinal venular caliber with markers of inflammation and endothelial dysfunction, which could explain the associations of physical activity with venular caliber.3,41

The finding of narrow arteriolar caliber among females who watched >1 hour of TV per day differed from that of the MESA and the AusDiab studies, which showed higher levels of TV viewing time to be associated with wider venular caliber in the overall population and in males, respectively.25,26 Greater time spent in sedentary behaviors such as TV viewing could have potent deleterious effects on biological attributes such as lipoproteins and C-reactive protein.24,25 However, the reasons for the association of CRAE with TV viewing among females in our study remain speculative. Sex differences have been noted in the associations of TV viewing time with cardiometabolic biomarkers, in which relationships were stronger in females than those in males.18,43,44 In the ARIC study and subsequent meta-analysis,3,45 the relationship between retinal vascular caliber and incident coronary heart disease was stronger in females than that in males, and may reflect the greater contribution of small vessel disease process in cardiovascular disease development in females. Hormonal factors in females are also known to be associated with a narrow arteriolar caliber,16,46 although we adjusted for menopause and hormone replacement therapy within our analyses. It remains to be determined whether biological variability, differences in the measurement of TV viewing time, or other factors could influence sex variations in the associations of TV viewing time with the microcirculation. Arteriolar narrowing is generally thought to result from cumulative arteriolar changes associated with remodeling from chronic hypertension and arteriolosclerosis.48 Females who watched more TV in our study had a narrow arteriolar caliber, even after adjusting for present blood pressure and history of hypertension, thus suggesting an independent role for the association of TV viewing time with narrow arterioles. Because retinal arteriolar narrowing has a strong role in the pathogenesis of coronary heart disease among females,3 there is a clear need for further cross-sectional and longitudinal studies to explore the clinical significance of this association among Asian females.

A unique feature of the study was the opportunity to examine associations among Asian ethnic groups. Several studies have demonstrated associations of retinal microvascular caliber with cardiovascular risk factors in Asian populations.5,49–52 Although the relationship of wider venular caliber with lower levels of physical activity in our study was significantly more pronounced among the Chinese, followed closely by the Indians, the direction of association was different in Malays. The reasons for this are unclear; however, the smaller numbers of participants in the ethnic groups other than Chinese limit the possibilities for identifying significant associations. Among the Chinese, there is evidence to suggest that greater levels of inflammatory mediators might play a role in the association of lower levels of physical activity with wider venules.53 The only other study to look at racial/ethnic differences in these associations was the MESA study, which did not show any statistically significant associations of physical activity with retinal venular caliber among Chinese Americans.25

Strengths of the study include the large multiethnic Asian sample, the use of a standardized method to measure retinal vascular caliber, and the availability of a range of covariates. However, the unavailability of fundus photographs for some...
<table>
<thead>
<tr>
<th>Factor</th>
<th>All</th>
<th>Males</th>
<th>Females</th>
<th>Chinese</th>
<th>Malays</th>
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<td>n</td>
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<td>1848</td>
<td>2018</td>
<td>2265</td>
<td>843</td>
<td>755</td>
</tr>
<tr>
<td>Leisure-time physical activity</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>CRAE</td>
<td></td>
<td></td>
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<tr>
<td>Quartile 3</td>
<td>-0.17 (-1.25–0.89)</td>
<td>-0.65 (-2.10–0.80)</td>
<td>0.42 (-1.17–2.00)</td>
<td>-0.17 (-2.12–2.46)</td>
<td>1.17 (-1.42–5.34)</td>
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<tr>
<td>Quartile 2</td>
<td>0.09 (-1.03–1.21)</td>
<td>-1.37 (-2.98–0.25)</td>
<td>1.30 (-0.28–2.89)</td>
<td>0.46 (-1.02–1.94)</td>
<td>-0.92 (-3.20–1.47)</td>
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<tr>
<td>Quartile 1</td>
<td>-1.01 (-2.06–0.05)</td>
<td>-1.58 (-3.13–0.06)</td>
<td>-0.11 (-1.60–1.38)</td>
<td>-0.82 (-2.22–0.59)</td>
<td>-0.94 (-3.12–1.25)</td>
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<tr>
<td>P (for trend)</td>
<td>0.15</td>
<td>0.05</td>
<td>0.19</td>
<td>0.21</td>
<td>0.68</td>
<td>0.65</td>
</tr>
<tr>
<td>TV viewing time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRAE</td>
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<td></td>
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<tr>
<td>Quartile 3</td>
<td>1.07 (-0.51–2.64)</td>
<td>2.06 (0.03–4.10)</td>
<td>0.96 (-2.97–1.89)</td>
<td>0.03 (-2.06–2.13)</td>
<td>-1.68 (-4.00–0.77)</td>
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<td>Quartile 2</td>
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<td>Quartile 1</td>
<td>1.51 (0.01–2.92)</td>
<td>2.25 (0.10–4.38)</td>
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<td>2.52 (0.44–4.99)</td>
<td>-0.97 (-4.20–2.55)</td>
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<tr>
<td>P (for trend)</td>
<td>0.13</td>
<td>0.12</td>
<td>0.20</td>
<td>0.02</td>
<td>0.49</td>
<td>0.21</td>
</tr>
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</table>

Data are reported as unstandardized regression coefficients (β) in μm, which provide an estimate of the mean difference in vessel caliber (arteriolar or venular) for each quartile, with Quartile 4 as the reference standard for leisure-time physical activity; and for each category with ≤1 h/d as the reference standard for TV viewing time. Model adjusted for age, sex, ethnicity, CRAE or CRVE (as appropriate), spherical equivalent of right eye, smoking, education, TV viewing time, systolic blood pressure, fasting glucose serum triglycerides, HDL-c, LDL-c, body mass index, C-Reactive Protein, presence of hypertension, presence of diabetes, current alcohol intake, total calorie intake, percentage of saturated fat intake, menopause (females), and HRT use (females) (Model 3).

* P < 0.05. Quartile cut points for physical activity: All: 0, 439, 1249; Males: 106, 672, 1596; Females: 0, 273, 919; Chinese: 0, 407, 1136; Malays: 0, 576, 1496; Indians: 0, 576, 1496.
Chinese participants might be a source of potential selection bias and the cross-sectional nature of the study limits the ability to assess the temporality of the association. The MET values used in our study are standard units of physical activity intensity assigned to activities based on their rate of energy expenditure to promote comparability across studies. However, this estimate does not take into consideration differences in the biological and environmental conditions of individuals studied. Thus, they may not represent the true MET values for our study participants, giving rise to ill-defined confidence intervals around the mean values.54 This has been overcome to some extent in our analyses by the use of categories for leisure-time physical activity. We used leisure-time physical activity alone as a measure of activity level, so the study could not capture the true level of overall daily activity. However, we carried out a subgroup analysis among the working population (2097) and adjusted for occupational physical activity (MET-min/wk) as well in Model 3. This showed a stronger association of leisure-time physical activity with the venular caliber; the association with arteriolar caliber did not reach statistical significance. Moreover, leisure-time physical activity contributed most to moderate-intensity activity in the population studied.52

Summary

In summary, our study has shown associations of lower levels of physical activity with wider retinal venular caliber and greater levels of TV viewing time with narrower retinal arteriolar caliber in a large multiethnic Asian population sample. Further prospective studies and intervention trials are needed (ideally using objective exposure-variable measures) to show the effect of physical activity and sedentary behavior on changes in retinal vascular caliber. A strong emphasis on increasing time spent in physical activity and reducing time spent in sedentary behavior may thereby help to reduce cardiovascular risk because of its possible direct beneficial effects on the microcirculation.

This study has found significant associations of two key behavioral risk factors with retinal microvasculature. Lower physical activity and higher TV viewing time were adversely associated with retinal microvascular caliber among Asian adults.

References


