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## Mental health and physical activity in the European Union

### Summary

**Objectives:** This article is the 3rd in a series of four that present data about physical activity in 15 member states of the European Union collected by the Eurobarometer 58.2. On a descriptive level it investigates the relationships between physical activity (MET-h/week) and mental health.

**Methods:** Data were collected in 2002 as part of the Eurobarometer by face-to-face interviews. A total of 16 230 respondents age 15 years and older were interviewed. Sample sizes were about 1000 respondents in most nations. Mental health was assessed with the Mental Health Inventory (MHI-5) and the Energy and Vitality Scale (EVI-scale). Physical activity was assessed with the last 7-days short version of the International Physical Activity Questionnaire (IPAQ).

**Results:** Across sociodemographic subgroups of the populations investigated (age, gender, marital status, gross household income, educational status) it was found, that those being more physically active had in general a better mental health. In some of the 15 nations evidence for a dose-response relationship between physical activity and mental health was found, while in others this was not the case.

**Conclusion:** Results seem to indicate a positive relationship between physical activity level and mental health for population subgroups. However, analysis found no evidence that this relationship can be characterized as being dose-response in all nations.

**Keywords:** Physical activity – Mental health – European Union – MHI-5 – EVI-scale – IPAQ.

In general, physical activity is associated with enhancing mental health and improving mood disorders (U.S. Department of Health and Human Services 1996; 1999). While evi-

dence for the positive effects of physical activity on mental health have mounted in recent years (Arent et al. 2001), the specific effects of physical activity on mental health are still under debate. Some studies have reported that those being physically active have lower rates of depression (Paffenbarger et al. 1994), that there is a protective effect of physically active on developing subsequent depression (Strawbridge et al. 2002), and that exercise programs can also benefit those, who already suffer from depression (Craft & Landers 1998). The participation in exercise interventions has also been associated with improvements in the quality of life and vitality of participants (Elley et al. 2003).

However, meta-analyses have hinted a lack of high quality trials that demonstrate the beneficial effects of physical activity on depression (Lawlor & Hopker 2001) and anxiety (Paluska & Schwenk 2000). From a perspective of evidence-based medicine, the effects of physical activity on depression have thus to be cautioned, mainly due to methodological shortcomings of the conducted studies. Especially, it is currently not known, which type, duration, or level of intensity of exercise might be effective for the treatment of depression (Brosse et al. 2002). Effects of physical activity on mental health have also been investigated on a population level. These studies have hinted, that physical activity might improve psychological well-being, and might reduce the risk of suffering from anxiety and depression (Hassmen et al. 2000; Goodwin 2003). However, the relationship between physical activity and mental health has not been characterized as being dose-response, and more research is needed to investigate this issue (Dunn et al. 2001). From a cross-national perspective, there is currently a lack of data on mental health indicators and the association between physical activity and mental health. In Europe, only data of the Outcome of Depression International Network Project (ODIN) provide some comparative insights in mental health indicators across European nations (Dowrick et al. 2000; Ayuso-Mateos et al. 2001; Lehtinen et al. 2003). Findings of this project seem to indicate

pronounced variations in the prevalence of mental disorders across member states, but have to be interpreted cautiously.

It is the purpose of this article to present data on the association between two indicators of mental health (mental health inventory [MHI-5], energy and vitality scale [EVI-Scale]) and physical activity for 15 member states of the European Union, and population subgroups. Such knowledge is important, in order to investigate potential cross-national and population subgroup specific differences in the effects of physical activity on mental health. The article is in this regard focusing on two questions. Firstly, if in all member states associations between physical activity (MET-hours per week) and two mental health indicators can be found. Secondly, if the nature of the relationship between physical activity and mental health can be described as being dose-response in the different member states. The article will explore these questions on a descriptive level.

## Methods

Data were collected between October and December of 2002 as part of the Eurobarometer 58.2. The Eurobarometer is conducted since 1970 and has, in the meantime, provided valuable cross-national data on a wide variety of topics (Mossialos & King 1999). The Eurobarometer 58.2 dealt with questions on smoking, environmental pollution, health status, mental health, physical activity and developmental aid. Fieldwork was carried out in 15 member states of the European Union by a consortium of market and public opinion research agencies (INRA, GfK Worldwide).

The population covered by the Eurobarometer were women and men aged 15 years and older of nationalities of the European Union. Data were collected by personal interviews. In all countries, a multi-stage, random sample design was applied. Within the sample framework, for each nation a number of sample points was drawn with the probability for each sample point being proportional to population size and population density. These sampling points were drawn systematically for the existing national administrative units. Sampling points consisted of a randomly drawn starting address, and further addresses were drawn by a standard random route procedure. Within the household, respondents were drawn at random. The realized sample sizes for each nation were: Belgium (1 110), Denmark (1 000), Eastern Germany (1 020), Western Germany (1 022), Greece (1 003), Spain (1 000), France (1 037), Ireland (1 013), Italy (1 027), Luxembourg (602), the Netherlands (1 035), Austria (1 023), Portugal (1 002), Finland (1 024), Sweden (1 000), Great Britain (1 010), Northern Ireland (302). Across nations, the

mean response rate for the face-to-face interviews was 54.6%.

Mental health was assessed with the MHI-5 and the EVI-scale. Both instruments are part of the SF-36 measure of perceived health status (Ware & Sherbourne 1992), and are currently recommended for surveillance purposes of mental health indicators on the European level. As such, the MHI-5 and the EVI-scale represent only two indicators for the assessment of an individual's mental health. In this regard, the MHI-5 has been described as being one of the most valid measures of mental health, while the EVI-scale has shown to be a valid measure for mental health, but does also measure components of physical functioning (Ware & Gandek 1998). The MHI-5 is a 5-item scale and assesses nervousness and feelings of depression in the past month (Bijl & Ravelli 2000). The MHI-5 has been tested against the GHQ-12 (Goldberg & Williams 1988) and the DSM-IV (American Psychiatric Association 1994). It has shown high correlations to the GHQ-12, and a good performance in identifying mood disorders (McCabe et al. 1996; Rumpf et al. 2001). The MHI-5 gives a sum score from 0-100, low scores indicating a higher degree of mental disorders. For the analysis a cut-off point of 52 or less was chosen to identify the occurrence of MHI-5 cases. The 52 point cut-off of the MHI-5 has shown to perform well in identifying major depression (Holmes 1998), and also in a recent report on mental health in Europe the 52 point cut-off was used for the MHI-5 (European Opinion Research Group 2003). The EVI-scale includes four items and assesses the perception of energy and fatigue of respondents in the past month (Bijl & Ravelli 2000). The EVI-scale provides a sum score from 0-100, higher scores indicating higher levels of energy and vitality. In the analysis the mean score of the EVI-scale is presented. Results of the Eurobarometer data in regard to these mental health indicators are presented in more detail in a report of the European Opinion Research Group (European Opinion Research Group 2003).

Physical activity was assessed using the short form of the International Physical Activity Questionnaire (Craig et al. 2003). The International Physical Activity Questionnaire (IPAQ) measures the frequency, duration, and level of intensity of physical activity in the last seven days across all contexts and allows for the calculation of metabolic equivalents. Metabolic equivalents represent the weekly amount of physical activity, and are a product of the frequency, duration, and intensity of physical activity in the last seven days. Physical activity related metabolic equivalents in hours per week (MET-hours/week) were calculated following existing guidelines (Ainsworth et al. 2000). In parts of the analysis, respondents were divided along the median for MET-hours

**Table 1** Occurrence of MHI-5 cases (percentage with a score of 52 or less) of individuals age 15 years and older according to physical activity status, sociodemographic characteristics, and nation (95 % C.I.)

		Physically less active (up to 24 MET-h/week)	Physically active (more than 24 MET-h/week)
All	15 722	24.8 (23.8–25.8)	16.3 (15.5–17.2)
Gender			
Female	8 469	28.5 (27.1–29.9)	19.8 (18.5–21.1)
Male	7 253	19.7 (18.3–21.2)	12.9 (11.8–14.0)
Age			
15–24	2 410	19.6 (16.9–22.3)	12.8 (11.0–14.6)
25–34	2 788	21.0 (18.6–23.3)	15.9 (13.9–17.8)
35–44	2 964	23.3 (20.9–25.6)	17.0 (15.1–19.0)
45–54	2 523	28.3 (25.7–31.0)	19.7 (17.4–22.0)
55–64	2 223	25.9 (23.3–28.5)	16.8 (14.4–19.1)
65+	2 814	28.2 (26.0–30.4)	16.3 (13.9–18.6)
Marital status			
Single	3 684	23.8 (21.6–26.0)	15.5 (13.8–17.1)
Married/with partner	9 425	21.7 (20.5–23.0)	14.4 (13.3–15.4)
Widowed/divorced	2 447	35.5 (32.9–38.0)	27.6 (24.6–30.6)
Gross household income			
--	2 637	36.9 (34.4–39.5)	25.0 (22.4–27.6)
-	2 735	25.3 (22.9–27.8)	16.1 (14.1–18.1)
+	2 535	19.9 (17.5–22.3)	14.0 (12.1–16.0)
++	2 507	15.4 (13.2–17.5)	12.2 (10.4–14.0)
Age when finished full-time education			
up to 15	4 046	32.1 (30.1–34.0)	22.0 (19.9–24.2)
16–19	6 155	24.4 (22.8–26.0)	17.1 (15.7–18.5)
20 and older	3 943	19.0 (17.8–20.8)	13.0 (11.5–14.5)
Nation			
Austria	990	23.2 (19.3–27.1)	15.0 (11.4–18.5)
Belgium	1 074	23.0 (19.4–26.6)	15.4 (11.9–19.0)
Denmark	938	20.5 (16.4–24.6)	12.7 ( 9.8–15.6)
Finland	1 005	10.6 ( 7.8–13.4)	7.2 ( 4.9– 9.5)
France	1 005	31.2 (27.3–35.1)	19.9 (15.9–23.9)
Germany (West)	966	28.5 (23.6–33.5)	14.5 (11.4–17.6)
Germany (East)	971	32.3 (27.3–37.4)	18.6 (15.2–22.1)
Great Britain	996	32.6 (28.6–36.6)	30.0 (25.6–34.3)
Greece	996	25.0 (20.9–29.1)	22.3 (18.8–25.9)
Ireland	966	21.9 (18.2–25.6)	8.6 ( 6.0–11.3)
Italy	986	31.2 (27.1–35.4)	27.3 (22.7–31.9)
Luxembourg	583	26.0 (20.2–31.8)	15.0 (10.9–19.1)
Netherlands	1 025	16.3 (12.0–20.6)	13.9 (11.2–16.7)
Northern Ireland	299	26.8 (20.3–33.4)	11.5 ( 5.0–18.0)
Portugal	972	38.8 (34.0–43.5)	21.5 (17.4–25.7)
Spain	968	22.4 (18.7–26.1)	13.2 ( 9.7–16.6)
Sweden	982	14.1 (11.1–17.0)	9.7 ( 6.7–12.7)

per week to distinguish between physically less active and physically active individuals. In the latter parts of the analysis, quartiles of MET expenditures were calculated for the total of respondents. In the analysis, the monthly gross household income is presented as the national income quartile that the respondent belonged to; “–” refers to the lowest national quartile, “+ +” to the highest national quartile.

Data analysis presents the percentage of respondents that have an MHI-5 score of 52 or less and the mean score of the EVI-scale. 95 % confidence intervals were calculated to allow for an assessment of the observed differences across nations. Results are presented stratified by gender and age in the Appendix.

## Results

A total of 16 230 interviews were conducted in the member states. Among respondents, 24.8 % of those being physically less active (up to 24 MET-h/week) were identified as having a score of 52 or less on the MHI-5 scale (Tab. 1). Among respondents who were classified as being physically active (more than 24 MET-h/week), the percentage of MHI-5 cases was 16.3 %. While females were to a higher percentage MHI-5 cases than males, for both subgroups a lower rate of MHI-5 cases occurred among those being physically active. The same relationship could be observed among different age groups, and between single, married, and widowed/divorced respondents. While respondents with higher levels of

**Table 2** Mean score of the EVI-scale of individuals age 15 years and older according to physical activity status, sociodemographic characteristics, and nation (95 % C.I.)

		Physically less active (up to 24 MET-h/week)	Physically active (more than 24 MET-h/week)
All	15 896	59.1 (58.6–59.5)	65.5 (65.1–65.9)
Gender			
Female	8 560	56.8 (56.2–57.4)	63.0 (62.4–63.6)
Male	7 336	62.2 (61.6–62.9)	68.0 (67.4–68.6)
Age			
15–24	2 438	64.1 (62.8–65.3)	67.8 (66.9–68.7)
25–34	2 801	61.5 (60.5–62.6)	65.0 (64.1–66.0)
35–44	2 991	60.0 (59.0–61.1)	64.3 (63.4–65.2)
45–54	2 549	58.4 (57.3–59.5)	64.5 (63.5–65.6)
55–64	2 242	59.0 (57.8–60.2)	65.7 (64.5–66.9)
65+	2 875	54.7 (53.7–55.6)	66.0 (64.7–67.2)
Marital status			
Single	3 717	61.6 (60.6–62.6)	67.2 (66.4–67.9)
Married/with partner	9 516	59.9 (59.4–60.5)	65.7 (65.1–66.2)
Widowed/divorced	2 494	53.8 (52.8–54.9)	61.3 (60.0–62.6)
Gross household income			
--	2 673	52.7 (51.6–53.8)	61.0 (59.9–62.2)
-	2 751	58.9 (57.8–60.0)	65.8 (64.8–66.7)
+	2 562	62.0 (60.9–63.1)	66.8 (65.8–67.7)
++	2 524	63.4 (62.3–64.5)	67.1 (66.2–68.0)
Age when finished full-time education			
up to 15	4 099	54.5 (53.6–55.3)	63.2 (62.2–64.1)
16–19	6 217	59.6 (58.9–60.3)	65.1 (64.4–65.7)
20 and older	3 991	62.1 (61.3–63.0)	66.6 (65.8–67.4)
Nation			
Austria	995	60.2 (58.6–61.9)	64.7 (63.1–66.4)
Belgium	1 086	61.4 (59.9–62.9)	67.8 (66.1–69.6)
Denmark	971	60.4 (58.6–62.3)	65.7 (64.3–67.2)
Finland	1 005	69.2 (67.6–70.8)	73.9 (72.5–75.2)
France	1 016	58.0 (56.4–59.6)	63.9 (62.3–65.6)
Germany (West)	992	58.2 (56.0–60.5)	66.5 (65.0–68.1)
Germany (East)	988	56.9 (54.9–58.9)	65.6 (64.1–67.1)
Great Britain	1 003	51.8 (50.2–53.5)	53.5 (51.6–55.4)
Greece	1 002	61.1 (59.3–62.9)	64.5 (62.9–66.2)
Ireland	990	57.0 (55.3–58.6)	68.2 (66.8–69.7)
Italy	984	57.2 (55.7–58.8)	61.8 (60.0–63.6)
Luxembourg	590	58.3 (55.6–61.1)	64.6 (62.6–66.7)
Netherlands	1 021	63.5 (61.3–65.6)	65.2 (63.8–66.6)
Northern Ireland	300	52.2 (49.2–55.2)	61.9 (58.5–65.3)
Portugal	987	53.8 (51.7–55.9)	65.9 (64.1–67.7)
Spain	974	62.6 (60.9–64.4)	70.6 (68.9–72.3)
Sweden	992	59.2 (57.6–60.9)	64.8 (62.9–66.7)

education and higher socio-economic status reported to a lesser degree feelings of nervousness and depression, also for these sociodemographic variables physical activity was related to a lower occurrence of MHI-5 cases. Across nations, respondents who reported higher levels of physical activity had a lower rate of occurring MHI-5 cases compared to those who reported lower levels of physical activity. However, the observed differences were small in Finland, Great Britain, Greece, Italy, the Netherlands, and Sweden where confidence intervals between groups did overlap.

Table 2 presents results for the mean scores on the EVI-scale. Among respondents who reported less physical ac-

tivity the mean score for the EVI-scale was 59.1, among those who reported more physical activity the mean score was 65.5. Across males and females, and all age groups, those who reported to be more physical active had also higher levels of energy and vitality. The same result could be observed across income quartiles, educational attainment, and level of physical activity. Across nations, pronounced differences in the mean score of the EVI-scale between physical activity levels could be observed in some nations such as Spain or Germany (East), while in other nations such as the Netherlands or Great Britain confidence intervals between the two groups overlapped.

**Table 3** Dose response relation between physical activity (MET-h/week) and occurrence of MHI-5 cases (percentage with a score of 52 or less) in the member states of the European Union (95 % C.I.)

	0–8 MET-h/week	8.1–24 MET-h/week	24.1–51.1 MET-h/week	51.11 and more MET-h/week
Austria	34.6 (28.5–40.8)	11.0 ( 6.8–15.2)	14.3 ( 9.7–18.9)	15.9 (10.2–21.5)
Belgium	28.6 (23.5–33.8)	16.0 (11.3–20.7)	17.6 (12.5–22.7)	12.9 ( 8.0–17.8)
Denmark	22.7 (16.0–29.4)	18.9 (13.7–24.1)	11.4 ( 7.5–15.3)	14.1 ( 9.7–18.4)
Finland	11.3 ( 6.6–16.0)	10.1 ( 6.6–13.6)	9.9 ( 5.7–12.7)	4.8 ( 2.0– 7.6)
France	32.9 (27.6–38.2)	28.9 (23.0–34.8)	20.8 (15.4–26.3)	18.8 (12.9–24.6)
Germany (West)	36.0 (28.5–43.5)	21.2 (14.9–27.5)	20.8 (15.4–26.3)	12.2 ( 8.2–16.1)
Germany (East)	38.3 (30.9–45.8)	26.5 (19.8–33.2)	20.6 (15.3–26.0)	17.0 (12.6–21.5)
Great Britain	34.7 (29.2–40.2)	30.0 (24.2–35.9)	34.0 (27.5–40.4)	26.1 (20.1–32.0)
Greece	27.5 (21.9–33.1)	21.6 (15.5–27.6)	21.0 (15.5–26.5)	23.2 (18.5–28.0)
Ireland	23.7 (18.3–29.1)	20.0 (15.0–25.1)	10.9 ( 6.7–15.0)	6.4 ( 3.1– 9.7)
Italy	35.9 (29.9–41.8)	26.1 (20.3–31.9)	28.3 (21.8–34.9)	26.2 (19.8–32.7)
Luxembourg	38.7 (28.6–48.8)	16.9 (10.4–23.5)	16.0 ( 9.9–22.0)	14.0 ( 8.4–19.6)
Netherlands	18.4 (11.8–25.0)	14.5 ( 8.8–20.3)	13.3 ( 9.1–17.4)	14.5 (10.7–18.2)
Northern Ireland	31.9 (23.3–40.5)	17.5 ( 7.8–27.1)	10.9 ( 1.5–20.2)	12.0 ( 2.7–21.3)
Portugal	44.1 (37.8–50.5)	30.9 (23.7–38.1)	21.3 (15.1–27.5)	21.7 (16.1–27.4)
Spain	24.2 (18.6–29.9)	20.9 (15.9–28.8)	15.2 (10.0–20.3)	11.1 ( 6.4–15.7)
Sweden	19.1 (13.7–24.4)	10.9 ( 7.5–14.3)	10.7 ( 6.8–14.6)	8.3 ( 3.4–12.6)

**Table 4** Dose response relation between physical activity (MET-h/week) and mean score of the EVI-scale in the member states of the European Union (95 % C.I.)

	0–8 MET-h/week	8.1–24 MET-h/week	24.1–51.1 MET-h/week	51.11 and more MET-h/week
Austria	56.7 (54.2–59.2)	64.2 (62.2–66.2)	64.9 (62.7–67.1)	64.5 (62.1–67.0)
Belgium	58.8 (56.6–61.0)	64.7 (62.7–66.7)	68.4 (66.1–70.8)	67.1 (64.5–69.7)
Denmark	57.3 (54.4–60.2)	62.6 (60.3–65.0)	64.8 (62.8–66.8)	66.7 (64.6–68.8)
Finland	67.1 (64.4–69.7)	70.5 (68.6–72.5)	72.5 (70.7–74.2)	75.6 (73.5–77.7)
France	56.3 (54.2–58.4)	60.4 (58.0–62.7)	63.8 (61.5–66.0)	64.2 (61.7–66.6)
Germany (West)	54.1 (50.6–57.5)	62.3 (59.5–65.2)	63.8 (61.4–66.1)	69.0 (66.9–71.2)
Germany (East)	54.7 (51.6–57.7)	59.2 (56.6–61.8)	63.6 (61.5–65.8)	67.2 (65.2–69.3)
Great Britain	51.4 (49.1–53.7)	52.3 (49.9–54.8)	52.0 (49.3–54.7)	55.0 (52.4–57.6)
Greece	58.8 (56.3–61.3)	64.3 (61.9–66.6)	65.3 (62.7–67.9)	64.0 (61.9–66.2)
Ireland	52.9 (50.9–55.2)	61.1 (59.0–63.2)	66.3 (64.4–68.3)	70.1 (68.0–72.2)
Italy	55.2 (52.8–57.5)	59.5 (57.4–61.6)	60.7 (58.2–63.2)	62.8 (60.2–65.4)
Luxembourg	51.3 (46.9–55.6)	63.2 (59.8–66.5)	64.8 (61.9–67.8)	64.4 (61.6–67.3)
Netherlands	61.3 (57.9–64.6)	65.5 (62.6–68.3)	64.5 (62.4–66.7)	65.8 (63.8–67.7)
Northern Ireland	49.4 (45.7–53.0)	57.5 (52.6–62.5)	59.1 (53.9–64.4)	64.4 (59.9–69.0)
Portugal	50.9 (48.2–53.6)	58.1 (54.9–61.3)	65.5 (62.7–68.4)	66.2 (63.8–68.6)
Spain	59.1 (56.3–61.9)	65.7 (63.5–67.9)	68.6 (66.1–71.0)	72.7 (70.3–75.1)
Sweden	56.2 (53.5–58.9)	61.2 (59.1–63.2)	64.9 (62.5–67.4)	64.6 (61.5–67.7)

Table 3 and 4 examine a potential dose-response relationship between level of physical activity in MET-hours per week and the MHI-5 and EVI-scale. For the occurrence rate of MHI-5 cases it could be noted, that in all nations, the highest rate of MHI-5 cases was observed among the quartile of least active respondents (Tab. 3). For nations Finland, France, Germany, Ireland, Luxembourg, Spain, and Sweden there seemed to exist a dose-response relationship between MET-hours per week and rate of MHI-5 cases. However, in all of these nations confidence intervals between groups overlapped. On the other hand, for nations such as Austria, Greece, and Italy such a dose-response relationship could not be observed.

For levels of energy and fatigue, across all nations respondents with the lowest MET-hours per week had also the lowest mean scores in the EVI-scale (Tab. 4). As with the MHI-5 scale, for some nations (e.g., Denmark, France, Eastern Germany, Ireland) a dose-response relationship between MET-hours per week and mean scores on the EVI-scale seemed to exist. In all nations of these nations confidence intervalls did overlap. At the same time, for nations such as Austria, Great Britain, Greece, and the Netherlands no such dose-response relationship could be observed. Tables A1 to A4 in the appendix present separated results by age groups and gender.

## Discussion

The article examined associations between physical activity and mental health in the member states of the European Union. Overall, relationships between the occurrences of MHI-5 cases, mean scores of the EVI-scale and physical activity could be observed in most, but not all nations. Across sociodemographic subgroups of the population (age, gender, marital status, gross household income, educational status), those who reported higher levels of physical activity did show in general better mental health. If results were separated for age groups and gender (Tab. in the Appendix), some of these effects, especially for older age groups, could be confirmed.

While these findings seem to confirm some positive effects of physical activity on mental health, the analysis did not find evidence for a dose-response relationship between physical activity and mental health across all nations. For some nations, data suggested that such a dose-response relationship might exist, while for other nations such a dose-response relationship could not be observed. This held true for the MHI-5, as well as the EVI-scale. Across nations, pronounced differences for the two mental health indicators could be observed. Such differences in mental health across European Nations were also reported by Ayuso-Mateos et al. (2001). Using the ICD-10 and the DSM IV criteria for the classification of depressive disorders, this study found relatively low prevalence's of depressive disorders in Finland and Spain, and higher levels of depressive disorders in areas of urban Great Britain. The reason for these differences is currently not fully understood. As in this study, the in some nations low response rates might limit the reliability of the available data.

Since cross-sectional data were used for the analysis, a causal relationship between physical activity and mental health cannot be implied. It might in this regard very well be, that some of those who reported less physical activity did so because of mental health problems. Further limitations of the study include the assessment of mental health with a questionnaire. While the two indicators that were used to assess mental health status in this study have shown good validity, it cannot be ruled out that slight conceptual differences pertained, even after the instructed translation process took place (European Opinion Research Group 2003). However,

it should be noted that these problems exist in most cross-national research projects. As the analysis remained on a descriptive level, potential confounding effects between physical activity, socio-economic status, age, and gender were not controlled for.

Physical activity was assessed with the last 7-days short version of the IPAQ. The IPAQ is conceptualised to allow for the estimation of metabolic equivalents, and assesses physical activity at work, at home, for transportation, and in leisure time. As such, the IPAQ follows the existing recommendations for physical activity that stress the importance of regular physical activity of moderate intensity on most days of the week, regardless of the context where it takes place (Pate et al. 1995). The measurement properties of the IPAQ were assessed in two international studies (Craig et al. 2003; Rütten et al. 2003), with results being inconsistent. However, it has to be noted that self-assessment of physical activity is in general difficult and produces results of a somewhat limited reliability and validity. For the results of this analysis this might mean, that due to the self-assessment of physical activity some of its beneficial effects on mental health might have been underestimated.

It has also been suggested that especially for mental health, leisure time physical activity might yield additional benefits compared to physical activity in other contexts such as at work or for transportation (Slattery 1996). With the IPAQ version that was used in this study a separation of physical activity in different contexts is not possible. In this regard, the use of the IPAQ might also have lead to an underestimation of the beneficial effects of physical activity on mental health. Neither were the frequency, duration, or intensity of physical activity separated in the analysis.

Overall, results indicate a positive relationship between physical activity and mental health. Even if such an association between physical activity and mental health was not found in all nations and it still has to be determined if the nature of this relationship is dose-response, results should be taken as encouragement to promote physical activity in the European Union. Especially the observed cross-national variations in the dose-response relationship between physical activity and mental health, and the potential differences in the context of physical activity on mental health might be of interest for future research.

## Zusammenfassung

### Psychische Gesundheit und körperliche Aktivität in der Europäischen Union

**Fragestellung:** Dieser Beitrag ist der dritte in einer Reihe von vier Beiträgen, die Daten zu körperlicher Aktivität aus dem Eurobarometer 58.2 für 15 Mitgliedsstaaten der Europäischen Union vorstellen. Der Beitrag untersucht mit Hilfe deskriptiver Analysemethoden Zusammenhänge zwischen körperlicher Aktivität (MET-Stunden pro Woche) und der psychischen Gesundheit in 15 Mitgliedsstaaten der Europäischen Union.

**Methoden:** Die Daten wurden im Jahre 2002 als Teil des Eurobarometers mit persönlichen Interviews erhoben. Insgesamt wurden 16 230 Personen ab 15 Jahren befragt; die durchschnittliche Samplegrösse lag in den meisten Nationen bei ca. 1 000 Interviews. Psychische Gesundheit wurde über den MHI-5 und die EVI-Skala operationalisiert. Körperliche Aktivität wurde über die letzte 7-Tage-Kurzversion des IPAQ erfasst.

**Ergebnisse:** Für alle untersuchten soziodemographischen Teilpopulationen (Alter, Geschlecht, Einkommen, Familienstatus, Bildung) zeigten die Analysen Zusammenhänge zwischen dem Grad körperlicher Aktivität und der psychischen Gesundheit. Personen, die körperlich aktiver waren, verfügten über eine bessere psychische Gesundheit. In einigen Nationen liessen sich Hinweise für eine „Dosis-Wirkungs“-Beziehung zwischen körperlicher Aktivität und psychischer Gesundheit finden, während dies in anderen Nationen nicht der Fall war.

**Schlussfolgerungen:** Die Ergebnisse deuten auf eine positive Beziehung zwischen körperlicher Aktivität und psychischer Gesundheit hin. Allerdings lassen sich Hinweise für eine Dosis-Wirkungs-Beziehung zwischen körperlicher Aktivität und psychischer Gesundheit nicht in allen Nationen nachweisen.

## Résumé

### Santé mentale et activité physique dans l'Union Européenne

**Objectif:** Il s'agit de la troisième contribution à une série de quatre articles présentant des données sur l'activité physique dans 15 états membres de l'Union Européenne, et récoltées par Eurobarometer 58.2. Nous décrivons ici la relation entre activité physique (en MET-heures par semaine) et la santé mentale.

**Méthodes:** Données récoltées en 2002 sur la base d'entretien face à face d'un total de 16 230 personnes âgées de 15 ans et plus. L'effectif était de plus de 1 000 répondants dans la plupart des états. La santé mentale était évaluée au moyen du Mental Health Interview-5 et de l'échelle EVI (Energy and Vitality). L'activité physique était mesurée par une version courte d'un rappel de sept jours, le questionnaire d'activité physique international (IPAQ en anglais).

**Résultats:** Parmi les sous-groupes sociodémographiques étudiés (définis par l'âge, le sexe, l'état civil, le revenu familial brut et la scolarité), les plus actifs avaient en général une meilleure santé mentale. Dans certains états il y avait même une relation dose-effet entre l'activité physique et la santé mentale, mais pas dans tous.

**Conclusions:** Ces résultats suggèrent qu'il y a une relation positive entre l'activité physique et la santé mentale dans des sous-groupes de la population. Mais les analyses ne montrent pas de relation dose-effet claire dans tous les états étudiés.

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## Appendix

**Table A1** Percentage of MHI-5 cases in men by physical activity (MET-h/week). European Union 2002

Age (years)	n	Percentage of MHI-5 cases (score of 52 or less)				Total
		0–8 MET-h/week	8.1–24 MET-h/week	24.1–51.1 MET-h/week	51.11 and more MET-h/week	
15–24	1 027	16.2	12.0	9.5	11.9	11.9
25–34	1 155	22.6	16.7	12.4	12.0	15.3
35–44	1 173	14.9	17.3	12.5	14.6	14.7
45–54	1 055	27.8	21.6	18.4	15.2	20.3
55–64	985	23.8	19.6	16.4	10.8	17.7
65–74	1 131	29.3	11.5	9.5	11.4	16.5

**Table A2** Mean score of the EVI-scale in men by physical activity (MET-h/week). European Union 2002

Age (years)	n	Mean score of the EVI-scale				Total
		0–8 MET-h/week	8.1–24 MET-h/week	24.1–51.1 MET-h/week	51.11 and more MET-h/week	
15–24	1 041	66.5	67.6	68.6	70.2	68.8
25–34	1 151	62.9	65.0	66.7	69.1	66.3
35–44	1 187	64.1	63.3	65.8	67.6	65.5
45–54	1 064	59.2	63.0	65.2	67.6	64.1
55–64	991	59.9	64.5	67.6	67.9	64.9
65–74	1 151	51.4	65.4	68.2	71.4	62.8

**Table A3** Percentage of MHI-5 cases in women by physical activity (MET-h/week). European Union 2002

Age (years)	n	Percentage of MHI-5 cases (score of 52 or less)				Total
		0–8 MET-h/week	8.1–24 MET-h/week	24.1–51.1 MET-h/week	51.11 and more MET-h/week	
15–24	1 128	26.4	20.9	15.1	14.8	18.8
25–34	1 332	22.9	20.7	22.0	16.9	20.7
35–44	1 472	32.8	23.3	21.3	19.1	24.1
45–54	1 198	42.7	20.5	21.0	24.8	27.3
55–64	1 045	36.9	23.0	19.3	21.3	25.4
65–74	1 437	38.7	25.3	24.5	17.7	29.9

**Table A4** Mean score of the EVI-scale in women by physical activity (MET-h/week). European Union 2002

Age (years)	n	Mean score of the EVI-scale				Total
		0–8 MET-h/week	8.1–24 MET-h/week	24.1–51.1 MET-h/week	51.11 and more MET-h/week	
15–24	1 133	60.0	63.7	65.9	65.6	64.1
25–34	1 342	58.2	61.6	61.3	62.8	60.9
35–44	1 471	55.6	59.4	62.2	61.8	59.8
45–54	1 210	52.7	59.5	62.8	62.0	59.1
55–64	1 056	51.8	60.2	63.6	63.5	59.5
65–74	1 468	48.8	57.6	61.4	64.5	55.5



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