

Physical activity of pupils during school-sport and leisure time, depending on their body weight: are overweight pupils physically inactive?

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Abstract:

It seems to be common sense, that hypomobility is an essential cause for overweight and adiposity. As a consequence, physical activity usually is recommended against adiposity. In literature doubts, based on empirical studies, could be found, that the lamentations about an unfit and by this fat youth seems to be rather a sociological phenomenon of an imaginary crisis than an empirically based fact.

Especially concerning young people in Germany, physical inactivity is accused to be an important cause of adiposity. Therefore we are interested in the spontaneous intensity of physical activity of pupils during their physical education and in leisure time in relation to their body mass index.

Pupils (10-19y old, 15 forms) were observed during their physical education systematically regarding quantitative and qualitative items. Additionally the intensity of physical and sporting activities in leisure time were investigated by questionnaire. The results show, that the rate of underweight was higher than of adiposity in the researched group. Between the intensity of physical activity in physical education and in leisure related to the deviations of normal weight (BMI) no relevant correlations could be stated.

Discussing these results, the hypotheses: Physical inactivity is a central cause of adiposity and physical activity is a very good action against adiposity seems to be too simple. Eating behaviour, genetic disposition, psychological factors etc. obviously are very relevant, too. This must be considered in public recommendations against adiposity as well as the risks of uncontrolled physical activities for joints, bones and muscles especially in case of overweight.

Key words: leisure time, physical activity, body weight

Introduction

It seems to be common sense, that hypomobility is a main cause of overweight and thus of calculated adiposity. As a result, physical activity is usually recommended against adiposity. Adiposity is a multicausal phenomenon, however. In spite of the common sense, that there must exist an interaction between physical inactivity and adiposity, some doubts arose concerning this hypothesis based on observations of everyday behaviour and results from Ketzer [1] or Klein [2, 3].

Ketzer [1] introduced Nordic Walking in a special clinic for overweight children. Most of the 53 children were physically active and motivated to learn a new sport without signs of neglecting physical activities.

Klein [2] looked systematically at the adiposity-state of children from an interdisciplinary point of view. He found in accordance with other systematic studies, that in contrast to often used statements about unfit and therefore fat children it cannot be assumed that a relevant problem of fatness caused by unfit exists in Germany. Opposite statements rather seem to be popular headlines without sufficient empirical base. In 2007 Klein underlined his conclusions and related the thesis of fatness due to unfit of children with the sociological phenomenon of an imaginary crisis.

Especially concerning young people in Germany, physical inactivity is still thought to be an important cause of adiposity and on this base different programs for intensification of physical activities – without specification – are propagated, e. g. by ministerial campaigns [4]. Therefore we are interested in the spontaneous intensity of physical activity of pupils during physical education and in leisure time in relation to their body mass index (BMI = QUETELET-Index).

Methods

Pupils (15 classes) of a gymnasium in three grades were investigated: Grades 5 & 6, 10-12 years old, grades 9 & 10, 14-16 years old and grades 12 & 13, 17-19 years; determination of 4 different activity indices:

- 1) Investigation of quantitative and qualitative items [5] by systematic observations during physical education, which were calculated into an activity score by using a mix of systematic observations (scored qualitative items: intensity of activities during their p. e. lessons, visible sweating, visible respiration) and quantitative measurements (counting of defined activity items, duration of self-taken breaks). Than these activity scores were subdivided into 5 degrees: Very high, high, mean, low, no (ordinal scale).

- 2) Measurements of heart rate during physical education (pupils with medium BMI and maximum BMI of the group, each).
- 3) pedometer-measurements during their physical education.
- 4) Questionnaire about the intensity of physical and sportive activities in leisure time, referring to 7 behaviour items.

Finally these 4 activity-indices were related to the BMI of the pupils.

The number of participants varied, depending on different subgroups during the observations and in the inquiry. For the special topics only complete data-sets were used.

Results

For the 329 pupils a BMI-classification in accordance with the percentage-values of Krohmeyer-hauschild et al. [6] showed: 8% overweight, 5% adipose and 7% underweight pupils.

No relevant differences of the activity behaviour (activity score) of the pupils with different degree of body weight could be stated (Table 1).

A comparison of maximal heart rate of the pupils with mean BMI and maximal BMI of the observed group, each, during their physical education showed no relevant differences (Table 2).

The pedometer measurements show very low correlation coefficients between percentage deviations from the BMI-limit for overweight and the registered steps during the physical education “playing volleyball” (Table 3); positive or negative correlation coefficients were calculated. The highest value for the determination coefficient amounted to 2.6%.

The results of the questionnaire about the intensity of physical and sporting activities in leisure time show only small or no interactions between both parameters and the deviations of normal weight (BMI), exemplarily in Tab. 4.

Conclusions

Our study about physical activity of pupils during physical education with systematic observations and measurements of heart rate and steps as well demonstrate, that an interaction of physical inactivity and BMI-related overweight cannot be stated for the examined group. This corresponds with the extensive study of [2] and confirms his suggestion, that the sociological phenomenon of an imaginary crisis plays a role for the populist lamentations about a physically inactive youth, becoming more and more fat by inactivity.

As a possible consequence of this lamentations the percentage of underweight was higher than of adiposity in our group.

Table 1. Activity behaviour (activity score) during physical education, classified in 5 subgroups (very high, high, mean, low and no), separated in 3 groups of body weight in an observed group of 60 pupils, each, (10-19 years old, median BMI: related to the observed subgroup of pupils)

	Very high	High	Mean	Low	No
Median BMI	8%	72%	17%	3%	0%
Overweight	19%	60%	21%	0%	0%
Adipose	9%	62%	29%	0%	0%

Table 2. Maximal heart rate during physical education for pupils with mean and maximal BMI respectively, 2 series (repetition)

	Mean BMI	Maxim. BMI
First series	190 min ⁻¹	191 min ⁻¹
Second series	185 min ⁻¹	187 min ⁻¹

Table 3. Interactions between the degree of overweight/adiposity and steps (pedometer) during physical education (warming up and playing volleyball), first and repeated measurements, separated into the 3 age groups

“Volleyball”		n	10-12 y	n	14-16 y	n	17-19 y
Correlation. coeff. r	1. measurement	52	-0,160	34	0.140	37	-0.098
Correlation coeff. r	2. measurement	51	0,104	34	0.010	37	-0.046
Determination. coeff r ²	1. measurement	52	2.6%	34	2.0%	37	1.0%
Determination. coeff r ²	2. measurement	51	1.1%	34	< 0.1%	37	0.2%

Table 4. Correlation coefficients, 3 relations to deviations of normal body weight (bw.). 1) for activity score (act. s.) during physical education, 2) physical activity (p. act.) during leisure time in hrs/week 3) sporting activity (sp. act.) during leisure time in hrs/week

	n	r ^{lessons} act. s./bw.	n	r ^{leisure} p. act./bw.	r ^{leisure} sp. act./bw.
Lower grade, 10-12 y	145	-0.25 ≈ 6.3%	136	0.07 ≈ 0.5%	-0.10 ≈ 1.0%
Intermediate grade 14-16 y	125	0.14 ≈ 2.0%	95	-0.07 ≈ 0.5%	0.12 ≈ 1.4%
Upper grade 17-19 y	93	0.04 ≈ 0.2%	55	-0.14 ≈ 2.0%	-0.05 ≈ 0.3%
Total group	363	0.25 ² ≈ 6.3%	286	0.14 ² ≈ 2.0%	0.12 ² ≈ 1.4%

The results of the questionnaire underline this conclusion. Our observations and measurements are based on a great number of pupils, partially up to 363, but these were pupils of a middle or higher social class, however. Probably with pupils of lower social classes this might be different; but this would underline, that the typical general lamentations have no empirical base and includes the risk to provoke a behaviour, leading to underweight.

It could be argued, that the pupils are forced to be physically active during their physical education. They are motivated to participate actively during their education, obviously, but they had possibilities enough, to do this more or less intensively, especially in playing volleyball.

The type of physical activity must be important in context with overweight/adiposity; only endurance activities with sufficient duration and intensity could have an effect on body weight, but only, if the metabolic loss of fat is not compensated by eating more. Our observations were focussed on endurance activities, only in the questionnaire we analyzed with regard to a general physical or sportive activity.

By an interdisciplinary point of view the hypotheses: Physical inactivity is a central cause for adiposity and physical activity is a very good action against adiposity seems to be too simple. Eating behaviour, genetical disposition, psychological factors etc. obviously are very relevant, too. This must be considered in public recommendations against adiposity as well as the risks of uncontrolled physical activities for joints, bones and muscles especially in case of overweight.

Summary

It seems to be common sense, that hypomobility is an essential cause for overweight and adiposity. As a consequence, physical activity usually is recommended against adiposity. In literature doubts, based on empirical studies, could be found, that the lamentations about an unfit and by this fat youth seems to be rather a sociological phenomenon of an imaginary crisis than an empirically based fact.

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