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# ANALYSIS OF PHYSICAL ACTIVITY IN PRESCHOOL CHILDREN FROM PIŁA. PART 1. ORDINARY AND ADDITIONAL PHYSICAL ACTIVITY AND FAVOURITE WAYS OF SPENDING LEISURE TIME\*\*

**\*Wojciech Chalcarz, Sylwia Merkiel**

Food and Nutrition Department of the Eugeniusz Piasecki University School of Physical Education  
in Poznań, Poland

Head of the Department: prof. dr hab. Wojciech Chalcarz

## Summary

**Aim.** The aim of this study was to analyse ordinary and additional physical activity in preschool children from Piła and to investigate their favourite ways of spending leisure time.

**Material and methods.** Parents of 165 preschoolers from Piła filled in questionnaires on general information about their children and their families, the children's ordinary and additional physical activity, and their favourite ways of spending leisure time. Statistical analysis was performed by the IBM SPSS Statistics 21 computer programme. The studied population was divided according to gender.

**Results.** Gender had statistically significant influence on parents' answers to the questions about familial osteoporosis and about their opinion on their children's body weight, as well as the percentages of children who preferred playing with a ball and rollerblading/roller skating during sunny weather and drawing/painting, playing with building blocks, playing computer games, playing with dolls and playing with toy cars during rainy weather.

**Conclusions.** In comparison to the previously studied preschool children from other regions of Poland, the studied preschoolers from Piła were characterised by reduced ordinary and additional physical activity. To reverse these unfavourable changes, it is necessary to educate preschoolers' parents, preschool staff and local authorities about the possibilities of increasing the children's physical activity and reducing their time spent in a passive way. Children, irrespective of gender, should be encouraged to various kinds of physical activity.

Key words: physical activity, preschool children, Piła, ordinary and additional physical activity, favourite ways of spending leisure time

## INTRODUCTION

Although it has been as many as 33 years since the first Polish publication which emphasised the importance of physical activity in maintaining preschool children's health (1), this problem not only remains, but has become one of the main issues in the area of public health. Both our studies on preschool children (2-8) and studies carried out in other countries (9-13) indicate that preschoolers' physical activity is decreasing while the prevalence of obesity among children and adolescents is increasing (14-17).

Decreased physical activity in preschool children is one of the cause of their unwillingness to take part in physical education classes when they move to school. This problem was raised in the Polish Supreme Audit

Office report published recently (18). Therefore, it is necessary to monitor physical activity in preschool children from various regions of Poland and to undertake intervention programmes as quickly as possible.

## AIM

The aim of this study was to analyse ordinary and additional physical activity in preschool children from Piła and to investigate their favourite ways of spending leisure time.

## MATERIAL AND METHODS

Parents of 165 preschoolers, including 79 girls and 86 boys aged 3 to 6 years who attended preschools in Piła, were asked to fill in questionnaires on general informa-

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tion about their children and their families, health status of the children and their families, the children's ordinary and additional physical activity (the way of going to preschool and coming back home, active ways of spending time at preschool and outside preschool, passive ways of spending leisure time outside preschool), as well as the children's favourite ways of spending leisure time during sunny and rainy weather. The questions included in the questionnaires were used in our previous studies (4-7).

The study was approved by the Bioethics Committee of the Poznan University of Medical Sciences. Parents were informed during a special meeting about the methods of the research and provided written consent to participate. The study was carried out in September/October 2010.

Statistical analysis was performed by the IBM SPSS Statistics 21 computer programme. The studied population was divided according to gender. Quantitative variables were first analysed using the Shapiro-Wilk statistic for testing normality. The level of significance was set at  $P \leq 0.05$ . For all the

analysed quantitative variables, means and standard deviations were calculated ( $\bar{x} \pm sd$ ). To investigate statistically significant differences between subgroups, the unpaired Student's t test for normally distributed variables and the non-parametric Mann-Whitney U test for skewed variables were used. The level of significance was set at  $P \leq 0.05$ . Qualitative variables were presented in contingency tables. Statistical significance was determined using Pearson's chi-square test, except for the variables with 2 x 2 tables with an expected frequency of less than five in at least one subgroup for at least one answer. In this case, Yates' corrected chi-square test or Fisher's exact test was used. The level of significance was set at  $P \leq 0.05$ .

## RESULTS

### Characteristics of the studied population

Tables 1 to 3 present, respectively, general information about the studied preschool children from Piła and

Table 1. General information about the studied preschool children and their families.

No.	Parameter		Girls (n = 79)	Boys (n = 86)	All children (n = 165)	P
1.	Child's age [years]	$\bar{x} \pm sd$	5.1 ± 1.0	5.1 ± 1.0	5.1 ± 1.0	NS
2.	Mother's age [years]	$\bar{x} \pm sd$	31.0 ± 4.7	32.3 ± 5.1	31.7 ± 5.0	NS
3.	Father's age [years]	$\bar{x} \pm sd$	33.6 ± 4.8	34.3 ± 5.6	34.0 ± 5.2	NS
4.	Mother's education [%]	Vocational	9.0	4.7	6.7	NS
		Secondary	39.7	50.0	45.1	
		Higher	51.3	45.3	48.2	
5.	Father's education [%]	Primary	2.7	0.0	1.3	NS
		Vocational	14.7	22.4	18.8	
		Secondary	52.0	44.7	48.1	
		Higher	30.7	32.9	31.9	
6.	Parents' assessment of the economic status of the family [%]	Very good	12.8	9.4	11.0	NS
		Good	51.3	52.9	52.1	
		Average	32.1	35.3	33.7	
		Bad	3.8	2.4	3.1	
7.	Number of children in the family [%]	One	45.6	39.5	42.4	NS
		Two	46.8	47.7	47.3	
		Three	5.1	11.6	8.5	
		Four	2.5	1.2	1.8	
8.	The sequence of the child in the family [%]	First	68.4	67.9	68.1	NS
		Second	27.8	26.2	27.0	
		Third	2.5	4.8	3.7	
		Fourth	1.3	1.2	1.2	

$\bar{x} \pm sd$  – mean ± standard deviation

P – significance; NS – not significant ( $P > 0.05$ )

Table 2. Health status of the studied preschool children and their families.

No.	Parameter	Girls (n = 79)	Boys (n = 86)	All children (n = 165)	P
1.	Birth weight [kg]*	3.3 ± 0.5	3.4 ± 0.5	3.3 ± 0.5	NS
2.	Food allergies [%]	11.4	7.0	9.1	NS
3.	Other allergies [%]	13.9	17.4	15.8	NS
4.	Taking medicines by the child [%]	23.1	33.7	28.7	NS
5.	Following a special diet by the child due to health problems [%]	2.5	0.0	1.2	NS
6.	Familial myocardial infarction [%]	39.2	29.1	33.9	NS
7.	Familial hyperlipidaemia [%]	2.5	2.3	2.4	NS
8.	Familial hypertension [%]	60.8	67.4	64.2	NS
9.	Familial cancer [%]	38.0	36.0	37.0	NS
10.	Familial obesity [%]	25.3	24.4	24.8	NS
11.	Familial diabetes [%]	50.6	47.7	49.1	NS
12.	Familial osteoporosis [%]	6.3	16.3	11.5	0.045

\* $\bar{x} \pm sd$  – mean ± standard deviation

P – significance; NS – not significant ( $P > 0.05$ ).

Table 3. Parents' opinion on their children's body weight and health status [%].

No.	Parameter		Girls (n = 79)	Boys (n = 86)	All children (n = 165)	P
1.	Parents' opinion on their children's body weight	Underweight	12.7	3.6	8.0	0.051
		Adequate body weight	83.5	95.2	89.6	
		Obesity	3.8	1.2	2.5	
2.	Parents' opinion on their children's health status	Good	91.1	88.2	89.6	NS
		Not good	0.0	4.7	2.4	
		I don't know	8.9	7.1	7.9	

P – significance; NS – not significant ( $P > 0.05$ ).

their families, health status of the studied preschool children and their families, and parents' opinion on their children's body weight and health status according to gender. Children's gender had statistically significant influence on parents' answers to the questions about familial osteoporosis and about their opinion on their children's body weight.

Statistically significantly higher percentage of the parents of boys compared to the parents of girls reported familial osteoporosis, 16.3% vs 6.3%, and assessed their child's body weight as adequate, 95.2% vs 83.5%, whereas statistically significantly higher percentage of the parents of girls compared to the parents of boys claimed that their child was underweight, 12.7% vs 3.6%, or obese, 3.8% vs 1.2%.

### Ordinary and additional physical activity

Tables 4, 5, 6 and 7 show, respectively, the way of going to preschool and coming back home, active ways of spending leisure time at preschool, active ways of spending leisure time outside preschool, and passive ways of spending leisure time outside preschool by the studied preschool children from Piła according to gender. No statistically significant differences were observed.

### Favourite ways of spending leisure time

Table 8 presents favourite ways of spending leisure time during sunny weather by the studied preschool children from Piła according to gender. Gender had statistically significant influence on the percentages

Table 4. The way of going to preschool and coming back home by the studied preschool children [%].

No.	Parameter		Girls (n = 79)	Boys (n = 86)	All children (n = 165)	P
1.	Going to preschool	On foot	30.4	36.0	33.3	NS
		In a car	46.8	45.3	46.1	
		By public transport	5.1	7.0	6.1	
		On foot or in a car	12.7	10.5	11.5	
		In a car or by public transport	5.1	1.2	3.0	
2.	Coming back home	On foot	32.9	41.9	37.6	NS
		In a car	39.2	39.5	39.4	
		By public transport	3.8	3.5	3.6	
		On foot or in a car	13.9	10.5	12.1	
		On foot or by public transport	1.3	2.3	1.8	
		In a car or by public transport	5.1	1.2	3.0	
		On foot or in a car or by public transport	3.8	1.2	2.4	

P – significance; NS – not significant ( $P > 0.05$ ).

Table 5. Active ways of spending leisure time at preschool by the studied preschool children [%].

No.	Parameter		Girls (n = 79)	Boys (n = 86)	All children (n = 165)	P
1.	Attending organised physical exercise classes		69.6	62.8	66.1	NS
2.	Attending corrective exercise classes	Yes, because the child has to	10.7	3.7	7.1	NS
		No, but the child should	10.7	11.1	10.9	
		No, because the child doesn't have to	78.7	82.7	80.8	
		Yes, although the child doesn't have to	0.0	2.5	1.3	
3.	Attending exercises*		16.7	11.1	13.9	NS
4.	Attending callisthenics for children*		90.7	88.9	89.8	NS
5.	Attending dance classes*		11.1	9.3	10.2	NS

P – significance; NS – not significant ( $P > 0.05$ ).

\*Calculated as the percentage of those children who attended organised physical exercise classes.

of children who preferred playing with a ball and rollerblading/roller skating. Statistically significantly higher percentage of boys, 24.4%, than girls, 3.8%, preferred playing with a ball during sunny weather, while statistically significantly higher percentage of girls than boys, 13.9% vs 1.2%, preferred rollerblading/roller skating.

Table 9 shows favourite ways of spending leisure time during rainy weather by the studied preschool children from Piła according to gender. Gender had statistically significant influence on the percentages of

children who preferred drawing/painting, playing with building blocks, playing computer games, playing with dolls and playing with toy cars. Both drawing/painting and playing with dolls were favourite ways of spending leisure time during rainy weather for statistically significantly higher percentages of girls than boys, 44.7% vs 23.3% and 9.2% vs 0.0%, respectively. Statistically significantly higher percentage of boys than girls preferred playing with building blocks, 24.4% vs 6.6%, playing computer games, 16.3% vs 1.3%, and playing with toy cars, 10.5% vs 0.0%.

Table 6. Active ways of spending leisure time outside preschool by the studied preschool children [%].

No.	Parameter	Girls (n = 79)	Boys (n = 86)	All children (n = 165)	P	
1.	Attending organised physical exercise classes, including:	17.7	19.8	18.8	NS	
	- swimming	42.9	47.1	45.2		
	- dancing	35.7	17.6	25.8		
	- football	0.0	17.6	9.7		
	- other	21.4	17.6	19.4		
2.	Doing physical exercise at home	Every day	10.1	7.0	8.5	NS
		5-6 times a week	1.3	0.0	0.6	
		3-4 times a week	11.4	8.1	9.7	
		Once or twice a week	21.5	22.1	21.8	
		No	55.7	62.8	59.4	
3.	Parents' doing physical exercise at home with the child	27.8	23.3	25.5	NS	
4.	Going for a long walk	Every day	30.4	24.4	27.3	NS
		5-6 times a week	12.7	4.7	8.5	
		3-4 times a week	29.1	38.4	33.9	
		Once or twice a week	21.5	24.4	23.0	
		No	6.3	8.1	7.3	
5.	Riding a bicycle	91.1	86.0	88.5	NS	

P – significance; NS – not significant ( $P > 0.05$ ).

Table 7. Passive ways of spending leisure time outside preschool by the studied preschool children [%].

No.	Parameter	Girls (n = 79)	Boys (n = 86)	All children (n = 165)	P	
1.	Daily time spent in front of a television	Less than 1 hour	2.6	5.9	4.3	NS
		1 hour	22.1	18.8	20.4	
		2 hours	48.1	48.2	48.1	
		3 hours	16.9	17.6	17.3	
		4 hours and more	10.4	9.4	9.9	
2.	Watching selected TV programmes	84.4	91.9	88.3	NS	
3.	Daily time spent in front of a computer	None	53.8	40.7	47.2	NS
		Less than 1 hour	28.2	32.1	30.2	
		1 hour	14.1	19.8	17.0	
		2 hours	2.6	6.2	4.4	
		3 hours	1.3	0.0	0.6	
		4 hours and more	0.0	1.2	0.6	
4.	Daily time spent in front of a television and a computer	Up to 1 hour	15.6	15.0	15.3	NS
		More than 1 hour to 2 hours	35.1	35.0	35.0	
		More than 2 hours to 3 hours	35.1	22.5	28.7	
		More than 3 hours to 4 hours	7.8	18.8	13.4	
		More than 4 hours	6.5	8.8	7.6	

P – significance; NS – not significant ( $P > 0.05$ ).

Table 8. Favourite ways of spending leisure time during sunny weather by the studied preschool children [%].

No.	Ways of spending leisure time	Girls (n = 79)	Boys (n = 86)	All children (n = 165)	P
1.	Riding a bicycle	59.5	59.3	59.4	NS
2.	Playing in a playground	44.3	39.5	41.8	NS
3.	Playing with a ball	3.8	24.4	14.5	< 0.001
4.	Going for a walk	31.6	23.3	27.3	NS
5.	Rollerblading/Roller skating	13.9	1.2	7.3	0.002
6.	Riding a scooter	8.9	9.3	9.1	NS
7.	Swimming/Bathing in a pool/lake	7.6	7.0	7.3	NS
8.	Other kinds of outdoor play	39.2	43.0	41.2	NS

P – significance; NS – not significant ( $P > 0.05$ ).

Table 9. Favourite ways of spending leisure time during rainy weather by the studied preschool children [%].

No.	Ways of spending leisure time	Girls (n = 79)	Boys (n = 86)	All children (n = 165)	P
1.	Watching television	26.3	32.6	29.6	NS
2.	Reading books	6.6	8.1	7.4	NS
3.	Going for a walk	6.6	9.3	8.0	NS
4.	Drawing/painting	44.7	23.3	33.3	0.004
5.	Playing with building blocks	6.6	24.4	16.0	0.002
6.	Playing computer games	1.3	16.3	9.3	0.001
7.	Doing puzzles	11.8	16.3	14.2	NS
8.	Playing board games	11.8	10.5	11.1	NS
9.	Games involving physical exercise at home	3.9	3.5	3.7	NS
10.	Going to the swimming pool	7.9	4.7	6.2	NS
11.	Playing with dolls	9.2	0.0	4.3	0.013
12.	Playing with toy cars	0.0	10.5	5.6	0.011
13.	Other kinds of indoor play	48.7	44.2	46.3	NS

P – significance; NS – not significant ( $P > 0.05$ ).

## DISCUSSION

### Characteristics of the studied population

The studied population of preschoolers from Piła comprised the same number of children as the population of children from preschools in Poznań (5), however, the percentage of girls was higher. The populations of children from preschools in Pabianice (2), in the Mazowsze region (6), in Nowy Sącz and the vicinity (4), in Darłowo (7) and from various regions of Poland (3) included a lower number of children. The studied children from Piła were younger than preschoolers from Nowy Sącz and the vicinity (4) and slightly younger than their peers from preschools in Darłowo (7), in

Poznań (5) and in the Mazowsze region (6). They also had younger mothers and fathers (5-7).

In comparison to mothers of the previously studied children (4-7), the highest percentage of mothers of the studied preschoolers from Piła had secondary education, whereas the percentage of fathers with secondary education was the same as the percentage of fathers of children from the Mazowsze region (6) and higher than the percentage of fathers of children from Darłowo (7) and Poznań (5). The percentage of parents of the studied preschoolers from Piła who assessed the economic status of the family as very good was the same as the percentage of parents of children from preschools in Darłowo (7) and lower only than the percentage of

parents of children from the Mazowsze region (6). The percentage of parents of the studied preschoolers from Piła who assessed the economic status of the family as good was lower only than the percentage of parents of children from Darłowo (7).

In comparison to the previously studied children from preschools in Darłowo (7) and in the Mazowsze region (6), the studied population of preschoolers from Piła was found to comprise the highest percentage of girls who suffered from food allergies and took medicines, and the highest percentage of boys who suffered from other allergies and took medicines. However, the percentage of both girls and boys from Piła who followed special diets due to health problems was the lowest. It is obvious that children who suffer from food allergies should follow elimination diets (19, 20). Meanwhile, among the studied preschoolers not only a very small percentage of children followed a special diet, but also the percentage of parents who assessed their children's health status as good was very high, similar to the percentage of parents of girls from Darłowo (7) and the percentage of parents of boys from the Mazowsze region (6). It seems that the health care professionals should pay more attention to educate parents on their children's health. The importance of this issue was highlighted a long time ago (21). The inability to assess adequately the health status of one's own child is very disconcerting since caring for health and proper development of the children is one of the basic roles of the family (22). Such attitude of the studied children's parents is difficult to understand and it is not clear whether it is the result of unawareness or irresponsibility. A paediatrician should draw the parents' attention to the health status of their children.

It is difficult to explain why in the families of the studied preschoolers from Piła, the prevalence of familial hypertension, diabetes and myocardial infarction reported by parents was higher than in the families of children from Darłowo (7) and the Mazowsze region (6) and why the prevalence of familial osteoporosis was lower.

### Ordinary and additional physical activity

There were many unfavourable findings on the ordinary and additional physical activity in the studied preschool children from Piła.

Firstly, the percentage of the studied preschoolers who went to preschool on foot was lower than the percentage of children from Poznań (5), Darłowo (7), Nowy Sącz and the vicinity (4) and the Mazowsze region (6), whereas the percentage of the preschoolers who were driven in a car was higher. Similar findings were also reported by Australian researchers (23). It is also the first time in our research (4-7) when we observed such a little increase in the percentage of children who went back home from preschool on foot in comparison to the percentage of children who went to preschool on foot. Usually, the percentage of preschoolers who went

home on foot was much higher than the percentage of preschoolers who went to preschool on foot which was probably the result of the fact that the children went back home with their grandparents or siblings who did not have a car. Most probably the observed change is the result of the fact that availability of the car to most of the society has increased over the period when our studies were carried out. This availability is also the reason for the habit of using the car on any occasion. Driving children to preschools and schools in a car will lead to further reduction in children's physical activity which was shown by the American researchers (24).

Secondly, the percentage of the studied preschoolers from Piła who attended organised physical exercise classes at preschool was much lower than the percentages of girls and boys from preschools in the Mazowsze region (6) and in Darłowo (7). Only the percentage of the studied preschoolers who attended callisthenics for children at preschool was similar to the percentage of children from Darłowo (7) and higher than children from the Mazowsze region (6). Also, the percentage of the studied children from Piła who attended organised physical exercise classes outside preschool was only a little higher than the percentage of children from the Mazowsze region (6) but as many as twice lower than the percentage of children from Poznań (5). Organised physical exercise classes conducted by experienced teachers play an important role in developing children's motor skills (25). Unfortunately, parents of preschoolers from Piła were most probably unaware of this. They not only did not pay much attention to their children's attendance to organised physical exercise classes, but also a small percentage of them did physical exercise at home with their children or went for a long walk with their children every day. From the public health point of view, it is of high importance to provide various physical exercise classes to children at preschool which should be obligatory and free of charge for every child. It is also indispensable to spread among preschoolers' parents and local authorities the knowledge of the role of organised physical exercise classes in motor development of the child. Very helpful tools for this purpose are provided within the programmes of increasing physical activity (26-29).

Thirdly, a very harmful to children's health was the fact that the percentages of the studied preschoolers from Piła who watched television for two hours, three hours or four hours and more every day were higher than the percentages of their previously studied peers from Darłowo (7), Nowy Sącz and the vicinity (4), the Mazowsze region (6) and Poznań (5). Adverse effects of spending long hours in front of a television include higher risk of obesity due to reduced time of physical activity along with increased time of sitting and consuming unnecessary additional energy from high-energy foodstuffs and beverages, being exposed to commercials of

high-energy, unhealthy and not recommended foods, as well as limiting time for sleep (30-33). Moreover, long hours of watching television by the children reduce the direct contact and spending leisure time with siblings, parents and peers, worsens sight, favours faulty posture and inadequate psychomotor development. Early exposure to television viewing is also associated with sedentary behaviours later in primary school (34), as well as in adolescence and adulthood (35). According to the recommendations of Canadian Society for Exercise Physiology, parents should limit screen time of 2- to 4-year-old children to under one hour per day and to a maximum of two hours for 5- to 6-year-old children (36, 37).

### Favourite ways of spending leisure time

Similarly to the previous studies (4, 5, 7), the most preferred ways of spending leisure time during sunny weather by the studied preschoolers included riding a bicycle, playing in a playground and going for a walk, however, the percentages of the studied children from Piła who preferred these ways of spending time were higher than among their previously studied peers. These findings indicate that the studied preschoolers were keen on physical activity. However, it depends on their parents whether the children are able to undertake various forms of physical activity. Parents should be encouraged to promote among their children the habit of spending leisure time outdoors from the early childhood because children who spend more time outdoors are more physically active (38).

In the studied preschool children from Piła, some social stereotypical influences were observed reflected in the higher percentage of boys who preferred playing with a ball and higher percentage of girls who preferred rollerblading and going for a walk. This observation is similar to the findings of our previous studies (5-7). This is the result of a common belief that some activities are adequate for the girls while other are adequate for the boys. However, the percentages of the studied girls and boys who preferred riding a bicycle were similar contrary to the previous studies in which higher percentages of boys preferred this kind of activity (5-7). This is highly favourable and it is important to note that children, irrespective of gender, should be encouraged to various kinds of physical activity.

During rainy weather, the studied preschoolers from Piła preferred mainly passive ways of spending leisure time, similarly to their peers from other regions of Poland (5-7) as well as from other countries (39-41). Moreover, similar gender-dependent tendencies were observed, that is only girls preferred playing with dolls and only boys preferred playing with toy cars. Higher percentage of girls compared to boys preferred drawing/painting, whereas higher percentage of boys preferred playing computer games and playing with building blocks. These preferences are most probably caused by cultural

influences. Gender differences in physical activities are typical (42, 43) and reflect traditional approach to these activities as gender-dependent. Such an approach is not good for future understanding between men and women, as well as for spending time actively together with the spouse.

### CONCLUSIONS

1. In comparison to the previously studied preschool children from other regions of Poland, the studied preschoolers from Piła were characterised by reduced ordinary and additional physical activity which was reflected in the higher percentage of preschoolers driven by car to preschool and back home, allowing the children to spend more time watching television, not going for a long walk every day and not doing physical exercise at home by the parents with the child.

2. To reverse these unfavourable changes, it is necessary to educate preschoolers' parents, preschool staff and local authorities about the possibilities of increasing the children's physical activity and reducing their time spent in a passive way.

3. Children, irrespective of gender, should be encouraged to various kinds of physical activity. □

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Correspondence to:  
\*Wojciech Chalcarz

Food and Nutrition Department of the Eugeniusz Piasecki  
University School of Physical Education in Poznań  
27/39 Królowej Jadwigi St., 61-871 Poznań  
tel.: +48 618-355-287  
e-mail: chalcarz@awf.poznan.pl