

Physical activity during leisure and commuting in Tianjin, China

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Objective To investigate physical activity during leisure time and commuting among persons aged 15–69 years in the urban population of Tianjin, China, and to assess its associations with demographic and health-related characteristics.

Methods In 1996 a cross-sectional survey of 2002 males and 1974 females provided information on physical activity during leisure time and commuting and on demographics and health behaviours.

Findings No leisure-time physical activity was engaged in by 67% of females and 61% of males. However, only 4% of females and 9% of males reported an absence of physical activity during commuting. The mean duration of leisure-time physical activity for the whole population was about 10 min per day. The average commuting time on foot or by bicycle was about 30 min. Leisure-time physical activity was more frequent among highly educated people, people with high incomes, white-collar workers, married people, non-smokers, or people commuting on foot or by bicycle than among other people. Persons with low incomes, male blue-collar workers and married people were more likely than others to engage in 30 min or more per day of physical activity on foot or by bicycle when commuting.

Conclusion People in Tianjin engaged in a high level of physical activity when commuting and a low level of leisure-time physical activity.

Keywords Physical Fitness; Life style/ethnology; Exercise; Bicycling/statistics; Walking/statistics; Health behavior; Workplace; Residential mobility; Transportation; Urban population; Socioeconomic factors; Cross-sectional studies; China (*source: MeSH, NLM*).

Mots clés Aptitude physique; Style vie/ethnologie; Exercice physique; Cyclisme/statistique, Marche/statistique, Hygiène de vie; Poste travail; Mobilité habitat; Transports; Population urbaine; Facteur socio-économique; Etude section efficace; Chine (*source: MeSH, INSERM*).

Palabras clave Aptitud física; Estilo de vida/etnología; Ejercicio; Ciclismo/estadística, Caminata/estadística; Conducta de salud; Lugar de trabajo; Movilidad residencial; Transportes; Población urbana; Factores socioeconómicos; Estudios transversales; China (*fuelle: DeCS, BIREME*).

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Voir page 937 le résumé en français. En la página 937 figura un resumen en español.

Introduction

There is good evidence that regular physical activity has a protective effect against several chronic conditions, including coronary heart disease, hypertension, obesity, diabetes, osteoporosis, colon cancer, depression and anxiety (1, 2). The Centers for Disease Control and Prevention (CDC) and the American College of Sports Medicine have recommended that every adult in the USA should accumulate at least 30 min of moderate intensity physical activity on most, and preferably all, days of the week (1). Walking and cycling are two forms of physical activity that meet the metabolic criteria for achieving health benefits from exercise (3, 4). However, walking and cycling to and from work and school have been ignored in population surveys as forms of moderate-to-vigorous physical activity (5). Many studies in Western cultures have measured commuting physical activity indirectly when investigating the frequency and duration of walking and cycling. Few have addressed physical activity undertaken during commuting as a single component of physical activity in relation to health. In Denmark a cohort study demonstrated that cycling to work was inversely associated with all-cause mortality (6), and a prospective study

in Japan showed that walking to work decreased the risk of hypertension among men (7). Intervention studies have suggested that commuting which involves walking or cycling improves health-related fitness (8, 9). Among urban populations, daily walking or cycling to and from work has been shown to be inversely associated with body mass index and concentrations of serum total cholesterol, low-density lipoprotein and triglyceride, and to be positively associated with high-density lipoprotein concentrations (10–12).

There is substantial epidemiological evidence that physical activity is negatively associated with increased age (1, 13–17). People's educational level is positively associated with their leisure-time physical activity (13–19). Blue-collar workers or other workers with comparatively low levels of skill are less likely to participate in leisure-time physical activity than white-collar or professional workers (16). Health behaviours are also related to physical activity: thus epidemiological research has indicated that cigarette smoking is associated with reduced levels of physical activity (14–18).

To our knowledge there are few data on the prevalence of commuting and leisure-time physical activity in China or

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other developing countries. The aim of the present study was to examine the level of such activity and its relationship to demographic and health-related characteristics among the urban population of Tianjin, a city in north-east China.

Materials and methods

In 1996 a cross-sectional population survey in urban areas of Tianjin provided the baseline for an intervention programme funded by the World Bank. The aim of the programme was to decrease the levels of behavioural risk factors for non-communicable chronic diseases through legislative and environmental changes.

The city of Tianjin has a population of 9.5 million, of whom 4 million live in six urban districts. In the first stage of a two-stage sampling procedure, 14 communities comprising 400 000 inhabitants were selected using a random selection process, with the proviso that at least two communities were drawn from each urban district. In the second stage, 4000 individuals aged 15–69 years were drawn at random from the local population registers in the sampled communities. The sample was stratified by gender and into four 10-year age groups and one 15-year group (55–69 years). The subsamples of each sampled community were of similar size. The response rate was 100%. The numbers of persons in the age strata were as follows: 15–24 years, 793 (19.8%; 399 males, 394 females); 25–34 years, 815 (20.4%; 410 males, 405 females); 35–44 years, 811 (20.3%; 409 males, 402 females); 45–54 years, 781 (19.5%; 390 males, 391 females); 55–69 years, 800 (20%; 406 males, 394 females). The study subjects were merged and regrouped into the following three age ranges: 15–34 years, 35–49 years, and 50–69 years. Because some information was unavailable for 24 individuals, the analysis covered 3976 subjects.

The survey was conducted by health workers who had received intensive training for this purpose. The questionnaires, which dealt mainly with aspects of demographics, health behaviour, health knowledge and physical activity, were completed during home interviews.

Data were obtained on age, sex, marital status, duration of education (0–6 years, 7–12 years, >12 years), income (<300 yuan, 300–500 yuan, >500 yuan; US\$ 1 = 8.3 yuan), and occupation (white-collar or blue-collar worker, retired, housewife, student, unemployed, or other). On the basis of the respondents' self-reported smoking status, participants were classified as never having smoked, ex-smokers, or current smokers.

The participants were asked: "During the last 30 days, did you participate in any physical activity or exercises such as running, walking, dancing, ball sports, or *qigong*?" Those who answered in the affirmative were given the opportunity to describe the exercise in detail, e.g. its frequency (≥ 20 times, 10–19 times, 5–9 times and 1–4 times per month) and duration. Participants were asked to indicate whether they walked, cycled, or used motorized transport when going to and from work, school and shops, as well as the daily duration of any activity that they mentioned. Duration was categorized as 0 min (use of motorcycle, car, bus, or no physical activity associated with commuting), ≤ 30 min on foot, ≤ 30 min by bicycle, 31–60 min on foot, 31–60 min by bicycle, and >60 min by bicycle.

The statistical analyses were carried out at the University of Kuopio, Finland, using SPSS 7.5 software. Commuting

physical activity was dichotomized at a threshold of 30 min in accordance with a recommendation of the Centers for Disease Control and Prevention and the American College of Sports Medicine (1). Leisure-time physical activity was dichotomized as "doing" or "not doing", since few people in the population performed more than 30 min of such activity. In order to assess the associations between physical activity and demographic and health behaviour variables, we calculated adjusted odds ratios using logistic regression. In the analysis of the associations between physical activity and demographic variables and between physical activity and smoking, adjustments were made for age and three other socioeconomic indicators.

Results

The mean age of the participants was 39.9 years; 76% of the males and 71% of the females had received 7–12 years of education (Table 1); only 13% of the males and 9% of the females had completed more than 13 years of education; 73% of the subjects were married; 59% of the males and 12% of the females were current smokers.

Absence of leisure-time physical activity was reported by 67% of the females and 61% of the males (Table 2). Leisure-time physical activity lasting 1–30 min per day was performed by 29% of the males and 24% of the females, and about 10% of the participants reported more than 30 min of such activity per day. The mean duration of leisure-time physical activity was 10 min for males and 8 min for females. Only 4% of females and 9% of males reported that they went to and from work by bus or that they performed no physical activity associated with commuting. A total of 50% of the males and 55% of the females reported 1–30 min of commuting physical activity on foot or by bicycle; 30% of the males and 34% of the females

Table 1. Socioeconomic characteristics and health measures of study subjects aged 15–69 years, Tianjin, China

Variable	Males (%) (n = 2002)	Females (%) (n = 1974)
Age (years)		
15–34	40	40
35–49	33	32
50–69	27	28
Education (years)		
0–6	11	20
7–12	76	71
>12	13	9
Income (yuan)^a		
<300	29	35
300–500	45	43
>500	26	22
Married	73	73
Occupation		
White-collar workers	21	18
Blue-collar workers	49	41
Retired or housewives	15	25
Students	10	10
Unemployed or other	5	6
Current smoker	59	12

^a US\$ 1 = 8.3 yuan.

Table 2. Physical activity among study subjects aged 15–69 years, Tianjin, China

Type of physical activity	Males(%)	Females(%)
Leisure-time (times per month)		
0	61	67
1–4	6	6
5–9	7	5
10–19	5	4
≥20	21	18
Leisure-time (min/day)		
0	61	67
1–30	29	24
>30	10	9
Commuting on foot or by bicycle (min/day)		
0 ^a	9	4
1–30	50	55
31–60	30	34
>60	11	7
Combined commuting and leisure-time (min/day)		
0	7	3
1–30	38	44
31–60	32	36
>60	23	17

^a Using motorized transport, or no commuting physical activity.

performed 31–60 min of such activity, and 11% of the males and 7% of the females cycled for more than 1 hour to and from work. The mean commuting time on foot or by bicycle was 31 min for males and 30 min for females, respectively.

Persons aged 35–49 years were less likely to participate in leisure-time physical activity than those aged 15–34 years. On the other hand, women aged 50–69 years were more likely than women aged 15–34 years to participate in such activity (Table 3). Highly educated people, persons with high incomes, white-collar workers, and married people were significantly more likely to participate in leisure-time physical activity than people in the reference group. Non-smokers, and persons going to and from work on foot or by bicycle were much more likely to engage in leisure-time physical activity than smokers or people who went to and from work by bus.

Men aged 50–69 years were more likely to perform over 30 min of commuting physical activity on foot or by bicycle than males aged 15–34 years (Table 4). Persons with comparatively low incomes or who were married were significantly more likely to engage in commuting physical activity lasting 30 min or more than those who had higher incomes or were unmarried. Male blue-collar workers were more likely to perform over 30 min of commuting physical activity than male white-collar workers.

Discussion

Of the female and male respondents, 96% and 91%, respectively, walked or cycled to and from work, school or shops daily. The commuting time on foot or by bicycle was about 30 min for the whole population. More than 60% of the participants reported an absence of leisure-time physical activity during the preceding 30 days. The mean duration of leisure-time physical activity was about 10 min. Thus, more

Table 3. Adjusted odds ratios for leisure-time physical activity by selected characteristics of male and female study subjects aged 15–69 years, Tianjin, China^a

Characteristic	Males	Females
Age (years)		
15–34	1.00	1.00
35–49	0.67 (0.51–0.88) ^{b,c}	0.68 (0.52–0.90) ^c
50–69	1.07 (0.79–1.45)	1.62 (1.13–2.31) ^c
Trend	<i>P</i> <0.001	<i>P</i> <0.001
Education (years)		
0–6	1.00	1.00
7–12	1.03 (0.78–1.39)	1.30 (1.01–1.64) ^d
>12	1.77 (1.23–2.54) ^c	2.15 (1.48–3.12) ^e
Trend	<i>P</i> <0.001	<i>P</i> <0.001
Income (yuan)^f		
<300	1.00	1.00
300–500	1.52 (1.20–1.92) ^e	1.48 (1.17–1.88) ^c
>500	2.01 (1.53–2.63) ^e	2.32 (1.76–3.06) ^e
Trend	<i>P</i> <0.001	<i>P</i> <0.001
Married (yes versus no)		
	2.45 (1.86–3.23) ^e	2.48 (1.92–3.20) ^e
Occupation		
Blue-collar versus white-collar	0.65 (0.48–0.87) ^c	0.52 (0.38–0.73) ^e
Current smoker (yes versus no)		
	0.66 (0.53–0.81) ^e	0.62 (0.42–0.89) ^c
Commuting physical activity (min/day)		
0	1.00	1.00
1–30	2.52 (1.67–3.81) ^e	1.39 (0.76–2.53)
31–60	3.06 (2.00–4.69) ^e	1.62 (0.88–2.96)
>60	3.14 (1.94–5.07) ^e	2.08 (1.05–4.10) ^d
Trend	<i>P</i> <0.001	<i>P</i> <0.001

^a Association between personal characteristics and physical activity adjusted by age and three other socioeconomic indicators, and association between smoking and physical activity adjusted by age, education, income, marital status and occupation.

^b Figures in parentheses are 95% confidence intervals.

^c *P*<0.01.

^d *P*<0.05.

^e *P*<0.001.

^f US\$ 1 = 8.3 yuan.

time was spent on commuting physical activity than on leisure-time physical activity. Daily commuting physical activity was a major component of the overall physical activity, which differs markedly from the situation among the populations of developed countries. For example, the data from the 2000 Behavioral Risk Factors Surveillance System indicated that about 27% of adults in the USA did not engage in any leisure-time physical activity (20). In the 15 Member States of the European Union it was estimated that 73.1% adults practised some kind of leisure-time physical activity (17). The number of cycling and walking trips (leisure and commuting) in Europe is small. On average, 5% of all trips in European countries in 1995 were made by bicycle. Cycling is common in Northern European countries. Walking as a means of transport is declining in Europe (21); for example, in Finland during 1999, 47% of females and 30% of males spent more than 15 min daily walking or cycling to and from work (22). In the USA about 80% of native Americans in the Inter-Tribal Heart Project reported that they did not walk or cycle to and from work (13).

Table 4. Adjusted odds ratios for more than 30 min of commuting physical activity, by selected characteristics, among male and female study subjects aged 15–69 years, Tianjin, China^a

Characteristic	Males	Females
Age group (years)		
15–34	1.00	1.00
35–49	1.09 (0.84–1.41) ^b	0.91 (0.71–1.16)
50–69	1.78 (1.34–2.37) ^c	1.23 (0.88–1.71)
Trend	$P < 0.001$	NS ^d
Education (years)		
0–6	1.00	1.00
7–12	1.03 (0.75–1.43)	1.00 (0.73–1.39)
>12	0.94 (0.63–1.40)	1.29 (0.83–2.00)
Trend	NS	NS
Income (yuan)^e		
<300	1.00	1.00
300–500	0.91 (0.73–1.14)	0.77 (0.63–0.96) ^f
>500	0.74 (0.57–0.96) ^f	0.78 (0.60–1.00) ^f
Trend	$P < 0.05$	$P < 0.05$
Married (yes versus no)	2.45 (1.86–3.23) ^c	2.48 (1.92–3.20) ^c
Occupation		
Blue-collar versus white-collar	1.47 (1.09–1.98) ^f	0.93 (0.69–1.26)
Current smoking (yes versus no)	0.96 (0.78–1.18)	0.92 (0.67–1.26)

^a Association between personal characteristics and physical activity adjusted by age and three other socioeconomic indicators, and association between smoking and physical activity adjusted by age, education, income, marital status and occupation.

^b Figures in parentheses are 95% confidence intervals.

^c $P < 0.001$.

^d NS = not significant.

^e US\$ 1 = 8.3 yuan.

^f $P < 0.05$.

A study in the Russian Federation found that walking to school accounted for 40–50% of children's physical activity (5).

The health benefits of regular leisure-time physical activity are well known (1, 2) but there is less awareness of the benefits of walking or cycling to work. In Japan, doctors regularly advise businessmen to walk to work in order to compensate for their low occupational physical activity (7). The amount of daily walking or cycling to and from work is inversely associated with body mass index and concentrations of serum total cholesterol, low-density lipoprotein, and triglyceride among men, and is positively associated with high-density lipoprotein concentrations in both genders (10–12). Several studies have suggested that daily cycling or walking to and from work is associated with a low level of cardiovascular risk factors (7–9) and a reduction in all-cause mortality (6). In a recent Chinese study, involving the use of both cross-sectional and cohort data, it was found that the ownership of motorized transport by households was associated with obesity in men and women and that the acquisition of a motorized vehicle increased the probability of men becoming obese (23). Since people may obtain health benefits from physical activity during commuting there is a need for further studies on the relationship between both commuting and leisure-time physical activity and health. In

many studies in developed countries, commuting physical activity has been measured indirectly when questions have been asked about the frequency and duration of walking and cycling. Few studies in developing countries have directly evaluated the level of commuting physical activity and its association with health. Our study suggests the importance of separating commuting physical activity as a component of total physical activity.

In the present study, persons aged 35–49 years were less likely to participate in leisure-time physical activity than those aged 15–34 years. This was consistent with the findings of other studies (13–16). Women aged 50–69 years were more likely than women aged 15–34 years to undertake leisure-time physical activity, and men in this age group were more likely than men aged 15–34 years to engage in more than 30 min of commuting physical activity. It is possible that middle-aged Chinese people have heavy work burdens and that they therefore have no time to exercise. People aged 50–69 years may be retired and have increased scope for leisure-time physical activity and for shopping on foot or by bicycle. The present study is consistent with previous findings indicating comparatively high levels of leisure-time physical activity among people of relatively high educational level, people on relatively high incomes, and white-collar and professional workers. This may arise because such people on the whole have sedentary occupations. Married individuals were significantly more likely to engage in leisure-time physical activity and in over 30 min of commuting physical activity on foot or by bicycle than were unmarried people (15).

Lifestyles have changed in China during the last two decades in response to rapid economic development, improved food supplies, expansion of television, computerization, and mechanization, increased car ownership, and improved public transport. Occupational physical activity, especially in the agricultural sector, has declined; and the prevalence of overweight has increased among adults, with light work-related physical activity being the strongest predictor of this trend (24). The acquisition of motor vehicles increased markedly in China between 1989 and 1997 and this has been associated with a growing prevalence of obesity in both men and women (23). Overweight and obesity are an increasing public health problem in China (24, 25).

A limitation of our study was that we did not collect data on physical activity in people's homes. It should be noted that Chinese women usually spend much more time than men on cooking and cleaning.

In conclusion, urban people in Tianjin had commuting and leisure-time physical activity levels that differed from those generally encountered in populations in developed countries. Commuting physical activity on foot or by bicycle should be considered separately from other physical activity in future investigations. ■

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Résumé

Activité physique des habitants de Tianjin (Chine) pendant leurs loisirs et leurs trajets professionnels

Objectif Étudier l'activité physique des personnes de 15 à 69 ans dans la population urbaine de Tianjin (Chine) pendant leurs loisirs et leurs trajets professionnels, et évaluer les associations possibles avec les caractéristiques démographiques et l'état de santé de ces personnes.

Méthodes En 1996, une enquête transversale portant sur 2002 hommes et 1974 femmes a fourni des informations sur l'activité physique de ces personnes pendant leurs loisirs et leurs trajets professionnels, ainsi que sur leurs caractéristiques démographiques et leur comportement en matière de santé.

Résultats 67 % des femmes et 61 % des hommes ne pratiquaient aucune activité physique pendant leur temps libre. En revanche, seuls 4 % des femmes et 9 % des hommes déclaraient ne pas profiter de leurs trajets professionnels pour faire de l'exercice. L'ensemble de

la population consacrait en moyenne 10 minutes par jour à l'exercice physique pendant les loisirs. La durée du trajet professionnel à pied ou à bicyclette était d'environ 30 minutes. Pendant les loisirs, l'exercice d'une activité physique était plus fréquent chez les personnes ayant un niveau d'instruction élevé, les personnes à haut revenu, les employés de bureau, les personnes mariées, les non-fumeurs ou encore les personnes qui se rendent à leur travail à pied ou à bicyclette. Mais pendant leurs trajets professionnels, ce sont surtout les personnes à faible revenu, les employés de bureau de sexe masculin et les personnes mariées qui consacrent 30 minutes ou plus à la marche ou aux déplacements à bicyclette.

Conclusion Les habitants de Tianjin ont un niveau élevé d'activité physique pendant leurs trajets professionnels et faible pendant leurs loisirs.

Resumen

Actividad física durante el tiempo de ocio y los desplazamientos al trabajo en Tianjin (China)

Objetivo Investigar la actividad física realizada durante el tiempo de ocio y los desplazamientos al trabajo entre las personas de 15-69 años en la población urbana de Tianjin (China), y evaluar la relación entre esa variable y diversos factores demográficos y relacionados con la salud.

Métodos En 1996 una encuesta transversal de 2002 hombres y 1974 mujeres proporcionó información sobre la actividad física realizada durante el tiempo de ocio y los desplazamientos al trabajo y sobre las características demográficas y los comportamientos con incidencia en la salud.

Resultados El 67% de las mujeres y el 61% de los hombres no hacían ninguna actividad física durante su tiempo de ocio. Sin embargo, sólo el 4% de mujeres y el 9% de hombres declararon no hacer ningún tipo de actividad física durante sus desplazamientos

al trabajo. La duración media de la actividad física durante el ocio en el conjunto de la población era de unos 10 minutos diarios. El promedio del tiempo invertido en caminar o ir en bicicleta en los desplazamientos al trabajo era de alrededor de 30 minutos. La actividad física recreativa era más frecuente entre las personas con estudios superiores, las personas con ingresos altos, los empleados de oficina, las personas casadas, los no fumadores, y las personas que iban al trabajo a pie o en bicicleta. Las personas con ingresos bajos, los varones con trabajos manuales y las personas casadas tendían con más frecuencia que el resto a hacer ejercicio cada día durante al menos 30 minutos yendo a pie o en bicicleta al trabajo.

Conclusión La población de Tianjin realizaba una considerable actividad física en sus desplazamientos al trabajo, y hacía en cambio poco ejercicio en sus ratos de ocio.

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