

# The relationship between physical activity and quality of life in prisoners: a pilot study

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## Key words

Prison • Physical activity • Quality of life

## Summary

**Introduction.** *Imprisoned people have usually a poor health status in comparison with the general population. The aim is to investigate a possible association between the quality of life and physical activity level in male inmates.*

**Methods.** *A cross-sectional pilot study was carried out between 2010 and 2011. A questionnaire contained SF12 and International Physical Activity Questionnaire was administered. Mental Component Score (MCS) and Physical Component Score (PCS) were computed. The physical activity level was measured using Metabolic Equivalents score (MET).*

**Results.** *121 inmates entered the survey. MCS is directly correlated to MET of physical activity ( $\beta = 0.23$ ;  $P = 0.03$ ) and negatively to BMI variations ( $\beta = -0.24$ ;  $P = 0.02$ ) and smoking status ( $\beta = -0.24$ ;  $P = 0.02$ ).*

**Discussion.** *This pilot study suggests to improve the investigation to support the promotion of physical activity programs in Italian prisons in order to improve inmates QoL and allow a better social integration at the end of detention.*

## Introduction

Imprisoned people have usually a poor health status in comparison with the general population [1].

This health disparity has been attributed to various causes. The behavioral factors such as use of intravenous drug, alcohol misuse, smoking, and inactivity could increase the risk of morbidity, mortality and mental disorders [2-5].

There is clear evidence of a connection between physical exercise and *Health Related Quality of Life* (HRQoL) [6-8], and this association has been proven for detention environments too [9-10]. Studies show a direct relationship between self-reported exercise, calculated in minutes per week, and good health of prisoners [4, 11].

In Italy no studies evaluated the association between quality of life and physical activity in the prison population while two studies suggest an association between physical activity and improvement of mental and physical health among prisoners [3, 12].

The hypothesis of the investigation is the possible association between the HQoL, assessed through the short form 12 questionnaire (SF12), and *Metabolic Equivalents* (MET) of physical activity in male inmates, assessed through the IPAQ questionnaire.

## Methods

### STUDY DESIGN, SETTING, PARTICIPANTS

This cross-sectional pilot study was carried out between 2010 and 2011.

STROBE Statement was applied to plan the study [13].

The male inmates were recruited on a voluntary basis in two prisons situated in the Center Italy, Rebibbia in Rome and the Cassino penitentiary. The prisons were chosen on an opportunistic basis.

We enrolled only the prisoners apparently healthy who showed good conduct during their detention and we excluded the inmates in higher security and mental health units.

The questionnaires were administered twice for prison, during each day of administration around 30 prisoners answered the questionnaire: 10 minutes to explain the project and 50 to support and complete the questionnaire were spent and reduce the missing data. The prisoners enrolled were informed concerning the nature and the aim of the research project.

### QUESTIONNAIRE AND VARIABLES

The questionnaire included three parts:

the *International Physical Activity Questionnaire* (IPAQ) [14] investigating the time spent carrying out moderate/intensity activity, walking and sitting in a week and referring adapted examples for inmates [15]. IPAQ responses were converted to MET minutes per week

(MET-min/wk) according to the IPAQ scoring protocol [16] through the analysis of total minutes over last seven days spent on vigorous activity, moderate-intensity activity, and walking;

Short Form-12 (SF-12) questionnaire [17] presenting 12 questions evaluating the HRQoL. The answers provide two outcome measures of the physical and the mental QoL: the *Physical Component score (PCS)* and *Mental Component Score (MCS)* and the score ranges from 0 to 100 (bad and good quality respectively). Although the use of SF12 rather than SF36 has been suggested for big samples (more than 500 subjects) the SF-12 was chosen for two reasons. First of all we were interested in the two summary subscales rather than eight health dimensions provided by the SF36 and secondly SF-12 has been already used in community-based cross-sectional studies [18].

Socio-demographic and biometric variables were included because they were considered potential confounding: age, gender, nationality, educational level, period of detention (dichotomized in 0-2 and  $\geq 2$ ; in years), civil status, smoking habits, weight in kilograms and height in centimeters auto-referred, subsequently combined to compute the BMI. Weight at the entrance was asked to and differential BMI was calculated.

The questionnaire was translated in three languages (Italian, English and France) allowing foreign prisoners to participate to the study.

A written consent to participate into the survey was collected from each participants. The study was approved by the Local Ethical Committee.

## STATISTICAL ANALYSIS

All results were recorded on paper and then double entered into SPSS19.0 database for analysis.

A probability level of 0.05 was set as limit for statistical significance.

Statistical analysis included descriptive statistics (mean, standard deviation and proportion) and inferential statistics.

In order to assess association between PCS and MCS of HRQoL and socio-demographic, biometric and attitudinal variables different statistic tests were performed:

to assess the normal distribution of the continuous variables, including the outcomes, the Kolmogorof-Smirnoff 's test was applied;

Pearson's Correlation for quantitative variables (age, BMI at the imprisonment, Current BMI, BMI variation, MET of physical activity);

Mann Whitney's test for dichotomous qualitative variables (civil status, smoking status, years of detention, nationality);

Kruskal-Wallis test has been performed for qualitative variables with more than two modalities.

Multivariate analysis was performed. According with Hosmer and Lemeshow [19] variables associated to PCS and MCS with probability level of 0,25 or less at the univariate and bivariate analysis were included in the model. Given the exploratory nature of the research project and the little literature available on the issue we chose

to adopt backward elimination model. Only covariates still present at the last elimination step were reported in Table III.

## Results

121 inmates entered the survey, 64 in Rome and 57 in Cassino detection centers (response rate = 87%).

The illiterate or the low educational level and no knowledge of English, Italian or French were the most common missing data sources that were referred from researchers that have administered the questionnaires.

The socio-demographic, biometric and attitudinal characteristics of the sample are described in Table I.

The bivariate analysis shows a direct association between PCS of HRQoL and MET of physical activity ( $r = 0.22$ ;  $P = 0.04$ ) and an inverse association with BMI variation ( $r = -0.23$ ;  $P = 0.02$ ). MCS of HRQoL is directly associated with MET of physical activity ( $r = 0.25$ ;  $P = 0.02$ ) and with age of inmates ( $r = 0.21$ ;  $P = 0.03$ ) and an inversely associated with the smoking attitude ( $P = 0.02$ ). Educational level, civil status, nationality and years of detention are not significantly associated with the inmates' quality of life.

Two multivariate analyses were performed, one with each HRQoL score (PCS and MCS) as outcome. The following variables entered the analysis of PCS as covariates: current BMI, BMI variation since the start of detention, MET of physical activity, Educational level, smoking status and years of detention. PCS resulted di-

Tab. I. Descriptive characteristics of the inmates studied.

Continuous variables		N. of responders	Mean	SD
Age (years)		121	35.0	11.1
BMI at the start of the detention		114	25.9	4.7
BMI at the present		112	26.1	3.4
PCS		113	48.7	7.7
MCS		113	45.6	11.0
Total MET per week		95	9278.9	13845.9
Years of detention		120	5.20	6.1
Qualitative variables			%	
Educational level	None or primary school	29	24.6	
	Secondary school	68	57.6	
	High school / university	21	17.8	
Smoking status	Smokers	83	69.7	
	No smokers	36	30.3	
Civil status	Married	41	33.9	
	Not married	80	66.1	
Years of detention	0-2	54	45.0	
	> 2	66	55.0	
Nationality	Italian	77	66.4	
	Foreign	39	33.6	

**Tab. II.** The impact of demographic and anthropometric characteristics and behaviors on the Quality of Life, bivariate analysis.

	Physical score		Mental score	
	Pearson's correlation	P	Pearson's correlation	P
Age	0.023	0.807	0.209	<b>0.026</b>
BMI at the imprisonment	0.077	0.428	0.061	0.533
Current BMI	-0.135	<b>0.172</b>	-0.108	0.274
BMI variation	-0.232	<b>0.021</b>	-0.164	<b>0.106</b>
MET total	0.217	<b>0.040</b>	0.248	<b>0.018</b>
Years of detention	0.088	0.355	-0.041	0.666
	<b>Median (IQR)</b>	<b>P*</b>	<b>Median (IQR)</b>	<b>P*</b>
<b>Educational level</b>				
None/primary school	50.2 (13.3)	<b>0.232</b>	47.0 (15.7)	0.591
Secondary school	48.7 (11.7)		49.6 (15.7)	
High school / university	51.7 (9.8)		43.3 (21.0)	
<b>Civil status</b>				
Not married	50.2 (12.7)	0.988	48.3 (15.0)	0.955
Married	49.5 (11.43)		46.4 (19.2)	
<b>Smoking status</b>				
No	52.0 (8.7)	<b>0.226</b>	52.1 (12.3)	<b>0.022</b>
Yes	49.5 (13.2)		45.0 (18.2)	
<b>Years of detention</b>				
0-2	48.6 (11.4)	<b>0.194</b>	50.7 (19.2)	0.898
> 2	50.8 (12.5)		47.1 (15.2)	
<b>Nationality</b>				
Italian	49.4 (13.0)	0.400	47.6 (18.3)	0.614
Foreign	50.4 (10.0)		47.5 (17.6)	

IQR: interquartile range

\* P: p-value of Mann Whitney's test for dichotomous qualitative variables and Kruskal-Wallis test for qualitative variables with more than two modalities.

Bold: p < 0.05.

**Tab. III.** The impact of demographic and anthropometric characteristics and behaviors on the Quality of Life, multivariate analysis.

Covariates*	Physical component score		Mental component score	
	Beta	P	Beta	P
BMI variation	<b>-0.262</b>	<b>0.017</b>	<b>-0,242</b>	<b>0,023</b>
MET total	<b>0.250</b>	<b>0.023</b>	<b>0,232</b>	<b>0,030</b>
Current BMI	-0.135	0.217		
Smoke	-0.119	0.270	<b>-0,242</b>	<b>0,023</b>
Educational level	0.018	0.872		
Age			0,153	0,140
R <sup>2</sup>	0.090		0.143	

\* Only variables still present at the last step of the backward elimination model are shown in the table.

Bold: p < 0.05.

rectly associated to physical activity (r = 0.25; P = 0.02) and inversely correlated to BMI variations (r = -0.26; P = 0.02). The following variables were included in the model for MCS: age, BMI variation since the start of detention, MET of physical activity and smoking status. MCS is influenced positively by MET of physical activity (r = 0.23; P = 0.03) and negatively by BMI variations (r = -0.24; P= 0.02) and smoking status (r = -0.24; P = 0.02).

### Discussion

Our results are consistent with the scientific literature on the issue. Even if HRQoL is rarely investigated among inmates population, physical activity has been proven to reduce depression and anxiety [3], increase functional capacity and improving the health status of incarcerated people [12]. Moreover in a US high security prison women participating in a focus group described limited physical activity as a specific prison-based factors that affected their physical health [20]. Our study reveals that physical activity is associated to both the physical and the mental components of the HRQoL in the inmates population. According with Meek et al. [21] we can state that physical activity can contribute to achieving “healthy prison” objectives in practice.

Moreover, there is evidence from our survey that BMI variations are inversely associated to the HRQoL and tobacco smoking is inversely associated with the mental component of HRQoL. Demographic factors and the educational level does not appear to affect the HRQoL. Likely this can be partially explained by the low sample size, it would be appropriate to continue to investigate this aspect.

The strengths of this study are mainly two. First the innovation that brings to the Italian landscape where few experiences have been conducted on the topic. Few studies have been carried out in this field. Even if the focus of this work is specific it can contribute to the evidence building on the prisoners health. Secondly, the possibility to actively intervening to bettering the HRQoL of inmates through the realization of physical training in Italian prisons. Physical activity is a proven cost effective tool to challenge chronic diseases in general population and this research seems to support albeit weakly to a number of limitations to the idea that physical activity can be beneficial to the quality of life. Larger studies are needed to find out [22].

However, we have to acknowledge the study presents some limitations. Above all the sample size (120 participants) and composition (only males) could not infer the associations we found to the general inmate population. Moreover, only few behavioral factors have been evaluated and not pathologic or environmental factors have been assessed due to the nature of pilot study.

The goodness of fit of the model could have been increased adding other factors to the multivariate analysis. Anyway, the results are promising and a multicenter study is ongoing to expand the sample and include the

female population in the study. Further research approaches could include the realization of a randomized trial with the organization of physical training in prisons and qualitative analysis to identify other determinants of inmates HRQoL.

If physical activity will be confirmed to highly affect the inmates HRQoL practical implications have to be considered. The realization of training programs for detention centers could be a simple, effective, and cost effective way to improve the Quality of Life of prisoners and to contribute to the re-educational aim of the prison detention. According with the Italian Constitution Document “punishments must aim at rehabilitating the condemned” for the restitution of healthy and renewed persons to the community [23].

Physical activity programs in prisons could contribute to accomplish this target.

## Conclusions

Both physical and mental components of quality of life are affected by physical activity that seems to be the main determinant, joint with the BMI variation and smoking attitude, of inmates’ quality of life [9].

A multicenter study is ongoing in Italy to confirm preliminary results.

Programs promoting physical activity should be planned and implemented in Italian prisons in order to improve inmates QoL and allow a better social integration at the end of detention.

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