Soz Präventivmed 1993; 38: 356–361

0303-8408/93/060356-06 $1.50 + 0.20/0

Relationships between leisure time physical activity for exercise and other health-related behaviors

Daan G. Uitenbroek

Research Unit in Health and Behavioral Change, University of Edinburgh

Relationships between Leisure Time Physical Activity for Exercise and other health-related behaviors.

In a previous article physical activity for exercise was studied in detail for several sociodemographic groups in Scotland and London [1]. This approach, in which the emphasis is on differences in physical activity behavior between respondents from different sociodemographic groups, by gender, age, occupation, education or area of residence, is not uncommon in the health sciences or in the study of exercise behavior [2–3]. However, during the previous decades an alternative approach has developed which studies the inter-relationships between various health related behaviors [5–7].

In this paper the relationship between physical activity for exercise and other health-related behaviors will be studied. A number of reasons can be put forward for studying the inter-relationships between health related behaviors. First, the results might be important for epidemiological research, since interrelationships between health behaviors might confound the relationships between risk factors and morbidity and mortality [8,9]. For example, the fact that non-smokers are at a lower risk for cardiovascular disease than smokers might be partly attributable to non-smokers exercising more often than smokers. Second, from the perspective of health promotion, the direct relation between exercise and other health behaviors might be of interest. Here, the effects of being a heavy smoker or drinker might be an important factor in shaping the type and extent of involvement in exercise. Third, the perspective of health behavior and lifestyle research in general. As the main causes of mortality in the developed world are strongly related to behavioral factors, the study of the psychological and sociological dimensions which influence these factors has become more important. Here one might ask: does the decision to exercise to improve health also lead to other preventive behaviors? Do more healthy as opposed to less healthy lifestyles thus develop? Are there "cultures" where healthy behavior is more common or more positively appreciated, and what is it in these cultures which "causes" this emphasis on a more healthy lifestyle [10,11]?

A number of overviews have summarized the current evidence on the relationships between physical activity and other health behaviors [12–14]. The evidence to date is patchy; there is, for example, quite a considerable amount of information on the relationship between smoking and exercise but there seems to be little on the relationship between sexual behavior and exercise. In many cases the evidence is inconsistent; for example, the amount of information on the relationship between physical activity for exercise and alcohol use is considerable; however, an association is found on some occassions but not on others. These problems are partly due to the fact that many studies were not designed to study the relationships between physical activity for exercise and other health behaviors, and they often concern unrepresentative groups, such as individuals who enroll in health risk prevention programs. Another problem is that health behaviors tend to be strongly related to sociodemographic factors. Thus, the fact that a relationship between smoking and exercise is found might be influenced by individuals from lower socioeconomic categories smoking more often and exercising less often than those from the higher socioeconomic categories.

The aim of this paper is to provide additional evidence for the relationship between physical activity for exercise and other health behaviors on the basis of a representative sample of the population. The respondents' sociodemographic profile will be taken into consideration. The relationships between physical activity for exercise and three clusters of health-related behaviors will be studied. These are: first, the relationships between physical activity for exercise and alcohol use and smoking; second, eating behaviors, weight and the intention to lose weight; third, preventive behaviors such as seat-belt use and blood pressure checks. In this third section the relationship between physical activity for exercise and the reported number of sexual partners is also studied.

Subjects and methods

The data analyzed are based on interviews carried out daily by computer assisted telephone interviewing (CATI). The respondents were selected using a two-stage procedure: 1) household telephone numbers were selected using a random digit dialing procedure; 2) once contact had been established an

inventory of all adults eligible for the interview was taken and a second random procedure was used to select a member of the household. The interview contained around 90 questions on health-related behavior, risk factors for disease, and lifestyle. The interview lasted around 15 minutes.

The data discussed in this paper were collected in the metropolitan areas of Glasgow and Edinburgh between January and December 1991. The analysis concerns 2418 male and 3053 female respondents. Questions on sexual behavior were only asked of respondents between 18 and 50 years of age. The analysis regarding sexual behaviors is therefore limited to the 1993 male and 2393 female respondents within these age limits. Response rates were calculated on a monthly basis, and fluctuated, according to the CASRO procedure[15], between 70.3% for December and 83.2% for June 1991.

Two questions on physical activity for exercise provide the basis for the analysis: the first asked the respondents if they engaged in any physical activity for exercise in the previous month; the second asked about the number of times they exercised for at least 20 minutes during the past week. The respondents are dichotomized into a group which exercised at least once for at least 20 minutes during the past week and a group who exercised less often. This categorization resulted in 1449 males (59.9%) being classified as physically active while 969 males (40.1%) were classified as non-active. For females the figures were 1443 (47.3%) and 1610 (52.7%) respectively.

The respondents who report having exercised once or more often in the previous week will be compared with the respondents who report having exercised less often on three clusters of variables. These variables were based in part on the Canadian Health Promotion Survey[16,17] and the American CDC Behavioral Risk Factor Surveys[18,19]. The first cluster is related to smoking and alcohol use. Smoking was determined by asking two questions: "Have you smoked at least a hundred cigarettes in your life?", and the second questions for those who answered "yes": "Do you smoke now?". Respondents answering "yes" to both questions were categorized as smokers; the remaining respondents as non smokers. Alcohol use was determined by the question: "Have you had any beer wine or spirits during the past month?". In addition, those who answered "yes" to this question were asked: "How many times during the past month did you have five or more drinks on one occasion?". The respondents were categorized on the basis of this question as: (1) light drinkers – respondents who consumed alcoholic beverages but on no occasion in the previous month consumed more than five alcoholic beverages on one occasion; (2) moderate drinkers – consumed more than five alcoholic beverages on between one and five occasions; and (3) heavy drinkers – consumed more than five alcoholic beverages on more than five occasions. A log-linear analysis was applied to investigate the hypothesis that the relationship between smoking and drinking alcohol on the one hand, and exercise behavior on the other hand, was caused not by a direct relationship between these variables but by a spurious relationship including the respondents' occupational or age classification. The higher order interactions of the log-linear analysis will be investigated to see whether the relationships found were similar for different age and occupational groups (according to British Census Bureau classification[20]) and percentages kept constant for age and occupation will be presented.

The second cluster of variables relates physical activity behavior with eating behavior. Four questions are considered. The first asked the respondents: "How often do you usually add salt to your food at the table?" after which the respondents were categorized into a group of salt users, those who answered "most of the time" or "sometimes", and a group of non-salt users, those who answered "rarely" or "never"; the second question asked the respondents: "What do you usually spread on bread?", after which the respondents were categorized into a group who answered "low fat spread" and a remainder group, those who answered "butter", "margarine" or "other"; third the respondents' BMI (kg/m^2) was assessed on the basis of questions on weight and height; and, fourth, the answer to the question "Are you trying to lose weight now?" are shown in the results section. Log-linear analysis was used to keep age and occupation constant in the proportional data, while analysis of variance was used to study the influence of occupational status and age on the average BMI.

The third cluster of variables presents the respondents' answers on two questions on preventive behavior, one asking the respondents: "How often do you use seatbelts when you drive or ride in the front seat of a car?", after which the respondents were dichotomized into those answering "always" and those giving one of the answers ranging from "never" to "nearly always"; the second question asked the respondents: "When did you last have your blood pressure checked?", after which the respondents were dichotomized into "less than a year ago" or "more than a year ago" and "never". Lastly, the respondents' answers are shown to the question "During the past five years, about how many sexual partners did you have altogether?". The respondents were dichotomized into those who reported having had more than three partners and those who had three or less partners.

Results

Table 1 contrasts respondents who reported exercising once or more often in the previous week with

Tab. 1. Relationships between physical activity for exercise and smoking and alcohol use. Percentages and valid N-of-Cases.

	Males			Females		
physically active: (proportion:)	>=1x p/w (60%)	<1x p/w (40%)	N	>=1x p/w (53%)	<1x p/w (47%)	N
current smoker	25.7%	43.1%*	2418	25.9%	42.1%*	3053
alcohol last month.	91.9%	84.0%*	2418	83.5%	73.0%*	3053
light drinker	26.2%	24.4%	547	45.8%	41.5%*	1053
moderate drinker	46.4%	44.1%	976	44.8%	50.5%*	1153
heavy drinker	27.4%	31.4%	620	9.4%	8.0%*	210
constant for age and occupation:						
current smoker	28.2%	41.4%*	2200	28.6%	42.8%*	2564
alcohol last month.	91.2%	84.7%*	2200	82.3%	74.2%*	2564

* $p < 0.05$ (Chi-sq).

respondents reporting exercising less often on variables related to smoking and alcohol use. On the first line of Table 1 it can be seen that for males 25.7% of the respondents who exercised once or more often in the previous week were smokers, compared with 43.1% of the respondents who exercised less often (Chi-sq: 90.1; df:1; $p < 0.00$). For females, these percentages are 25.9% and 42.1% respectively (Chi-sq: 94.7; df:1; $p < 0.00$). With regard to alcohol use, in comparison with respondents who exercised more often, respondents who report having exercised less than once in the previous week are also less likely to report having drunk alcohol in the previous month. The difference is statistically significant for both males (Chi-sq: 35.7; df:1; $p < 0.00$) and females (Chi-sq: 48.6; df:1; $p < 0.00$). On the next three lines of Table 1 the exercise behavior of those respondents who had drunk alcohol in the previous month is related to their drinking pattern. For males there seems to be a slight tendency for respondents who exercise less than once per week to be classified as heavy drinkers more often, however, this relationship is not statistically significant. For females there was a statistically significant relationship, with relatively more females who exercised at least once in the previous week falling into the moderate and heavy drinker categories (Chi-sq: 7.9; df: 2; $p < 0.02$). The last two lines of Table 1 give the relationships between exercise behavior and smoking and alcohol use while keeping age and occupational status constant. The relationships did not change much in the log-linear analysis, and there were no statistically significant higher order interactions which pointed to a large difference in the relationships by age or occupational status.

Table 2 shows the relationships between physical activity for exercise and two indicators of eating behavior; adding salt to food, and using low-fat spreads. In addition the average BMI and the answer to the question asking whether the respondent is currently trying to lose weight are shown. With regard to the two eating behaviors it can be seen that the respondents who reported exercising more often are also more likely to engage in healthy eating behaviors; i.e. add salt to food less often and report using low fat spreads more often than the respondents who report exercising less often. With regard to average BMI, respondents exercising less than once in the previous week have a higher average BMI while respondents exercising once or more often had a lower BMI. The relationship between physical activity for exercise and the responses to the question "Are you trying to lose weight at the moment?" showes that the highest proportion of respondents trying to lose weight can be found among the respondents who reported exercising once or more often in the previous week, and the lower proportion among respondents who reported to have exercised less than once in the previous week.

Comparing males with females it seems that females engage more often in healthy eating behavior and more often report trying to lose weight than males. Further, the relationship between the eating behaviors and physical activity for exercise are stronger for females than for males; i.e. the proportional differences between exercisers and non-exercisers in eating and weight-losing behaviors are larger. However, the direction is similar for males and females.

Table 2 also shows the relationships between the variables of interest while keeping constant the respondents age and occupational classification. Although there are some slight shifts the relationships discussed did not change much. Inspection of the higher order interactions did not show statistically significant relationships which might point to differences in the relationships within the age and occupational groups. In the last line of table two the relationship between physical activity for exercise and using low-fat spread is studied once more, keeping constant for weight losing behavior. This is done because of the fact that weight losers might exercise more and eat more low fat products, and weight-losing behavior might thus create a spurious

Tab. 2. Relationships between physical activity for exercise and eating behavior, average BMI and weight-losing behavior.

	Males			Females		
physically active: (proportion:)	>=1x p/w (60%)	<1x p/w (40%)	N	>=1x p/w (53%)	<1x p/w (47%)	N
Add salt to food	59.3%	68.0%*	2418	48.8%	61.3%*	3052
Uses low fat spread	35.1%	28.7%*	2418	49.2%	38.5%*	3053
Average BMI	24.17	24.71 ♯	2408	22.91	24.03 ♯	3027
Tries to lose weight	29.6%	25.2%*	2418	44.3%	36.3%	3052
constant for age and occupation:						
Add salt to food	63.4%	68.7%*	2200	52.0%	63.0%*	2563
Uses low fat spread	34.5%	28.8%*	2200	49.7%	39.0%	2564
Average BMI	24.32	24.64 ♯	2191	23.00	23.70 ♯	2543
Tries to lose weight	30.2%	26.0%*	2200	45.5%	40.6%	2564
constant for age, occupation and weight-losing behavior						
Uses low fat spread	36.5%	31.3%*	2418	50.2%	40.2%*	2564

* $p < 0.05$ (Chi-sq); ♯ $p < 0.05$ (t-test).

Tab. 3. Relationships between physical activity for exercise and preventive and sexual behavior.

	Males			Females		
physically active: (proportion:)	>=1x p/w (60%)	<1x p/w (40%)	N	>=1x p/w (53%)	<1x p/w (47%)	N
Always use seat-belt	84.3%	81.6%*	2394	93.4%	91.4%*	2998
Bloodpr check last yr	53.5%	52.5%	2412	69.8%	71.4%*	3052
More than 3 partners	22.0%	15.1%*	1658	4.4%	3.0%	1975
constant for age and occupation:						
Always use seat-belt	84.4%	82.4%	2181	93.3%	91.6%	2529
Bloodpr check last yr	56.8%	52.2%	2194	69.5%	71.8%	2563
More than 3 partners	19.9%	15.7%	1520	4.1%	3.2%	1737

* $p < 0.05$ (Chi-sq).

relationship between physical activity for exercise and the use of low fat spread. As can be seen the relationship remains; thus, irrespective of whether the respondents tried to lose weight or not, respondents who exercised more often also used low fat spread more often.

The first two lines of Table 3 show the relationships between physical activity and the answers to the questions on reported seatbelt use and having had a blood pressure check in the previous year. As can be seen, the respondents who reported exercising once or more often in the previous week reported using seatbelts and having had a blood pressure check more often than those respondents who reported having exercised less than once in the previous week. However, the relationship is statistically significant only with regard to seatbelt use and for females (Chi-sq: 4.0; df:1; $p < 0.05$); furthermore, this last relationship disappears if the respondents' age and occupation are held constant (Chi-sq: 2.4; df:1; $p = 0.12$). With regard to the numbers of sexual partners the differences between the respondents who reported exercising once or more often in the previous week and those who exercised less often appear to be large. The respondents who reported exercising once or more often were more often categorized as having had more partners in the previous five years, than were the respondents who exercised less than once, and this difference was statistically significant for males (Chi-sq: 11.4; df:1; $p < 0.00$) but not for females (Chi-sq: 2.3; df:1; $p = 0.12$). However, when age and occupation were kept constant the relationship between exercising and sexual behavior got less pronounced for males and was not statistically significant (chi-sq: 3.3; df:1; $p = 0.08$).

Discussion

The aim of this paper was to study the relationships between physical activity for exercise and other health behaviors. The analysis showed that compared with respondents who exercise less often; 1) respondents engaging in physical activity for exercise more often also behave more healthily with regard to smoking, diet and weight-losing behavior; 2) respondents who reported exercising more often

are more likely to have drunk alcohol in the previous month, and are more likely to report a higher number of sexual partners in the previous five years; however, this last relationship is not statistically significant; and 3) there does not seem to be a strong relationship with preventive behaviors such as using seat-belts or having had a blood pressure check in the previous year. The lack of a relationship between physical activity for exercise and these two preventive behaviors might have been partly caused by specific characteristics of the two preventive behaviors; seat-belt use is obligatory in Britain and almost all respondents reported using them, independent of exercise behavior, while having a blood pressure check is dependent on visiting a medical doctor.

In answer to the points mentioned in the introduction it seems that the population data analyzed in this paper confirm many of the relationships previously observed. Although slight changes can be observed, these relationships are maintained if possible confounding factors are held constant. On the basis of these results it seems that interrelated health behaviors are a factor to be considered in epidemiological and health behavior research. The relationships between physical activity for exercise and other healthy behaviors seems to point to a lifestyle component governing exercise behavior. For example, the relationship between exercise, alcohol use and sexual behavior might be related to the fact that exercising individuals have more social contacts while the relationship between smoking and eating behaviors might be related to social "healthy behavior" norms, governing both exercise and other health behaviors. These ideas will have to be further developed in theory and research and might then form a basis for health promotion and the development of healthy lifestyles in relation to exercise.

Summary

In this article the relationships between physical activity for exercise and other health-related behaviors is studied. The data analyzed were collected during 1991 by telephone in Glasgow and Edinburgh and concern 2418 male and 3053 female respondents between 18 and 60 years of age. In the analysis, respondents who reported exercising less than once in the previous week were contrasted with respondents who reported exercising more often. Compared with respondents exercising less often, respondents who reported exercising more often reported being smokers and adding salt to their food significantly less often, and more often reported drinking alcohol, using low-fat spread and engaging in weight-losing behavior. No significant relation was found between physical activity for exercise and seat-belt use among males and blood pressure checking among males and females.

Résumé

Relations entre les activités sportives de loisirs et d'autres facteurs comportementaux ayant attrait à la santé

Cet article présente une analyse des relations entre l'activité sportive pendant les loisirs et d'autres comportements ayant attrait à la santé. Les données présentées ont été récoltées par interview téléphonique auprès de 2418 hommes et de 3053 femmes agés de 16 à 60 ans à Glasgow et à Edinburgh (Ecosse) en 1991. L'analyse compare des personnes ayant eu moins d'une activité sportive de loisir durant la semaine précédant l'interview aux sujets ayant des activités sportives plus fréquentes. Les personnes plus actives se désignaient moins souvent comme fumeur, ajoutaient de faıon significative moins souvent du sel au repas, déclaraient plus fréquemment consommer de l'alcool, l'utilisation de produits à tartiner pauvres en calories, et elles faisaient des efforts pour réduire leur poids. Une relation significative entre l'activité sportive de loisirs, le port de ceintures de securité dans la voiture chez les hommes et les contrôles de tension artérielle dans les deux sexes n'a pas été constatée.

Zusammenfassung

Beziehungen zwischen körperlich-sportlicher Freizeitaktivität und anderen gesundheitsassoziierten Verhaltensfaktoren

Dieser Artikel präsentiert eine Analyse der Beziehungen zwischen körperlich-sportlicher Freizeitaktivität und anderen gesundheitsassoziierten Lebensstilfaktoren. Die vorliegenden Daten wurden im Jahre 1991 mittels Telephoninterview in Glasgow und Edinburgh (Schottland) bei 2418 Männern sowie 3053 Frauen im Alter zwischen 18 und 60 Jahren erhoben. In der Auswertung wurden alle Personen mit weniger als ein Mal wöchentlicher körperlich-sportlicher Freizeitaktivität mit allen Personen mit häufiger sportlicher Betätigung verglichen. Im Vergleich zu den weniger aktiven Personen waren die Aktiveren (Selbstangaben) signifikant seltener Raucher, fügten signifikant seltener dem Essen Salz bei, gaben häufiger Alkoholkonsum, Verwendung eines fettarmen Brotaufstrichs sowie Anstrengungen zur Gewichtsreduktion an. Keine signifikante Beziehung resultierte zwischen körperlich-sportlicher Freizeitaktivität und 1) Tragen der Sicherheitsgurten bei den Männern sowie 2) Blutdruckkontrolle bei Männern und Frauen.

References

1 *Uitenbroek DG, McQueen DV.* Leisure time physical activity behavior in three British cities. Soz Präventivmed 1990; *36*:307–314.
2 *Stephens Th, Jacobs DR, White CC.* A descriptive epidemiology of leisure-time physical activity. Publ Hlth Rep 1985; *100*:147–157.
3 *Ford ES, Merritt RK, Heath GW, Powell KE, Washburn RA, Kriska A, Haile G.* Physical Activity Behaviors in Lower and Higher Socioeconomic Status Populations. Am J Epidemiol 1991; *133*:1246–1255.
4 *Ross CE, Hayes D.* Exercise and psychologic well-being in the community. Am J Epidemiol 1988; *127*:762–771.
5 *Green LW.* Research agenda: Building a consensus on research questions. Am J Hlth Prom 1986; *2*:70–72.
6 *Kickbush I.* Lifestyles and Health. Soc Sci Med 1986; *22*:117–124.
7 *McQueen DV.* A Research program in Lifestyle and Health: Methodological and Theoretical Considerations. Rev d'Epidemio S Pub 1987; *35*:28–35.
8 *Blackburn H, Jacobs DR.* Physical Activity and the Risk of Coronary Hearth Disease. New Engl J Med 1988; *319*:1217–1219.
9 *Marti B, Tuomilehto J, Salonen JT, Puska P, Nissinen A.* Relationship between Leisure-time Physical Activity and Risk Factors for Coronary Hearth Disease in Middle-Aged Finnish Women. Act Med Scand 1987; *222*:223–230.
10 *Abel Th.* Measuring health lifestyle in a comparative analysis: Theoretical issues and empirical findings. Soc Sci Med 1991; *32*:899–908.
11 *Cockerham WC, Kunz G, Lueschen G.* Social Stratification and Health Lifestyle in Two Systems of Health Care Delivery: A Comparison of the United States and West-Germany. J Hlth Soc Behav 1988; *29*:113–126.
12 *Shephard RJ.* Adolph Abraham memorial lecture, 1988, Exercise and lifestyle change. Br J Sports Med 1989; *23*: 11–22.
13 *Blair SN, Jacobs DR, Powell KE.* Relationships between exercise or physical activity and other health behaviors. Publ Hlth Rep 1985; *100*:172–179.
14 *Blair SN, Kohl HW.* Measurement and Evaluation of Health Behaviors in Relationship to Physical Fitness and Physical activity Patterns. In: National Center for Health Statistics, edt. Assessing Physical Fitness and Physical Activity in Population Based Surveys, 1989; 527–546.
15 Council of American Survey Research Organizations. Report of the CASRO completion Rates Task Force. New York: Audits and Survey Company Inc, 1982.
16 *Schoenborn C, Stephens Th.* Health Promotion in the United States and Canada: Smoking, Exercise and other health related behaviors. Am J Publ Hlth 1988; *78*:983–984.
17 *Stephens Th.* Exercise, Chapter 12. In: Rootman I, Warren R, Thomas S, Larry P, edt. Ottawa, Canada: Minister of Supply and Services, Health and Welfare Canada, 1988; 155–160.
18 *Hogelin G.* The behavioral risk factor surveys in the United States 1981–1983. In: Anderson R et al., edt. Health behaviour research and health promotion. Oxford: Oxford University Press, 1988; 111–124.
19 *Remington PL, Smith MY, Williamson DF, Anda RF, Gentry EM, Hogelin GC.* Design characteristics and usefulness of state-based behavioral risk factor surveillance: 1981–1987. Publ Hlth Rep 1988; *103*:366–375.
20 Classification of occupations and coding index: Office of Population Censuses and Surveys. London: HMSO, 1980.
21 *Wood PD, Stefanick ML, Dreon DM, Freyhewitt B, Garay SC, Williams PT, Terry R, Haskell W.* Changes in Plasma-Lipids and Lipoproteins in Overweight Men During Weight-loss Through Dieting as Compared with Exercise. New Engl J Med 1988; *319*:1173–1179.

Acknowledgements

The unit is funded by the Chief Scientist Office of the Scottish Home and Health Department; the Health Education Board Scotland (HEBS); and by the Economic and Social Research Council (ESRC: Grant # XA 44250009). The opinions expressed in this communication are those of the author, not of the funding bodies.

Address for correspondence:
Daan G. Uitenbroek
Research Unit in Health and Behavioral Change
University of Edinburgh
24 Buccleuch Place
Edinburgh EH8 9LN/UK