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Gender bias in the assessment of physical activity in population studies

Summary

Objectives: Despite their generally more health promoting behaviours, women are found to participate less in physical activity than men. This study explores possible gender bias in measurement of physical activity in population studies.

Methods: Data collected by telephone (CATI) from the Berne Lifestyle Panel in 1996 is utilised. A representative sample of the population of the city of Berne comprised N = 1119 cases. Gender differences are assessed for the weekly frequency of three measurements of physical activities.

Results: An indicator of sport and exercise showed higher physical activity among men, while the indicator of habitual physical activity showed higher rates of daily walking and biking among women. A combined indicator of general physical activity showed no significant gender differences.

Conclusions: The results provide empirical evidence on potential risk of underestimation of physical activity among women and of misclassification with respect to high or low risk behaviour patterns.

Key Words: Gender – Physical activity – Survey.

Studies on gender and health behaviour have found that women show generally more positive health behaviours than men[1–4]. However, there seems to be one exception, as most epidemiological studies report less physical activity among female compared to male respondents[3,5,6]. It is not easily understandable why that gender group that takes on average less health risks and better care of their body would show less healthier conduct when it comes to physical activities. One possible answer to that paradox may relate to the fact that most risk factor studies have used measures of physical activity that are strongly associated with sport and exercise. Yet, these forms of physical activity are today, especially in the European context, still considerably closer to typical male domains such as competitive sports and membership in sport and gym clubs. For example, a Swiss survey has shown that, compared to men, women ages 55 to 65 performed more moderate activity (3 to 3.9 times the basal metabolic rate) but less often activities associated with energy expenditures greater or equal to four times the basal metabolic rate[7]. Thus, according to the way physical activity is measured, there may be a significant gender bias, even in population-based studies. Questions on possible gender bias arise not only from the perspective of health behaviours as patterns of social behaviours. Epidemiological studies concerned rather with estimation of risk factors for example, have demonstrated that for men and women different activity forms need to be considered when measuring daily individual energy expenditures[8].

Methods

In order to explore potential measurement bias we apply three different indicators that measure potentially gender-specific forms of physical activity. Depending on the measure employed, we expect significant gender differences in prevalence of physical activity. With respect to the patterning of health behaviours, we also expect that gender adequate indicators would fit better the general finding of healthier behaviour patterns among women.

The present analysis employs data from the 1996 first wave of the Berne Lifestyle Panel, a computer-assisted telephone interview survey (CATI) on health relevant lifestyles and their determinants. The respondents comprise a

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representative sample of the population of Berne in the age between 55 and 65 years. The net response rate was 64.0% (n=1119) (for more details see[9]). Overall eight behaviour variables on physical activity, alcohol consumption, and eating concerns were included:

The information on the number of hours per week spent for sport and exercise was used for the variable SPORT, coded as none = "0"; ≤2 hours = "1"; >2 hours = "2". Additional dichotomous information on physical activities, daily walking for relaxation (*relax*), and daily walking or biking for at least 20 minutes for commuting to work or doing the grocery shopping (*twentym*), was included in two other physical activity indicators. Habitual physical activity (HPA) was computed as: $HPA = relax_{0/1} + twentym_{0/1}$. A more general indicator on physical activity (GPA) was computed as: $GPA = relax_{0/1} + twentym_{0/1} + sporty_{0/1}$ whereas ≤1 hour of sport activities = sporty = "0" and >1 hour of sport activities = sporty = "1". GPA recoded to none activity = 0, at least one = 1, and >1 activity = 2. Indicators and their categorisation are rather crude as they were developed not to provide exact prevalences but to explore the basic principles of gender measurement bias.

Exploratory bi-variate analyses included contingency table and correlation analyses. Chi squared and Spearman rank correlations were computed as measures of statistical associations.

Results

Distributions of three different indicators of physical activity are shown in Table 1.

As expected in all but two variables women report more positive health behaviours than men, including habitual physical activity. The two exceptions regard our indicator for sport and exercise (higher scores for men) and the combined measure of general physical activity (no significant gender difference). The later result is a consequence of combining two measures of which sport is more frequent among males and habitual physical activity more among female respondents.

Table 2 displays associations between the three measures of physical activity and other health related behaviours. As known from earlier studies relationships among health behaviours are often considerable yet, not statistically strong[10,11]. In the present case, rather crude categories additionally reduce the maximum value of correlation coefficients. However, as shown in Table 2 there are significant correlations between measures of physical activity most eating habits and among males smoking and drinking habits.

Correlation coefficients in Table 2 also indicate that different measures of physical activity yield considerably different patterns of associations between health behaviours. For example among males the correlation coefficient between

Variables men: n = 419 women: n = 626	Range		Mean		S. D.		Gender differences	
			men	women	men	women	Chi 2	p value
SPORT	0	2	1.07	0.91	0.86	0.83	13.84	0.001
HPA*	0	2	0.76	0.94	0.75	0.76	15.29	0.000
GPA	0	2	1.17	1.25	0.79	0.77	2.62	0.271
ALC	1	3	1.77	2.31	0.70	0.58	196.53	0.000
BINGE	1	3	2.66	2.90	0.60	0.39	74.25	0.000
SMOKE	1	3	2.60	2.70	0.76	0.65	13.13	0.001
MEAT	1	3	1.43	1.81	0.64	0.74	81.15	0.000
VEGT	1	3	2.15	2.50	0.75	0.68	67.16	0.000
EAT	1	3	1.90	2.25	0.77	0.74	57.43	0.000

* HPA = habitual physical activity, GPA = general physical acitivity, ALC = Alcohol consumption, BINGE = binge drinking, SMOKE = smoking, MEAT = meat/sausage consumption, VEGT = Fruits/vegetables consumption, EAT = eating concerns.

Table 1 Statistical description of the variables

	Women (n = 626)								
Men (n = 419)	SPORT	HPA	GPA	ALC	BINGE	SMOKE	MEAT	VEGT	EAT
SPORT		0.17**	0.52**	0.04	0.05	0.09*	0.07	0.12**	0.10*
HPA*	0.17**		0.83**	0.05	0.05	0.08	0.07	0.18**	0.21**
GPA	0.56**	0.82**		0.06	0.03	0.08	0.08*	0.19**	0.20**
ALC	0.07	0.13**	0.13**		0.23**	0.10*	0.03	0.13**	0.10*
BINGE	0.09*	0.06	0.06	0.34**		0.08	0.07	0.07	0.06
SMOKE	0.21**	0.09	0.14**	0.05	0.02		0.01	0.15**	0.09*
MEAT	0.15**	0.10*	0.15**	0.11*	0.13**	0.08		0.04	0.12**
VEGT	0.14**	0.12**	0.17**	0.11*	0.11*	0.15**	0.06		0.28**
EAT	0.08	0.09*	0.11*	0.16**	0.05	0.18**	0.14**	0.24**	

* HPA = habitual physical activity, GPA = general physical acitivity, ALC = Alcohol consumption, BINGE = binge drinking, SMOKE = smoking, MEAT = meat/sausage consumption, VEGT = Fruits/vegetables consumption, EAT = eating concerns. *p<0.05; **p<0.01.

Table 2 Correlation analyses (Spearmans rank correlation) of variables form the Bern Lifestyle Panel, Switzerland, 1996, by gender.

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physical activity and smoking is twice as high when sport and exercise (0.21) rather than habitual physical activity (0.09) is utilised. Among males there is a substantial difference in strength of association between alcohol consumption and physical activity. A significant relationship between more physical activity and less alcohol consumption is found only for those indicators that include habitual physical activity yet not for sport and exercise alone. In contrast, the coefficient for the association between physical activity and less frequent binge drinking is significant only for the variable SPORT. Among women, measures of physical activity that include habitual activities are more strongly correlated with eating habits than sport and exercise alone. Among men patterns of correlations between physical activity and eating habits also vary, yet the differences are less pronounced.

Conclusions

Epidemiological studies mostly based on the risk factor paradigm have previously discussed issues of gender bias with respect to accuracy in physical activity assessment[7,12]. From a health promotion perspective the present report introduces a different focus. It considers physical activity primarily a social behaviour which is, in its meaning and expressive form fundamentally linked to gender. While this general idea has been mentioned earlier[13] there have been rarely any empirical explorations that would link qualitative and substantive issues with methodological problems of measurement of physical activity in general populations. However, the present study has clear limits that should be taken into account when interpreting its results. The literature included in this brief report was limited basically to a minimum to introduce the general aim of the study. The sample utilised here is limited to a specific age group of adults 55 to 65 years of age and represents only an urban Swiss population. The general character of the study was exploratory and testing of respective hypotheses seems necessary in future studies. Statistical methods applied here are rather simple and future analyses should include more sophisticated statistical testing.

Despite such limitations there are several conclusions that can be drawn from the present findings. First and most important, the results strongly indicate that studies on physical activity should carefully consider and define their measures taking into account possible gender biases and gender specificity of indicators. More specifically, the present findings provide preliminary evidence that traditional measures of physical activity that often and only implicitly focus on sports and exercise may lead to underestimation of physical activity in women population samples when leaving out forms of physical activity that comprise more habitual movements such as taking the bike to work or going for walks and household chores[13]. In addition, associations of physical activity with other health relevant behaviours varied considerably across different measures of physical activity. This finding indicates a further risk of misleading empirical findings and false interpretations.

We provide here one example to demonstrate possible consequences of applying gender-biased measures in an attempt to cluster respondents according to their behavioural risk patterns. Four behaviour variables (alcohol, fruit/vegetables, smoking and *either* sport/exercise *or* the combined measure of GPA) were dichotomised over the mean and summed, yielding a scale from 0 to 4. Next, respondents were grouped into one of three groups (0,1 = risk prone; 2 = balanced; 3 = healthy behaviour pattern). Depending on the physical activity measure employed in that index we compared the classification of individuals. While among men no substantial differences where found we observed a considerable difference among women. Using the more appropriate measure of general physical activity considerably more women were classified as practising a health promoting behaviour pattern (59.1%) as compared to employing SPORT (53.0%) in the otherwise same index.

Overall, the present results add empirical evidence to earlier findings[14,15] indicating that women are not generally less physically active than men but that their patterns of physical activity are qualitatively different. Consequently, and beyond gender separating analysis[17], gender sensitive measures of physical activity should be developed and utilised in future population studies in order to prevent measurement bias in prevalence estimations, false classifications, and flawed interpretations.

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Zusammenfassung

"Gender bias" bei der Erfassung von körperlicher Aktivität in der Normalbevölkerung

Fragestellung: Obwohl sie sich im Allgemeinen gesünder verhalten, zeigen Frauen im Vergleich zu Männern geringere Beteiligungen an Sport und körperlichen Aktivitäten. Die vorliegende Arbeit exploriert mögliche gender-bias-Effekte in der Messung von körperlicher Aktivität in Bevölkerungsstudien.

Methoden: CATI-basierte Daten des Berner Lebensstil Panels von 1996 werden analysiert. Der Datensatz bildet ein repräsentatives Sample der Stadt Berner Bevölkerung mit N = 1119. Geschlechterunterschiede werden im Hinblick auf den Einsatz von drei unterschiedlichen Indikatoren für körperliche Aktivitäten untersucht.

Ergebnisse: Ein Indikator für sportliche Aktivität zeigt höhere körperliche Aktivität unter Männern. Ein Indikator für habituelle Aktivität erbringt dagegen höhere Raten von Zufussgehen und Radfahren bei Frauen. Ein Kombinationsindikator zeigt keine signifikanten Unterschiede nach Geschlecht.

Schlussfolgerungen: Die Ergebnisse liefern Hinweise auf potentielle Risiken der Unterschätzung von körperlicher Aktivität bei Frauen und von Fehlklassifizierungen in Bezug auf gesundheitsrelevante Verhaltensmuster.

Resumé

Biais lié au sexe lors de la mesure de l'activité physique dans les études de population

Objectifs: Bien qu'elles aient en général des attitudes plus saines, les femmes sembleraient avoir moins d'activités physiques que les hommes. Cette étude explore la possibilité qu'il y ait un biais lié au sexe dans la mesure de l'activité physique dans les études de population.

Méthode: Données récoltées par téléphone (CATI) dans le cadre de la "Bern Lifestyle Panel" en 1996. Un échantillon représentatif de la population de la ville de Berne comprenant n = 119 personnes. Les différences liées au sexe portent sur la fréquence hebdomadaire de trois mesures d'activité physique.

Résultats: Un indicateur de sport et d'exercice a montré plus d'activité physique chez les hommes, alors que les femmes se situent plus haut sur l'indicateur d'activité physique habituel en terme de marche et de vélo. L'indicateur combiné d'activité physique générale ne montrait pas de différence entre les sexes.

Conclusions: Ces résultats fournissent des preuves empiriques d'un risque potentiel de sous-estimation de l'activité physique chez les femmes et de biais de classement par rapport à des profils de comportement à haut ou bas risque.

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Appendix: Health behaviour variables

Alcohol consumption (ALC) was measured in number of drinks (beer, wine) per day and coded as 1 = more than 2 glasses; 2 = 1–2 glasses; 3 = none. Binge drinking (BINGE) was approximated by reports to a question on how frequent in the last month did respondents have 5 or more alcoholic drinks at one occasion, coded as 1 = more than 4 times; 2 = 1–3 times and 3= less than 1. Smoking (SMOKE) measured the average number of cigarettes smoked per day and was categorised as 1 = none smoker; 2 = 1–10; 3 = more than 10. Two variables assessed eating habits: Meat and sausage consumption (MEAT) was categorised as 1 = 6 servings or more per week; 2 = three to 5 servings per week; 3 = none to two servings per week. A vitamin C rich diet was approximated by consumption of fresh fruit and vegetables (VEGT) and coded as 1 = none of both daily; 2 = one of both daily; 3 = both daily. Eight items on concerns with healthy eating (EAT), measured on a five point scale, how much respondents paid attention that their diet was e.g., too sweet, too fatty. The individual mean score on the 8 items was recoded as 1 = never/rarely; 2 = often; 3 = very often/always.

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