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Title: Perceived opportunities, gender, urbanization and leisure-time physical activity. A European study

Authors: Charlotte Van Tuyckom

In: Sport&EU Review, 1(1), 3-21.

## **To refer to or to cite this work, please use the citation to the published version:**

Van Tuyckom, C. (2009). "Perceived opportunities, gender, urbanization and leisure-time physical activity. A European study", *Sport & EU Review* 1(1), 3-21.

## Abstract

Limited research has been conducted on the effect of opportunities for leisure-time physical activity within the residential environment on leisure-time physical activity (LTPA) behavior in a European context. The purpose of this study was (i) to fill this gap and (ii) explore the potential role of gender and level of urbanization in this regard. Based on the Eurobarometer-survey from 2005 (N=24846), the results of our Hierarchical Linear Modeling Bernoulli model confirms the effect of opportunities on LTPA in Europe. Moreover, this effect is larger for European citizens living in rural areas compared to those living in large towns. A joint effect of LTPA perceived opportunities and sex was, however, not revealed. The findings show the potential of opportunities (infrastructure, etc.) within residential environments to LTPA for the European population, especially for those living in villages or rural areas.

## Introduction

A growing body of research has brought to public attention the negative consequences of physical inactivity and the benefits of regular leisure-time physical activity (LTPA) for health (Brownson et al. 2001; Rütten & Abu-Omar 2004). Despite the well-documented physical, psychological, and social benefits of LTPA (Cavill, Kahlmeier, & Racioppi 2006), inactivity remains pervasive. It is estimated that about two-thirds of the adult population (aged 15 years or more) do not reach recommended levels of activity. Physical inactivity consequently constitutes a major public health concern with related social and economic costs (Colditz 1999). In an effort to solve this lack of LTPA problem, research in the past two decades has employed different theoretical perspectives in order to understand the factors that enhance or reduce LTPA. In particular, social cognitive models that emphasize the interaction of intrapersonal factors, micro-environmental influences and LTPA have gained empirical support (Sallis & Owen 1999; Trost et al. 2002). However, despite being identified as contributing towards LTPA, such individually-focused factors have generally been found to account for only a modest proportion of variance in LTPA behavior. Leading public health authorities (Cavill, Kahlmeier, & Racioppi 2006) have also highlighted the necessity to go beyond these more 'traditional' efforts. Rütten et al. (2001b, p. 139) mention the need of a *"paradigm shift away from the individual oriented approaches towards a more expanded model of health behavior change that includes higher levels of impact"* (see also Schmid, Pratt, & Howze 1995). A key feature of these 'ecologic models of health behavior' (Grzywacz & Marks 2001; Sallis & Owen 2002) is that they emphasize LTPA as being the result of multiple influences, i.e. intra- and interpersonal but also broader physical environmental, societal, organizational and policy factors. Consistent with this ecological perspective, researchers have attempted to document how objective and subjective LTPA opportunities and environments influence the extent to which individuals are physically active in their leisure-time (Humpel et al. 2004c; Humpel, Owen, & Leslie 2002; Rütten et al. 2001b; Seefeldt, Malina, & Clark 2002; Stahl et al. 2002; Sugiyama et al. 2009; Wicker, Breuer, & Pawlowski 2009). In these studies, availability, distribution and quality of local sport and recreational facilities, as well as features of the physical environment have all been shown to be associated with LTPA participation. In other words, a lack of (perceived) adequate sporting opportunities and infrastructure seems to be one of the important barriers to LTPA. One of the few investigations seeking to shed light on the importance of (perceived) opportunities for LTPA in a cross-national European context is the MAREPS study (Rütten et al. 2000). This analyzes health behavior and its determinants for inhabitants of seven European Member States

and concludes that the perception of good LTPA opportunities and LTPA participation is positively related to each other.

In addition, researchers have begun to use models that allow certain demographic and personal characteristics such as a person's weight status (Blanchard et al. 2005), gender (Bengoechea, Spence, & McGannon 2005; Foster, Hillsdon, & Thorogood 2004) and degree of urbanization (Duncan et al. 2009) to act as potential moderators of the effect of perceived opportunities for LTPA within the residential environment rather than as confounding variables. Consistent with the ecological perspective which puts forward that there are interactions among levels in the system linking individuals with their (perceived) environments (Grzywacz & Marks 2001; Sallis & Owen 2002), the focus of this article is on the role of gender *and* urbanization in the association between perceived LTPA environment and LTPA participation. It is the first study combining both variables. Moreover, it is the first doing this in a European setting, comprising all 27 European Member States.

With respect to gender, previous research has revealed that women in the European Union typically exhibit lower levels of LTPA than their male counterparts (Hartmann-Tews 2006; Van Tuyckom & Scheerder 2008). Moreover, research focusing on gender differences in LTPA determinants has revealed that women face different barriers (e.g. lack of time due to multiple roles) than men which can limit their LTPA participation (Jaffee et al. 1999). Despite the emerging interest in the association between the role of (perceived) LTPA environment and LTPA participation, only few studies have systematically explored the differences between women and men. Some exceptions, although not focusing on PA *in leisure-time*, are four recent studies examining associations of changes in perceptions of local PA opportunities with changes in neighborhood walking (Bengoechea, Spence, & McGannon 2005; Foster, Hillsdon, & Thorogood 2004; Humpel et al. 2004c; Humpel et al. 2004a), thereby revealing contrasting findings for men and women. In addition, in the above mentioned cross-national MAREPS study (Rütten et al. 2000), the availability of LTPA facilities seemed to be of high significance especially for female sport activity. However, more research is needed to further elucidate the way in which gender interacts with perceptions of the LTPA environment in order to influence LTPA participation. The present study hopes to fill this gap and hypothesizes, in line with Rütten et al. (2000) that LTPA opportunities will be of special importance for women.

With respect to the relationship between level of urbanization and LTPA, in different countries there are varied findings so that no definite conclusions can be made (Duncan et al. 2009). A French and Australian study concluded that rural citizens were more active in their leisure-time compared to urban residents (Bertrais et al. 2004; Brown, Young, & Byles 1999), although other studies have observed the opposite (Eyler et al. 2003; Parks, Housemann, & Brownson 2003) or have observed no difference at all (Wilcox et al. 2000). Research on the entire European Union has shown that LTPA is highest among European citizens living in large towns and lowest among those living in rural areas or villages (Van Tuyckom & Scheerder 2008). As is the case with gender, previous research suggests that the perceived opportunities relating to (general) physical activity differ between rural and urban citizens (Parks, Housemann, & Brownson 2003; Wilcox et al. 2000). In particular, the effect of opportunities on participation has been shown to be lower among rural residents than among their urban counterparts. This hypothesis will be tested here in a European setting. Given the importance of LTPA in all European countries, understanding the differences in the effect of perceived LTPA opportunities within the residential environments of urban and rural populations may assist in understanding LTPA variations within Europe.

However, despite the above suggested importance of (perceived) availability of LTPA infrastructure and their relationship with LTPA participation, to date, no studies have been published on how these two relate in a cross-national sample of all 27 European Member States. Furthermore, no single study is available that compares this association between urban and rural citizens, and between men and women in one and the same model. Consequently, the purpose of this study is to (i) determine whether there is an association between perceived opportunities for LTPA within the residential environment and LTPA patterns of European citizens in a representative sample of the EU-27, and (ii) examine whether this association between perceived LTPA environment and LTPA differs according to gender and degree of urbanization.

## Methods

### Data description

Eurobarometer 64.3: Foreign Languages, Biotechnology, Organized Crime, and Health Items is the most recent Eurobarometer survey in which LTPA is assessed (Papacostas 2005). It was carried out in November 2005 at the request of the European Commission, Directorate-General Press and Communication Polls and covers the population of the respective nationalities of the European Union member states, resident in each of the member states and aged 15 years and older (N=24846). The survey was also conducted in Bulgaria and Romania, which at that time were still preparing for accession to the EU. The basis sample design applied in all states is a multi-stage, random probability one. In each country, a number of sampling points was drawn with probability proportional to population size (for a total coverage of the country) and to population density. In order to do so, the sampling points were drawn systematically from each of the 'administrative regional units', after stratification by individual unit and type of area. They consequently represent the whole territory of the countries surveyed according to the Eurostat NUTS-II as well as according to the distribution of the resident population of the respective nationalities in terms of metropolitan, urban and rural areas. In each of the selected sampling points, a starting address was drawn at random. Further addresses (i.e. every Nth address) were selected by standard 'random route' procedures, from the initial address. In each household, the respondent was drawn at random, following the 'closest birthday rule'. 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 (Papacostas 2005). In each member state, at least 500 (Malta) and at most 1557 (Germany) interviews were conducted.

### Measures

All respondents reported the degree in which they were engaged in LTPA and to what extent there were opportunities for LTPA in their community and residential area. Reliability was established by internal consistency analysis for multi-item scales. Urbanization was assessed by asking the respondents in which community they lived. Answer categories were: (i) living in a rural area or village, (ii) living in a small- or mid-sized town, or (iii) living in a large town. Gender was coded (i) men, (ii) women.

### Leisure-time physical activity

Eurobarometer 64.3 (2005) assesses LTPA by means of the following question: *"In the last 7 days, how much physical activity did you get from recreation, sport and leisure-time activities?"* The answer

categories are (i) a lot, (ii) some, (iii) little, and (iv) none. For analytical purposes, this original question is dichotomised whereby respondents who answered ‘none’ or ‘little’ are defined as not (or little) physically active in their leisure-time; those who answered ‘some’ or ‘a lot’ are defined as physically active in their leisure-time. Unfortunately, no conclusions can be made with regard to the vigorousness or duration of LTPA.

### Perceived LTPA opportunities

With respect to the opportunities, different aspects of the environment for LTPA were assessed. In particular, the situation in one’s own residential area and community were chosen as indicators. Therefore, service providers (such as sports clubs) and the community itself were differentiated as two different actors that might create opportunities for LTPA. In particular, the following four-point scale items were used with answer categories strongly agree, tend to agree, tend to disagree, strongly disagree: *“The area where I live offers me many opportunities to be physically active”*, *“Local sport clubs and other local providers offer many opportunities to be physically active”*, *“My local authority does not do enough for its citizens in relation to physical activities”*. After rescaling the last item, the items were submitted to tests of unidimensionality (principal component analysis) and reliability (internal consistency, Cronbach’s  $\alpha$ ). As Table A1 in the Appendix shows, the analysis resulted in every of the 27 European member states in identification of one factor, both for all respondents and when analysing LT physically active and inactive separately. The three items sum score scale constructed on this basis shows –except for Spain- satisfactory statistical characteristics (Eigenvalue and Cronbach’s  $\alpha$ ).

## Analysis of the data

First, descriptive distributions of self reported LTPA and the perceived opportunity scale were analyzed for cross-national variation. Second, zero order correlation analysis was conducted using the Statistical Package for the Social Sciences (SPSS), version 17.0 (2008). Third, binary logistic regression analyses were carried out where LTPA was regressed on the perceived opportunity scale, urbanization and sex, controlling for age (in years) and educational attainment (age when finished education). These analyses were repeated with the inclusion of interaction terms, i.e. perceived opportunity\*urbanization and perceived opportunity\*sex, to check for possible moderating effects of these variables. Since cross-national data have a specific hierarchical structure –with individuals nested within their national units-, Hierarchical Linear Modeling (HLM) and its Bernouilli model for binary outcomes is applied. The analyses were performed using the HLM6.0 software package (Raudenbush, Bryk, & Congdon 2000).

## Results

### Descriptive statistics

Figure 1 shows the cross-national distribution of LTPA. The mean LTPA for the total sample of 27 European member states is 39%, implying that only four out of ten European citizens are physically active in their leisure-time. This proportion is lower than previously observed in other European surveys (Hartmann-Tews 2006; Van Tuyckom & Scheerder 2008). However, these differences may be due to differences in the conceptualization of LTPA. From Figure 1, it is clear that only in five countries, physically active people form the majority, with the highest percentage in Finland (62%)

and the Netherlands (58%). The lowest percentage LT physically actives can be found in Greece (17%), Romania (18%) and Portugal (21%).

Figure 2 shows the means of the LTPA perceived opportunity scale used to assess perceived opportunities for LTPA within the residential environment. Although the cross-national differences are not that large, the Figure shows that the East-European countries Bulgaria, Romania and Poland report the least supportive environments, followed by Portugal, Slovakia and Malta. Most favorable environments pertain to the Netherlands and Denmark, followed by Germany, France, Luxembourg and Finland.

**Insert Figure 1 and Figure 2 about here**

### Correlation between the variables

With regard to the zero-order correlations of the investigated variables (Table 1, Pearson correlation coefficients), for LTPA, all relations turn out to be significant ranging from weaker ones with small town ( $r=0.032$ ;  $p<.001$ ), large town ( $r=0.036$ ;  $p<.001$ ), and sex ( $r=-0.074$ ;  $p<.001$ ), to slightly stronger relations with educational attainment ( $r=0.161$ ;  $p<.001$ ), LTPA perceived opportunities scale ( $r=0.180$ ;  $p<.001$ ) and age ( $r=-0.191$ ;  $p<.001$ ). The results imply that LTPA is highest among younger individuals, men, higher educated people, living in small or large towns (compared to rural areas) and having better LTPA perceived opportunities. Furthermore, women report less supportive environments than their male counterparts ( $r=-0.035$ ;  $p<.001$ ). Age, urbanization and educational attainment show positive relationships with LTPA perceived opportunities (respectively  $r=0.022$ ,  $0.097$ ,  $0.036$  and  $0.117$ ; all  $p<.001$ ).

**Insert Table 1 about here**

### Regression analysis for LTPA

To check for the significance of LTPA perceived opportunities, urbanization and sex, a binary logistic regression analysis was performed to check for those variables that might explain differences in LTPA. Age and educational attainment were included as control variables. Table 2 presents the result of the multilevel Bernoulli analysis (i.e. 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, but also the extent of the association.

Before estimating the full 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 LTPA it is useful to begin by estimating an unconditional or empty model, that is, a model with no predictors at either level (Raudenbush & Bryk 2002). The results (not shown) show that statistically significant variance exists at the country level, making it clear that the multilevel nature of LTPA should not be ignored. In order to understand how much of the overall variance in LTPA is attributable to either the individual level or the country level, it is useful to calculate the intraclass

correlation coefficient (ICC)<sup>1</sup>. The ICC measures the proportion of variance of the dependent variable that exists between countries. As noted in other research (Steenbergen & Jones 2002), 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 LTPA that exists between countries is still considerable: 7.75% (that is  $100 \times 0.277 / (0.277 + 3.29)$ ).

The estimates from the full model are presented in Table 2. 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. All selected variables in model 1 prove to be significant predictors of LTPA. Women report being less physically active in their leisure time compared to men (OR: 0.817;  $p < .001$ ). Both citizens living in large and small or mid-sized towns show significant effects (compared to the reference category of Europeans living in rural areas or villages), whereby those living in large towns report slightly higher odds ratios (OR: 1.192;  $p < .001$ ) than citizens living in small or mid-sized towns (OR: 1.109;  $p < .05$ ). In addition, older people report lesser LTPA compared to their younger counterparts (OR: .986;  $p < .001$ ), and higher educated people report higher LTPA scores than lower educated ones (OR: 1.214;  $p < .001$ ). These results are consistent with existing research into LTPA in the European Union showing that the degree of participation in LTPA differs between social population categories such as gender, age, urban residence, educational attainment (see also Collins & Kay 2003; Hartmann-Tews 2006; Sugden & Tomlinson 2000; Trost, Owen, Bauman, Sallis, & Brown 2002; Van Tuyckom & Scheerder 2008). Moreover, the most interesting result of model 1 is that, after controlling for the previously mentioned variables, individuals reporting supportive LTPA environments report higher LTPA scores than people reporting less supportive environments (OR: 1.108;  $p < .001$ ), which confirms our hypothesis that perceived opportunities for LTPA within the residential environment have positive consequences for the LTPA behavior of Europeans. This is consistent with results from several other studies (Humpel et al. 2004c; Humpel et al. 2002; Rütten et al. 2001b; Seefeldt, Malina, & Clark 2002; Stahl et al. 2002; Sugiyama et al. 2009; Wicker, Breuer, & Pawlowski 2009).

Moreover, one interaction term, i.e. the joint effect of LTPA perceived opportunities and urbanization, introduced in model 2, is also (partly) significant. The analysis reveals that the effect of LTPA perceived opportunities on LTPA is moderated by the degree of urbanization in the sense that its influence becomes smaller in the group of European citizens living in large towns (OR interaction term: 0.971;  $p < .05$ ) compared to those living in rural areas or villages. For Europeans living in small- or mid-sized towns, the result is, however, not significant (OR interaction term: 1.001;  $p = n.s.$ ). This implies that there is a partial interaction effect between perceived opportunities and LTPA, revealing

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<sup>1</sup> The intraclass correlation coefficient for linear multilevel models is obtained by the following formula:

$$\rho = \frac{\tau_{00}}{\tau_{00} + \sigma^2}$$

where  $\sigma^2$  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 (Raudenbush & Bryk 2002). Snijders & Bosker (1999) 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  $\pi^2/3$ .

larger effects of LTPA opportunities on LTPA in the group of European citizens living in rural areas or villages compared to those living in large towns. Moreover, in contrast with our hypothesis, a joint effect of LTPA perceived opportunities and sex could not be revealed by the present analysis (results not shown).

Upon examination of the variance components, it is evident that some of the estimates of the random portion of the models are significant. That is, after controlling for the selected individual-level factors, there still remains a significant amount of variation across European Member States both in LTPA, and in the effect of the individual-level variables on LTPA. This implies that in future research, beyond the scope of this article, a model should be specified that tries to predict those varying slopes by including some country-level determinants.

**Insert Table 2 about here**

## Discussion

Some limitations of the present study should be highlighted. First, our data are restricted to physical activity in leisure-time, and any inferences pertain only to this form of activity. Also, the duration of LTPA has not been assessed so that no conclusions with regard to the intensity of LTPA can be made. In addition, we should notice that the term LTPA can be differently understood in different countries. Methodologically, this concerns the problem of instrumental (metric or linguistic) equivalence (Hartmann-Tews & Rulofs 2006). Moreover, although the Eurobarometer data were the best available, the self-reported registration of LTPA and available LTPA opportunities may have been subject to biases and consequently provide inaccurate information (Boothby 1987). Selective perceptions of opportunities for LTPA within the residential environment cannot be excluded, and individuals with an affinity for sport or physical activity could perceive their LTPA-related environment differently (i.e. more positively). With LTPA being socially desirable, inactive individuals may blame the lack of infrastructure for their inactiveness, without this being the case from an objective point of view (Wicker, Breuer, & Pawlowski 2009). Consequently, inactive people may subjectively perceive a worse infrastructure. However, from the existing literature, it is not clear yet whether the actual or perceived environment is more influential (Rütten et al. 2001a; Wicker, Breuer, & Pawlowski 2009). Therefore, future studies should include assessments of both dimensions in their designs. However, this might be extremely difficult in a large cross-national sample as ours since objective data may not be available in all European countries, or at least not in sufficient detail for comparison.

Keeping these limitations in mind, our analyses show significant differences in LTPA participation among the different European countries. Compared with the high involvement in LTPA in Finland and the Netherlands, the percentage of LTPA people in Greece, Romania and Portugal appears to be quite low. At the same time Romania and Portugal are among the countries showing the lowest rates of perceived opportunities for LTPA within the residential environment, the Netherlands and Finland on the other hand are among the countries showing the highest rates. This is already a first indication that good opportunities might be an important determinant of the degree of LTPA within the population. Probably, these widely divergent scores have their root in international differences in sports policy. For instance, the Scandinavian countries are characterized by a very strong tradition regarding the Sport-for-All policy, especially as opposed to countries from the Mediterranean Sea



Area. Also the North- and West-European nations were some decennia ago pioneers in the popularization of mass sports. Notably as well is that some of the EU-countries with high rates are characterized by comparable policies with respect to (mass-)sports. In particular, in the Scandinavian countries, Germany and the Netherlands, sports policy responsibility is on the one hand controlled by a ministry and on the other by a non-governmental organization (such as a sports confederation). In contrast, the Mediterranean countries are characterized by a less comparable sports policy structure. In Italy, for example, the responsibility for sports is completely in hands of the National Olympic Committee (CONI), whereas in Portugal and Spain an autonomous organization receiving resources from the government is at work, and in Greece there is a ministry with a central role regarding government responsibility in sports. Moreover, sports policy in the Mediterranean countries is strongly focused on club-organized sports, whereas in the Low Countries and definitely in the Scandinavian countries, a lot of policy attention goes to the promotion of other- and non-organized sports participation (Van Tuyckom 2009).

In line with this general assumption about the relationship between opportunities within the residential environment and LTPA, a first analysis based on correlations shows that better perceived opportunities are related to a higher degree of LTPA. Consequently, good opportunities for LTPA within the residential environment may be an important factor for involving people in LTPA. In a second analysis, this effect has been tested in a HLM regression analysis. Controlled for age, sex, educational attainment and level of urbanization, the LTPA opportunity scale indeed shows a statistically significant main effect on self rated LTPA, with Europeans reporting supportive LTPA environments reporting higher LTPA scores than those reporting less supportive environments. Additionally, higher scores on LTPA were found among man, citizens living in small, mid-sized or large towns, younger people, and individuals with higher educational attainment.

The relation between perceived opportunities and self reported LTPA was also checked for differences in both gender and level of urbanization. However, in contrast to recent research (Bengoechea, Spence, & McGannon 2005; Foster, Hillsdon, & Thorogood 2004; Humpel, et al. 2004a; Humpel et al. 2004b; Rütten et al. 2000), in the total EU-27 sample no interaction effect of gender and opportunities could be found. With respect to the level of urbanization, significant differences in the relationship between reported opportunities and LTPA could be observed between rural and urban citizens, with a higher effect of perceived opportunities among European citizens living in rural areas in comparison to those living in large towns. This result is in congruence with previous research on general physical activity (Parks, Housemann, & Brownson 2003; Wilcox et al. 2000).

The results presented on LTPA and perceived opportunities in a representative sample of citizens from all 27 European Member States support general assumptions to contextualize individual health behavior and indicate the need for policy and environmental approaches to physical activity. A significant relationship was found between the perceived residential LTPA environment and the self-reported LTPA. This relationship differs partly according to the level of urbanization. Individuals living in rural areas or villages may profit most from a stimulating LTPA environment. Consequently, providing support in terms of good LTPA opportunities in these rural regions may increase the chance of affecting a greater percentage of the non-active population (Rütten et al. 2000). Moreover, to explain the varying slopes, future research should include country-level predictors. LTPA within Europe –and the effects of opportunities, gender, and level of urbanization- might, for example, differ according to geographical indicators such as North – East – South – West country groupings; welfare indicators such as GDP per capita, human development index, etc.; cultural indicators such as

the type of welfare state (Heinemann 2003); and policy indicators such as the type of sport policy system (Camy et al. 2004; Petry, Steinbach, & Tokarski 2004).

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## Tables and Figures

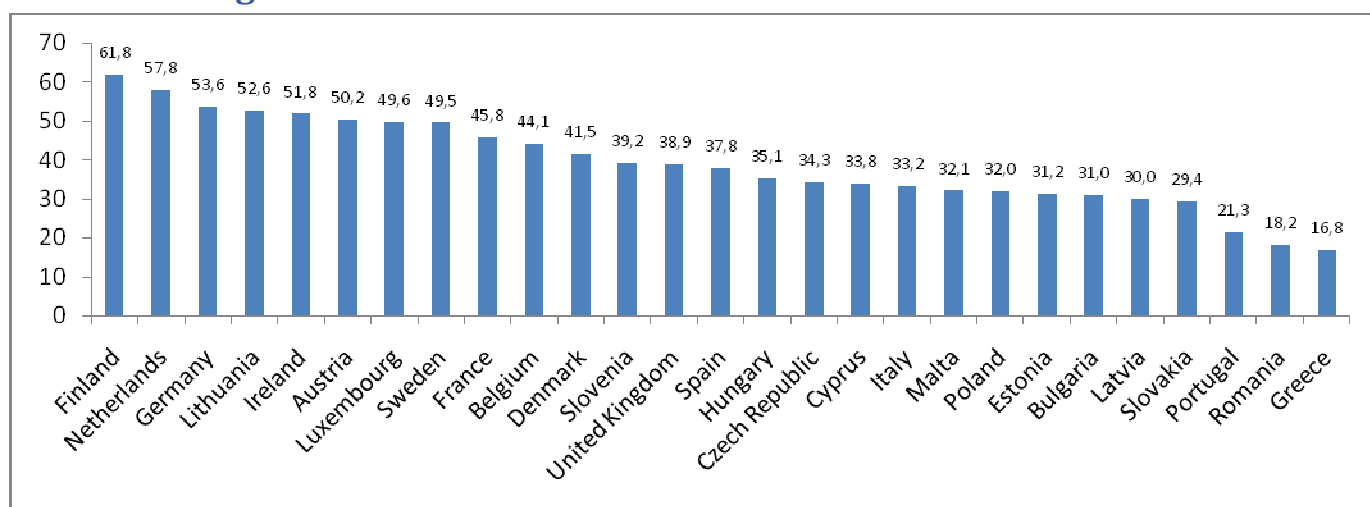


Figure 1 Proportions of LTPA in % for all EU-27 member states (2005)

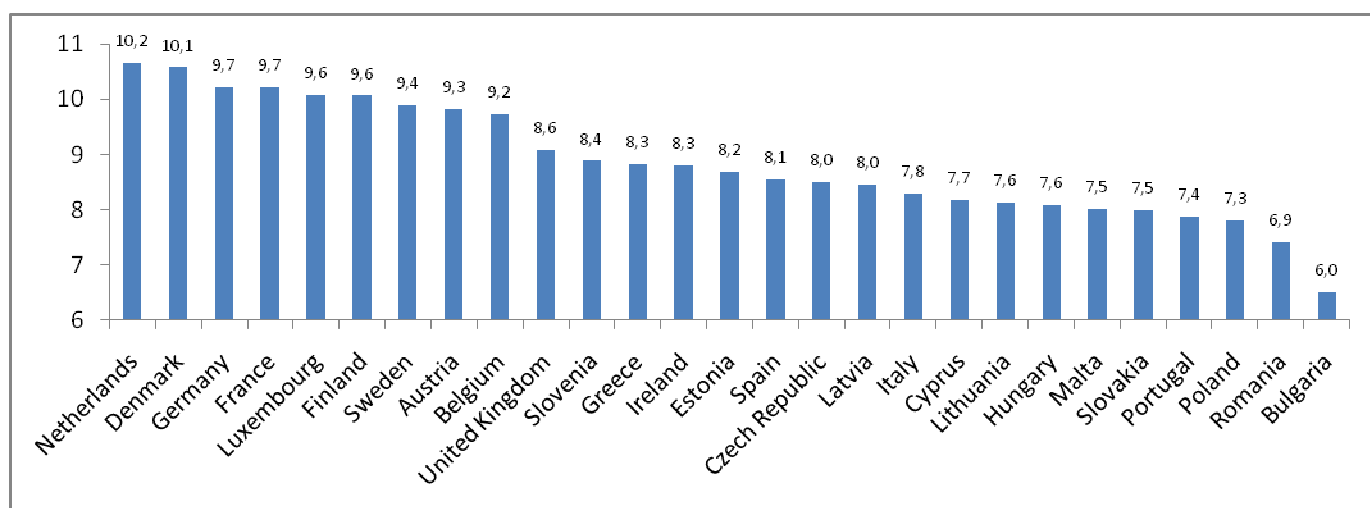


Figure 2 Perceived opportunities for LTPA within the residential environment (mean ratings) for all EU-27 member states (2005)

Table 1 Zero order correlations

	LTPA	opportunities scale	small town	large town	sex	age	educational attainment
LTPA	1	0.180***	0.032***	0.036***	-0.074***	-0.191***	0.161***
opportunities scale		1	0.097***	0.036***	-0.035***	0.022***	0.117***
small town			1	-0.451***	0.009	0.006	0.036***
large town				1	0.011	-0.075***	0.100***
sex					1	0.026***	-0.051***
age						1	-0.270***
educational attainment							1

Note: \*:  $p < 0.05$  \*\*:  $p < 0.01$  \*\*\*:  $p < 0.001$

**Table 2 Generalized hierarchical linear modeling of LTPA among Europeans (EU-27, 2005), results of model without (model 1) and with (model 2) interaction term (N=24846)**

Variable	Model 1		Model 2	
	Odds Ratio	Random Component	Odds Ratio	Random Component
Intercept	0.596***	0.236***	0.567***	0.350***
Educational attainment	1.214***	0.006***	1.207***	0.006***
Age	0.986***	0.000***	0.986***	0.000***
Sex ( <i>ref.cat. men</i> )	0.817***	0.023***	0.822***	0.024***
Degree of urbanization ( <i>ref.cat. rural area or village</i> )				
Small- or mid-sized town	1.109*	0.046***	1.092	0.338
Large town	1.192***	0.023	1.509***	0.147
Opportunities scale	1.108***	0.002***	1.113***	0.003***
Interaction opportunities*small town			1.001	0.003
Interaction opportunities*large town			0.971*	0.003

Note: \*: p<0.05 \*\*: p <0.01 \*\*\*: p<0.001

## Appendix

Table A 1 Scale characteristics of perceived opportunities for LTPA within the residential environment

Country	Sports participant	Statement 1	Statement 2	Statement 3_Recoded	Factor Eigenvalue	% of variance	Scale Cronbach's alpha
Belgium	no	3.1215	3.1673	2.7218	1.905	63.515	0.679
	yes	3.4037	3.4197	2.7083	1.978	65.948	0.705
	both	3.2490	3.2819	2.7218	1.934	64.459	0.69
Denmark	no	3.4168	3.4119	3.0275	1.932	64.395	0.688
	yes	3.6588	3.628	3.1407	1.815	60.499	0.586
	both	3.5161	3.5031	3.0756	1.897	63.23	0.66
Germany	no	3.1347	3.0969	3.1688	1.81	60.339	0.643
	yes	3.4799	3.3668	3.1679	1.783	59.423	0.619
	both	3.3196	3.2424	3.1649	1.806	60.194	0.636
Greece	no	2.8426	2.7481	2.6721	1.982	66.052	0.733
	yes	3.1012	2.8848	2.5758	1.996	66.518	0.734
	both	2.8863	2.7714	2.6555	1.979	65.968	0.731
Spain	no	2.769	2.7956	2.2967	1.873	62.45	0.261
	yes	3.1707	3.2117	1.9943	1.737	57.907	0.289
	both	2.9254	2.9621	2.1736	1.864	62.137	0.239
Finland	no	3.3854	3.0327	3.0296	1.654	55.129	0.533
	yes	3.3955	3.1951	3.0296	1.789	59.626	0.635
	both	3.3923	3.1339	3.0296	1.73	57.679	0.598
France	no	3.2438	3.3002	2.958	2.042	68.08	0.743
	yes	3.5143	3.4756	2.9634	1.959	65.304	0.694
	both	3.3731	3.3837	2.9586	2	66.674	0.72
Ireland	no	2.7201	2.7658	2.5093	1.908	63.6	0.686
	yes	2.996	3.072	2.4417	1.822	60.726	0.639
	both	2.8672	2.9307	2.4724	1.864	62.122	0.661
Italy	no	2.6242	2.5858	2.3339	1.78	59.344	0.58
	yes	3.0308	2.972	2.1795	1.756	58.525	0.594
	both	2.7619	2.7193	2.2806	1.771	59.018	0.574
Luxembourg	no	3.3202	3.4099	2.9591	2.153	71.768	0.783
	yes	3.3473	3.3632	2.8831	2.206	73.542	0.8
	both	3.3319	3.3826	2.9165	2.189	72.973	0.795
Netherlands	no	3.5853	3.4353	2.9188	1.629	54.293	0.543
	yes	3.6914	3.6007	2.989	1.695	56.492	0.553
	both	3.6467	3.5322	2.9602	1.666	55.538	0.551
Austria	no	3.0452	3.0132	3.1514	1.809	60.289	0.584
	yes	3.3246	3.2713	2.8473	1.685	56.153	0.457
	both	3.1892	3.1486	2.9918	1.756	58.543	0.506
Portugal	no	2.3843	2.3443	2.4184	1.877	62.572	0.437
	yes	2.8413	2.7767	2.4109	1.766	58.876	0.46
	both	2.4928	2.4473	2.4186	1.859	61.978	0.453
Sweden	no	3.139	3.0822	3.0022	1.781	59.371	0.652



	yes	3.3791	3.198	2.9773	1.713	57.091	0.609
	both	3.2575	3.1402	2.9905	1.745	58.177	0.63
United Kingdom	no	2.855	2.9188	2.6368	2.074	69.127	0.768
	yes	3.0916	3.1122	2.6301	2.03	67.679	0.748
	both	2.9523	2.9983	2.6313	2.052	68.391	0.758
Cyprus	no	2.6799	2.5369	2.2457	2.047	68.244	0.765
	yes	2.9512	2.8509	2.2484	1.848	61.605	0.62
	both	2.774	2.6464	2.2456	1.956	65.202	0.721
Czech Republic	no	2.6282	2.5882	2.5735	2.026	67.547	0.755
	yes	2.9386	2.8647	2.5648	1.966	65.537	0.724
	both	2.7355	2.6854	2.567	2.004	66.802	0.745
Estonia	no	2.7222	2.5659	2.6315	1.767	58.916	0.625
	yes	3.0497	2.9793	2.5424	1.952	65.053	0.717
	both	2.8304	2.7091	2.5997	1.827	60.892	0.658
Hungary	no	2.4811	2.3786	2.4899	1.807	60.229	0.607
	yes	2.8176	2.7037	2.4351	1.816	60.522	0.63
	both	2.6083	2.5035	2.4682	1.812	60.386	0.617
Latvia	no	2.7279	2.6978	2.5805	1.989	66.316	0.724
	yes	2.7367	2.8015	2.3931	1.846	61.534	0.677
	both	2.7249	2.7219	2.5132	1.942	64.745	0.708
Lithuania	no	2.7748	2.1214	2.2738	1.23	40.995	0.253
	yes	3.0559	2.5418	2.2592	1.325	44.174	0.287
	both	2.9205	2.331	2.2717	1.289	42.982	0.279
Malta	no	2.3639	2.6228	2.3905	1.924	64.15	0.719
	yes	2.5935	2.8163	2.3662	1.713	57.105	0.614
	both	2.4444	2.6888	2.3822	1.846	61.521	0.683
Poland	no	2.5657	2.1572	2.2867	1.47	49.004	0.454
	yes	2.9608	2.4982	2.1882	1.67	55.666	0.601
	both	2.6992	2.2718	2.2543	1.533	51.102	0.507
Slovakia	no	2.6749	2.2972	2.3191	1.59	53	0.526
	yes	2.7228	2.57	2.3768	1.772	59.079	0.635
	both	2.6924	2.3827	2.3382	1.643	54.765	0.562
Slovenia	no	2.8627	2.6835	2.5256	1.885	62.843	0.687
	yes	3.2594	3.0228	2.5816	1.821	60.709	0.647
	both	3.0211	2.8198	2.549	1.869	62.312	0.676
Bulgaria	no	1.9887	1.7253	1.9958	1.681	56.631	0.533
	yes	2.3394	2.0037	2.0927	1.652	55.072	0.421
	both	2.1051	1.8215	2.0307	1.665	55.488	0.495
Romania	no	2.453	2.0889	2.046	1.8	59.99	0.633
	yes	3.0301	2.8182	1.9466	1.604	53.46	0.411
	both	2.5574	2.2188	2.0133	1.749	58.309	0.589
EU-27	no	2.7625	2.6426	2.5649	1.889	62.956	0.688
	yes	3.1575	3.0499	2.6285	1.872	62.404	0.675
	both	2.9163	2.8017	2.5883	1.891	63.036	0.688