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Abstract

Introduction. – Physical activity (PA) is an important public health issue and its benefits in relation to health have been strongly emphasized in recent years in Europe.

Facts. – This article examines the social stratification of leisure-time PA among Europeans (EU-27) in 2005. Based on the Eurobarometer 64.3 survey, the results of our Hierarchical Linear Modeling Bernoulli model show that 4 out of 10 Europeans are not exposed to PA in their leisure time. In addition, leisure-time PA in the EU-27 is socially stratified according to sex, age, occupation, and geographical status. Moreover, with respect to both overall leisure-time PA and the social stratification of leisure-time PA, there are substantial between-country variations that should be scrutinized in future research.

Conclusion. – The current findings show that it is important for EU member states to draw up national plans in support of leisure-time PA that take account of the customs and cultural characteristics of a country.

Key Words: leisure-time physical activity, European adults, social stratification, Eurobarometer, public health

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Résumé

Introduction. – L'exercice physique est présenté comme un outil de santé publique et l'avantage pour la santé a largement été accentué pendant les dernières années en Europe.

Faits. – Cet article examine la stratification sociale de l'exercice physique de loisir chez les Européens (EU-27) en 2005. En se basant sur l'Eurobaromètre 64.3, les résultats obtenus de notre modèle multiniveau nous démontrent que 4 sur 10 Européens ne sont pas exposés à l'exercice physique de loisir. En plus, l'activité physique de loisir dans l'Union européenne est stratifiée en function de l'âge, du sexe, de la profession, et de la location géographique. En outre, en ce qui concerne l'exercice physique de loisir en general et la stratification sociale de l'exercice physique, il y a des variations substantielles entre les pays qui doivent être examinés dans des futures récherches scientifiques.

Conclusion. – Nos résultats démontrent qu'il est important pour les Etats membres de l'Union européenne de concevoir des projets nationaux en faveur de l'exercice physique de loisir rendant compte des traditions et caractéristiques culturelles d'un pays.

Mots clés: exercice physique de loisir, adultes européens, stratification sociale, Eurobaromètre, santé publique

Literature review

Physical activity is an important public health issue and the benefits of an active lifestyle in relation to well-being and health have been strongly emphasized in recent years in Europe, as well as in most of the rest of the world [1-4]. Physical inactivity is associated with increased risk of chronic diseases and premature mortality [5] and with other disease states such as hypertension, diabetes, osteoporosis, particular forms of cancer, obesity and even psychological disorders [6]. Therefore, the need to increase participation in regular physical activity has been identified as one of the most prevalent public health burdens of our times in many developed countries [2, 3, 5, 7]. Physical inactivity is estimated to account for about 600,000 deaths per year in the WHO's European region [7]. In addition, more than half of the adult population in this region is overweight or obese, and obesity-related illnesses are estimated to account for as much as 7% of total healthcare costs in the EU. Childhood obesity is of particular concern. According to the International Obesity Task Force, an estimated 3 million European school children are now obese, and some 85,000 more children become obese each year [7]. The European Commission believes, therefore, that the EU and its member states must take proactive steps to reverse the decline in physical activity that has occurred over the past several decades. In 2007 the Commission adopted two white papers in which the need for physical activity figures prominently: the White Paper on a Strategy for Europe on Nutrition, Overweight and Obesity related health issues [8] and the White Paper on Sport [9].

The European Union defines physical activity as "any bodily movement associated with muscular contraction that increases energy expenditure above resting levels" [10]. This broad definition includes different contexts of physical activity, for example, leisure-time physical activity or sporting activity, occupational physical activity (i.e., manual workers), physical activity from household activities (i.e., cleaning, gardening, home repair), and physical activity connected with self-powered transport (i.e., walking to work, cycling to bakery). Since many leisure-time physical activities or sports have the distinct advantage over other types of physical activity of being, by their very nature, sufficiently physically demanding to meet the intensity required for health benefits, the present study pays specific attention to the contribution of *leisure-time physical activity*. Throughout, where reference is made to leisure-time physical activity, it is based on the broad definition agreed on by the Council of Europe which states that it is "all forms of physical activity which, through casual participation, aim at expressing or

improving physical fitness and mental well-being, forming social relationships or obtaining results in competition at all levels." [11]. This definition of leisure-time physical activity (or sports) extends beyond traditional team games and incorporates individual sports and fitness-related activities such as aerobics and dance, as well as recreational activities such as long walks and cycling. It extends from casual and informal participation to more serious organized club sport. For a minority it even involves complete commitment in pursuit of the highest level of excellence at world level. With respect to this specific form of physical activity, it is interesting to note that over the last few decades a process of “sportification” has emerged within Europe [12-14]. Societal interest in leisure-time physical activity has increased, and there is a multiform spectrum of sport participation styles [13]. However, in spite of the growing popularity of sport and the increasing internal differentiation of the sport system, the level of non-participation in leisure-time physical activities remains quite high, and social inequality, exclusion, and discrimination are still prevalent with regard to leisure-time physical activity. Several authors have argued that the opportunity to be physically active in leisure-time physical activity is stratified according to certain socio-cultural characteristics [15, 16]. Differences in participation rates are found among groups defined by gender, age, marital status, socio-economic status, and geographical status [17-22].

The purpose of this study is to present empirical insight into the social stratification of leisure-time physical activity in the European Union. Previous research has already focused on the association between certain socio-demographic variables and the prevalence of sufficient physical activity for health across the EU-15 [23]. However, the present study is the first of its kind to focus specifically on the social stratification of leisure-time physical activity, and to do this from a complete European (EU-27) perspective. Moreover, since previous research [24, 25] has revealed significant variation in leisure-time physical activity across countries, the present study is also designed to identify between-country variation in (the socio-demographic patterning of) leisure-time physical activity.

Methods

Data

The developments mentioned above have led public health experts to push for internationally coordinated efforts to assess and monitor physical activity—leisure-time physical activity in particular—on the population level [26]. However, international studies determining

the prevalence of physical activity in the EU are scarce since such efforts have in the past been hampered by the use of different sampling and measurement methods among member states [27-29]. In response to this problem, standard population-level public opinion surveys, called Eurobarometers, are conducted on behalf of the European Commission and provide regular monitoring of social and political attitudes in the European public. Eurobarometer 64.3 *Foreign Languages, Biotechnology, Organized Crime, and Health Items* is the most recent Eurobarometer survey in which leisure-time physical activity was assessed. It was carried out in November 2005 by request of the European Commission, Directorate-General Press and Communication Polls and covers the population of each of the 27 EU member states aged 15 years and older (N = 26,362). A multistage random sample design was applied in all countries and all interviews were conducted face-to-face in people's homes, in the appropriate national language. With respect to the data capture, CAPI (Computer Assisted Personal Interview) was used in those countries where that technique was available [30]. In each member state, at least 500 (Malta) and at most 1,557 (Germany) interviews were conducted (see Table 1). To ensure national representative samples, quotas were applied in each country according to demographic factors (gender, age, and town size) using the most recent census data. Since this Eurobarometer survey applies standardized measurements, it allows for cross-country comparisons of (the social stratification of) leisure-time physical activity. Consequently, the results of this study can assist policy makers and public health experts in developing strategies for the promotion of leisure-time physical activity [3]. From a public health perspective, therefore, it is important to map out the physical activity of Europeans. Moreover, since interventions are most effective when they alter the underlying influencing variables, studying the social stratification of leisure-time physical activity is an important prerequisite for designing relevant policies and effective programs [22].

Measures

The present study focuses specifically on aspects of *active* leisure-time physical activity. *Passive* activity—i.e., activity performed as spectators, newspaper readers, or television viewers—will not be dealt with here. Eurobarometer 64.3 (2005) assesses leisure-time physical activity by means of the question “In the last 7 days, how much physical activity did you get from recreation, sport and leisure-time activities?” Answer categories are (i) a lot, (ii) some, (iii) little, or (iv) none. These categories are dichotomized, with respondents who answered “none”

defined as physically inactive in leisure-time activities, and all others as physically active in leisure-time activities. In this way, it is possible to distinguish totally inactive participants from active participants. To examine the social stratification of leisure-time physical activity in the European Union, the above question is related to the following five background variables: (i) gender: men versus women; (ii) age: 15- to 24-year-olds, 25- to 34-year-olds, 35- to 44-year-olds, 45- to 54-year-olds, 55- to 64-year-olds, or 65 years old and older; (iii) marital status: cohabiting or married, single, divorced, or widowed; (iv) occupation: self-employed, manager, white-collar worker, manual worker, house person, unemployed, retired, or student; and (v) geographical status: living in a rural area or village, in a small- to mid-sized town, or in a large town.

Statistical analyses

Since cross-national data have a specific hierarchical structure, with individuals nested within their national units, Hierarchical Linear Modeling (HLM) and its Bernoulli model for binary outcomes is applied [31]. The probability of event occurrence (leisure-time physical activity) is estimated by calculation of multivariate odds ratios, which compare leisure-time physical activity according to the various socio-demographic categories [32]. The analyses were performed using the HLM 6.0 software package [31].

Table 2 present the results of the multilevel Bernoulli analysis (a binary logistic regression analysis), estimating the probability that a European citizen is physically active in his/her leisure time. Only odds ratios and their level of statistical significance are presented because the logit coefficients are only intuitively meaningful, while odds ratios can show not only the direction of the association, but also the extent of the association. An odds ratio can be defined as the ratio of the odds of an event occurring in one group to the odds of it occurring in another group. An odds ratio of 1 indicates that the event (leisure-time physical activity) is equally likely to happen in both categories. An odds ratio above 1 indicates that the event is more likely to happen in that category compared to the reference category. An odds ratio of less than 1 indicates that the event is less likely to happen in that category compared to the reference category.

Findings

The unconditional model

Before estimating the individual-level model, it is appropriate to ask whether in fact significant variation in the dependent variable across contextual units—here, countries—exists and, if so, what proportion of the total variance is accounted for by the country level. To gauge the magnitude of variation between countries in leisure-time physical activity it is useful to begin by estimating an unconditional or empty model, that is, a model with no predictors at either level [33]. The results from this unconditional model for leisure-time physical activity are presented in the upper part of Table 1. For a country with a typical leisure-time physical activity rate, the expected log odds of being involved in leisure-time physical activity is 0.507, corresponding to an odds of exp(0.507) = 1.66 or a probability of 1/(1+exp(-0.507)) = .624. It seems that on average, 63% of European adults indicate some sort of activity from recreation, sport, or leisure-time activities in the last 7 days. This implies that in 2005, almost 4 in 10 European citizens are still inactive with regard to leisure-time physical activity. In addition, the results show that statistically significant variance exists at the country level, making it clear that the multilevel nature of leisure-time physical activity should not be ignored. In order to understand how much of the overall variance in leisure-time physical activity is attributable to either the individual level or the country level, it is useful to calculate the intraclass correlation coefficient (ICC).[1] The ICC measures the proportion of the variance of the dependent variable that exists between countries. As noted in other research [34], it is unsurprising that the individual level accounts for a great deal of the variance when data are measured at the individual level, as is the case in the present study. Nonetheless, the proportion of the variance in leisure-time physical activity that exists between countries is still considerable: 6.4% (that is 100 x 0.227/(0.227+3.29)). This variance between European member states is congruent with previous studies into leisure-time physical activity in Europe [24, 25] and can also be seen in the lower part of Table 1. This country analysis was conducted in such a way that the EU-27 average was used as the reference category. The countries are ranked according to decreasing leisure-time physical activity

[1] The intraclass correlation coefficient for linear multilevel models is obtained by the following formula: $\rho = \frac{\tau_{00}}{\tau_{00} + \sigma^2}$ where σ^2 is the individual-level variance. However, in nonlinear models, such as our Bernoulli model, this formula is less useful because the individual-level variance is heteroscedastic. Snijders & Bosker [33] describe an alternative definition of the ICC for nonlinear models as follows: $\rho = \frac{\tau_{00}}{\tau_{00} + \pi^2/3}$. This definition treats the dependent variable as an underlying latent continuous variable following a logistic distribution of which the variance is $\pi^2/3$.

percentages. It shows Finland as the most active nation: more than 8 out of 10 Fins aged 15 and older do some type of leisure-time physical activity. Remarkably, in contrast with previous research [25] in which leisure-time physical activity was assessed by means of the question "How often do you exercise or play sport?" the other Scandinavian countries are not among the leaders in the present survey. Sweden (71%) and Denmark (62%) are merely in 8th and 13th place, respectively. Portugal and Romania are last with only 4 out of 10 citizens being active in sports. In general, leisure-time physical activity declines when moving from north to south in Europe. Citizens from more northern locations and from Scandinavian countries exceed their continental colleagues from the Mediterranean Sea area. In addition, East Europeans generally score less well with respect to leisure-time physical activity than West Europeans. The exceptions, however, are Slovenia and, to a lesser degree, the Czech Republic and Bulgaria.

Insert Table 1 about here

The individual-level model

The estimates from the individual-level model are presented in Table 2. The results for the individual-level variables are more or less consistent with existing research into leisure-time physical activity which indicates that it is socially structured. In all EU member states, and thus throughout the entire European Union, the degree of participation in leisure-time physical activity differs between social population categories such as gender, age, urban residence, level of education, profession and marital status [18-22]. After controlling for the other background characteristics, our analysis shows a significant difference between European men and women. Men are 1.26 (1/0.79) times as likely to be physically active in their leisure-time compared to women. With respect to age, the results show that 15- to 24-year-olds are more likely to be active than respondents in all other age categories. Moreover, the odds ratios decrease with increasing age—for example, 15- to 24-year-olds are 1.33 (1/0.75) times more likely to participate in sports compared to 25- to 34-year-olds, 1.57 (1/0.64) times compared to 35- to 44-year-olds, 1.81 (1/0.55) times compared to 45- to 54-year-olds, and 1.89 (1/0.53) times compared to 55- to 64-year-olds. Compared to individuals aged 65 or older the odds ratio even increases to 2.25 (1/0.39). In contrast with existing research, however, no significant effect is noticeable regarding marital status. With regard to occupation, students (OR = 2.17), managers (OR = 1.75), white-collar workers (OR = 1.38), and the self-employed (OR = 1.22) are more likely to be involved in leisure-time physical activity compared to manual workers. However, manual workers are

significantly more likely to be actively involved in leisure-time physical activity than house persons (OR = 0.85), or unemployed (OR = 0.84) or retired (OR = 0.88) individuals. With respect to geographical status, the findings show that, compared to Europeans living in rural areas or villages, individuals living in large towns are more likely (OR = 1.23) to be physically active in their leisure time. Despite the popularization and democratization of leisure-time physical activity, it appears that the differences assessed in previous research have remained very persistent within the European Union in 2005. Since no available theory suggests which of the individual-level variables should be set to vary randomly across countries, we allow all coefficients of individual-level variables to vary randomly at the country level to estimate a random component for each variable.

Upon examination of the right column of Table 2, it is evident that the estimates of the variance components of the random portion of the model—the randomly varying individual-level intercept, and the randomly varying variables for gender and dummy variables for the three age groups from 45 years on, for divorced individuals, for the self-employed, managers, white-collar workers, and students, as well as for the geographical status categories of respondents living in small- or middle-sized and large towns—are significant. That is, after controlling for the individual-level factors, there still remains a significant amount of variation both in leisure-time physical activity across European member states and in the social stratification of leisure-time physical activity. This implies that in future research a model should be specified that tries to predict those varying slopes by including country-level determinants. However, this goes beyond the scope of this article.

Insert Table 2 about here

Conclusion

From a public health perspective it is important to monitor physical activity among Europeans in order to inform the development of appropriate policies and assess progress towards health targets. However, comparison of physical activity data collected from all member states is often problematic as different sampling and measurement methods are employed among the member states. The Eurobarometer survey series has been a useful instrument in overcoming this problem. Based on Eurobarometer 64.3, the current contribution is the first of its kind to present insights into *leisure-time* physical activity patterns from a complete European (EU-27) perspective. Moreover, the data allow us to carry out a multilevel Bernoulli analysis so that the

social stratification of leisure-time physical activity can be examined. Some interesting findings emerge. First, based on the unconditional model, we find that on average 63% of European citizens are physically active during their leisure time. Therefore, the popularization of sports and other physical activities at the end of the 20th and the beginning of the 21st century does not change the fact that in 2005, 4 out of 10 Europeans were not exposed to physical activity in their leisure time, even by the rather broad definition of leisure-time physical activity used in the 2005 Eurobarometer survey. Moreover, there is apparent variance between European member states. The country analysis shows differences between North and West European countries on the one hand and South and East European countries on the other. In general, sporting participation declines when going from north to south and from west to east. Future research should include possible country-level variables that might explain this geographical variation.

Furthermore, the individual-level HLM model shows that leisure-time physical activity in the EU-27 is socially stratified. The sportive leisure-time behavior of European citizens aged 15 and over differs in terms of sex, age, occupation, and geographical status. These discrepancies can be summarized as follows: (1) more European men than women take part in leisure-time physical activity, (2) leisure-time physical activity is proportionally related to age—increasing age, decreasing physical activity, (3) there is a higher percentage of leisure-time physically actives in groups with a higher professional level, and (4) individuals living in large towns take part more in leisure-time physical activity than those living in rural areas or villages. Apart from the non-effect of marital status, these findings are more or less congruent with the results from previous national and regional studies of sport participation and physical activity which have shown that in many European countries physical activity patterns are still characterized by social differences [16, 19, 35]. Moreover, in an age of mass consumption and media communication it appears that the traditional parameters have a less structuring effect than in the past [29]. Certainly participation in leisure-time physical activity has acquired a greater degree of differentiation. Consequently, lifestyle factors such as media preferences and television viewing habits might complement traditional structural mechanisms like age, gender and socio-economic status and consequently should be introduced in future research. Furthermore, specifying a model where the individual effects of the social stratification variables are allowed to vary randomly across countries reveals that the above social stratification mechanisms differ between countries. In particular, the results show that effects of gender, older age groups, divorced individuals, the

self-employed, managers, white-collar workers, and students as well as geographical status groups differ across European member states. Previous research on a national level has shown that in a number of northern and western European countries, the levels of leisure-time physical activity for men and women have leveled out; in certain age categories women now do even more exercise and physical activity than their male counterparts. In these countries, the differences between young and old have also become less pronounced than elsewhere. The percentage of older people taking part in leisure-time physical activity has risen, while the proportion of younger people taking part has stagnated or even declined [29]. Consequently, to explain these varying slopes—in addition to explaining the geographical variation in leisure-time physical activity mentioned above—future research should include country-level predictors. Leisure-time physical activity within Europe—and some of the social stratification effects—might differ according to geographical indicators such as north-east-west-south country groupings, welfare indicators such as GDP per capita, human development index, etc., cultural indicators such as the type of welfare state [36], and policy indicators such as the type of sport policy system [37-39].

In conclusion, the results imply that Europe still has many policy challenges to face in the field of leisure-time physical activity. A European Union aiming at greater and greater integration of its citizens into the political sphere should also pay attention to optimal and equal opportunities with regard to the active participation in leisure-time physical activities of its citizens. Clearly, as recently as 2005, democratization of leisure-time physical activity had still not yet been realized. The findings presented here should guide policy makers and public health experts in developing strategies for the promotion of leisure-time physical activity, particularly in the subgroups of women, elderly, individuals with a lower socio-economic status, and people living in rural areas. Moreover, due to the clearly identifiable geographical patterns, it is important for EU member states to draw up national plans in support of leisure-time physical activity among the population in order to promote awareness its benefits in relation to health. These plans should take account of the customs and cultural characteristics of each country. An important objective should be the development of a “sport for all” movement both at national and local levels. Moreover, where separate physical activity policies exist, they should be made complementary and show the continuum from light intensity to competitive, organized leisure-time physical activity. These “sport for all” programs should aim at encouraging participation in

leisure-time physical activity for all citizens, promoting the perception that the entire population is the target (not only elite players) and that leisure-time physical activity is a human right, regardless of gender, age, socio-economic status, etc. Moreover, these policies should focus less on what Coser called "greedy institutions" [40], referring to institutions that demand total commitment from their members such as sports clubs. Leisure-time physical activity has become more informal. Whereas during the first half of the twentieth century it was still unthinkable for someone to publicly go jogging or cycling in sports clothing, by the second half of the twentieth century it had become a completely normal phenomenon. Leisure-time physical activity has also been increasingly dominated by idealistic notions of fitness and youthfulness. Consequently, there has been a huge growth in fitness-based sports, which take place in commercial settings. The quest for good health and a slim, muscular body has gone on to play a more important role in individual self-worth and the competition for social status. This has led to other leisure-time values such as sociability, and has forced the competitive dimension of sports club life into the background [29].

Change in leisure-time physical activity among European countries can be brought about through innovation in policy and practice as well as through increased cross-sectoral cooperation and the adoption of new roles by diverse actors who are already well established and respected in their fields of competence. For this purpose, big solutions and comprehensive, global strategies cannot and should not be provided. It is only on the basis of a large number of small changes in policy and practice that our European society may become more leisure-time physical-activity friendly.

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Tables and Figures

Table 1. Results unconditional model and country analysis of leisure-time physical activity in the EU-27 (2005)

Results unconditional model [a]	
Intercept	0.507***
	(0.088)
Country-level variance	0.227***
	(0.477)
Intraclass correlation	0.065

Country	Sample size	Leisure-time physical activity (%)
Finland	1015	81.08***
Netherlands	1029	77.45***
Austria	996	76.81***
Lithuania	975	75.08***
Germany	1550	75.03***
Slovenia	1025	73.17***
Ireland	980	72.24***
Sweden	1052	70.53***
Latvia	959	69.97***
Luxembourg	496	68.75**
Belgium	995	63.52
Bulgaria	975	62.56
Denmark	1021	62.39
Czech Republic	1023	61.88
Italy	991	61.76
Slovakia	1030	60.39
Spain	1013	60.12

United Kingdom	1311	57.28***
Poland	984	56.91***
France	1005	56.72***
Cyprus	500	54.80***
Estonia	985	54.62***
Hungary	1014	52.07***
Greece	1000	49.20***
Malta	499	46.89***
Romania	951	43.53***
Portugal	988	39.78***
Total *N*	26362	62.97

*: $p \leq .05$; **: $p \leq .01$; ***: $p \leq .001$.

[a] Estimates are from a Bernoulli model estimated in HLM; robust standard errors in parentheses.

Table 2. Generalized hierarchical linear modeling of leisure-time physical activity among Europeans (EU-27, 2005), results of individual-level effects

Variable	Categories	Odds ratio	Random component
Intercept		2.893***	0.271***
Level 1 variables			
Gender	*Men (ref. cat.)*		
	Women	0.794***	0.041***
Age category	*15- to 24-year-olds (ref. cat.)*		
	25- to 34-year-olds	0.754***	0.037
	35- to 44-year-olds	0.637***	0.059
	45- to 54-year-olds	0.551***	0.158*
	55- to 64-year-olds	0.530***	0.193**
	65 years and older	0.391***	0.212**
Marital status	*Cohabiting or married (ref. cat.)*		
	Single	1.083	0.042
	Divorced	0.968	0.061**

	Widowed	0.679	0.039
Occupation	*Manual worker (ref. cat.)*		
	Self-employed	1.221*	0.098**
	Manager	1.750***	0.070*
	White-collar worker	1.378***	0.067*
	House person	0.852*	0.060
	Unemployed	0.839*	0.073
	Retired	0.877	0.058
	Student	2.173***	0.248*
Geographical status	*Rural area or village (ref. cat.)*		
	Small- or mid-sized town	1.112	0.065***
	Large town	1.227**	0.061***

*: $p \leq .05$; **: $p \leq .01$; ***: $p \leq .001$