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Posted Date: 5 June 2023

doi: 10.20944/preprints202306.0256.v1

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Article

How Czech Adolescents Perceive Their Physical Activity

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Abstract: Adolescence is a critical stage in the development of an individual's physical activity habits and preferences. Adolescents' perceptions of physical activity can influence their motivation to engage in physical activity and, consequently, their overall level of physical activity. Thus, our primary aim was to investigate whether Czech adolescents misperceive their peers' Moderate to Vigorous Physical Activity (MVPA) and Vigorous Physical Activity (VPA). Our dataset comprised cross-sectional data on 1289 adolescents aged 11–15 years collected in 2020 and 2021. Basic descriptive statistics, chi-squared tests and binomial regression models were used to analyse the data. Our study points out that there is a discrepancy between the self-perceived levels of own MVPA and VPA and the perceived descriptive norms of peers' MVPA and VPA. Adolescents underestimate the prevalence of sufficient MVPA and VPA, and thus perceived descriptive norms in MVPA and VPA are worse than levels of own MVPA and VPA. These findings indicate room for targeted intervention based on the social norms based approaches to increase the physical activity of adolescents or at least strengthen their actual positive behaviour.

Keywords: MVPA; VPA; social norms; children; adolescents; perception

1. Introduction

Engaging in sufficient Physical Activity (PA) can have significant benefits for the overall health of children and adolescents. This includes improvements in their physical well-being, as well as positive impacts on their mental and social-emotional health [1]. Despite this, studies indicate that adolescents are failing to meet the recommended level of physical activity [2]. As with adolescents in other countries, Czech adolescents are facing the same issue as a significant proportion of them do not meet public health guidelines for recommended levels of physical activity [3].

The conduct of individuals regarding their health is significantly impacted by social norms. Such influence ranges from reinforcing favourable behaviours that can safeguard and improve one's well-being, to promoting unfavourable actions that elevate the possibility of detrimental health outcomes [4].

The development of the theoretical basis for the investigation of social norms is grounded in the evolution of several frameworks. Initially, social norms were defined and explored within larger theories such as the theory of reasoned action (TRA) and theory planned behaviour (TPB) [5]. The focus theory of normative conduct (FTNC) evolved from the TPB [6] focusing exclusively on social norms.

The FTNC framework delineates norms into two distinct categories: injunctive and descriptive [7]. Injunctive norms involve an evaluative component, whereas descriptive norms do not. Descriptive norms refer to individuals' perceptions of common behaviours within their social context. When faced with unfamiliar situations, people may rely on descriptive norms as a shortcut for understanding socially appropriate behaviour. By observing the actions of others around them and

if widespread participation indicates social acceptability, individuals may adopt similar conduct themselves.

As the study of social norms advanced, researchers began to consider the referent group for injunctive and descriptive norms in terms of proximity: either proximal or distal. Proximal refers to an individual's close friend circle (for example, a few friends they spend most of their time with). On the other hand, distal pertains to a larger population such as students at one's university [8,9].

As the research on social norms has progressed, correlational studies have provided compelling evidence that descriptive norms have a positive association with both intention and behaviour. The effectiveness of norms as a means of influencing behaviour has been demonstrated across a wide range of behaviours, such as promoting healthier eating habits, encouraging energy conservation, and reducing binge drinking.[10–13] Studies investigating the connection between social norms and physical activity are limited. Even though research on social norms has not placed much emphasis on physical activity, certain studies demonstrate a correlation between the two [4,14–16].

In addition, the findings of Vorlíček et al [17,18] on a sample of Czech adolescents indicate that there might be room for targeted intervention based on the social norms approach to increase the PA of adolescents or at least strengthen their actual positive behaviour.

The Social Norms Approach (SNA) is commonly used to encourage positive health behaviours by addressing individuals' misperceptions of their peers' attitudes and actions.[19] Studies have shown that people tend to overestimate the prevalence of negative behaviours and attitudes among their peers while underestimating positive ones. This misperception can lead to negative behaviours such as excessive alcohol consumption and a decrease in positive behaviours such as healthy eating, using sun protection, and being physically active [20].

Understanding how Czech adolescents perceive their physical activity is crucial for developing effective interventions and strategies that encourage a more active lifestyle. Given that the discrepancy between self-perceived levels of behaviour and perceived social norms is crucial to the application of the SNA, our primary aim was to investigate whether Czech adolescents misperceive their peers' PA behaviours. Furthermore, we aimed to investigate the associations between their self-perceived PA and descriptive social norms PA and whether these associations differed with gender and class grade.

2. Materials and Methods

2.1. Procedure Sample and Participant Selection

The present cross-sectional study involved 1289 adolescents (46% of them boys) aged 11–15 years (mean 12.95 ± 3.6 years) from 12 randomly selected schools (Grades 6–9) from the Czech Republic. Schools with a specific focus on sport and schools for pupils with special educational needs were not recruited. Measurement was voluntary, and no incentives were provided in return for participation. Less than five percent of the adolescents opted out of the data collection.

2.2. Assessments and Measures

For the purposes of this study, we used questions on MVPA and VPA from HBSC study as a feasible and valid survey instrument.[21]

Self-perceived MVPA was assessed using the following item:

“Physical activity is any activity that increases your heart rate and makes you get out of breath some of the time. Physical activity can be done in sports, school activities, playing with friends, or walking to school. Some examples of physical activity are running, brisk walking, rollerblading, biking, dancing, skateboarding, swimming, soccer, basketball, football, surfing.”

“Over the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day? Please add up all the time you spent in physical activity each day.”

The students could select a response from eight options, ranging from “zero days (never)” to “seven days”.

Descriptive norm on MVPA was assessed using modified item:

“Over the past 7 days, on how many days do you think most of your classmates were physically active for a total of at least 60 minutes per day?” The students could select a response from eight options, ranging from “zero days (never)” to “seven days”.

Self-perceived VPA was assessed using the following item:

“Outside school hours: how often do you usually exercise in your free time so much that you get out of breath or sweat?”

The students could select a response from seven options, ranging from “Every day” “4 to 6 times a week” “2 to 3 times a week” “Once a week” “Once a month” “Less than once a month” to “Never”.

Descriptive norm on VPA was assessed using the following item:

“Outside school hours: how often do you think most of your classmates usually exercise in their free time so much that you get out of breath or sweat?”

The students could select a response from seven options, ranging from “Every day” “4 to 6 times a week” “2 to 3 times a week” “Once a week” “Once a month” “Less than once a month” to “Never”.

2.3. Procedure

The data were collected from 2020 to 2021 in regular school weeks during the spring and autumn seasons. The pupils filled in an electronic questionnaire at school during class under the supervision of teachers and researchers.

2.4. Data Processing

Statistical data processing was performed using the IBM SPSS Statistics software, version 23 (IBM, Armonk, NY, USA). Basic descriptive statistics, Chi-squared tests and binomial regression models were used to analyse the data.

3. Results

MVPA

According to results showed in Table 1, 18% of Czech adolescents reported more than 60 minutes of MVPA daily. Significantly more boys than girls (20.6% vs. 15.8%) had 60 minutes of daily MVPA ($\chi^2 = 22.21$; $p = 0.002$). Levels MVPA gradually and significantly decreased from 6th grade to 9th grade ($\chi^2 = 50.927$; $p < 0.001$). While in 6th grade 23.9% of adolescents had more than 60 minutes of daily MVPA, in 7th grade it was 21.9%, in 8th 16.8% and in 9th it was only 8.4%.

Table 1. Self-perceived MVPA among Czech adolescents according to gender and school class grade.

	0 days		1 day		2 days		3 days		4 days		5 days		6 days		7 days		Total	χ^2 (p)	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%			
Total	45	3.5%	93	7.2%	176	13.7%	231	17.9%	211	16.4%	204	15.8%	97	7.5%	232	18.0%	1289		
Boys	27	4.6%	30	5.1%	72	12.2%	97	16.4%	90	15.2%	105	17.7%	49	8.3%	122	20.6%	592	22.21	
Girls	18	2.6%	63	9.0%	104	14.9%	134	19.2%	121	17.4%	99	14.2%	48	6.9%	110	15.8%	697	(0.002)	
Grade	6th	15	4.3%	20	5.8%	35	10.1%	58	16.7%	63	18.2%	44	12.7%	29	8.4%	83	23.9%	347	
	7th	7	2.3%	25	8.0%	40	12.9%	46	14.8%	46	14.8%	59	19.0%	20	6.4%	68	21.9%	311	50.927
	8th	9	2.7%	20	6.0%	50	15.0%	62	18.6%	52	15.6%	58	17.4%	26	7.8%	56	16.8%	333	(<0.001)
	9th	14	4.7%	28	9.4%	51	17.1%	65	21.8%	50	16.8%	43	14.4%	22	7.4%	25	8.4%	298	

MVPA - Moderate to Vigorous Physical Activity.

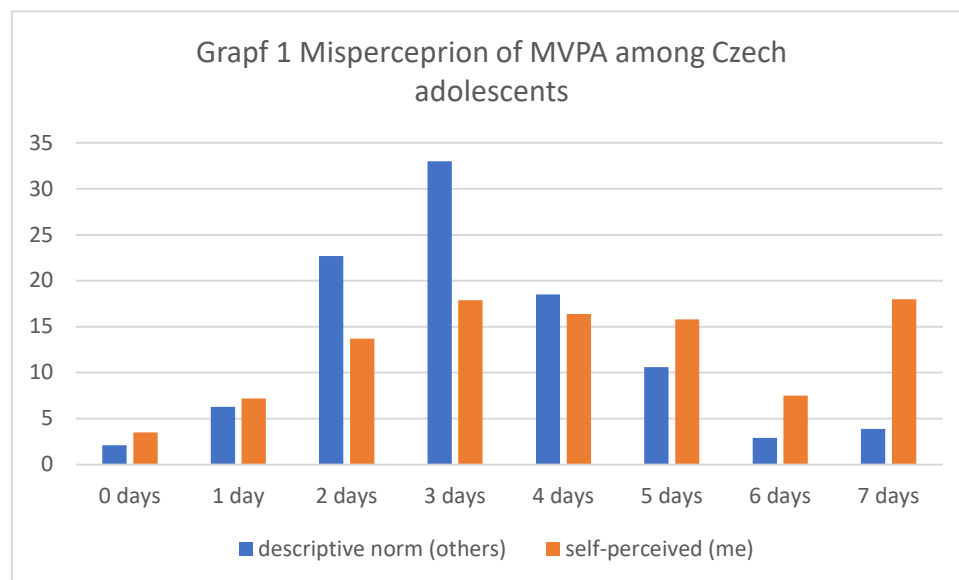
Regarding perceived descriptive norms in MVPA, only 3.9% of adolescents believed that their peers have at least 60 minutes of daily MVPA. (Table 2) Boys perceived their peers as having more MVPA compared to girls ($\chi^2 = 27.435$; $p = 0.001$). We did not observe significant differences across grades ($\chi^2 = 31.954$; $p = 0.059$).

Table 2. Perceived descriptive norms of MVPA among Czech adolescents according to gender and school class grade.

	0 days		1 day		2 days		3 days		4 days		5 days		6 days		7 days		χ^2 (p)	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
Total	27	2.1%	81	6.3%	293	22.7%	425	33.0%	239	18.5%	137	10.6%	37	2.9%	50	3.9%		
Boys	16	2.7%	34	5.7%	126	21.3%	175	29.6%	113	19.1%	77	13.0%	15	2.5%	36	6.1%	27.435	
Girls	11	1.6%	47	6.7%	167	24.0%	250	35.9%	126	18.1%	60	8.6%	22	3.2%	14	2.0%	(<0.001)	
Grade	6th	5	1.4%	25	7.2%	77	22.2%	108	31.1%	64	18.4%	38	11.0%	16	4.6%	14	4.0%	
	7th	8	2.6%	14	4.5%	65	20.9%	96	30.9%	64	20.6%	41	13.2%	7	2.3%	16	5.1%	31.954
	8th	7	2.1%	16	4.8%	84	25.2%	103	30.9%	62	18.6%	36	10.8%	10	3.0%	15	4.5%	(0.059)
	9th	7	2.3%	26	8.7%	67	22.5%	118	39.6%	49	16.4%	22	7.4%	4	1.3%	5	1.7%	

MVPA - Moderate to Vigorous Physical Activity.

When comparing self-perceived MVPA and perceived descriptive norm in MVPA (i.e. adolescents own behaviour vs. behaviour of their peers) we found clear misperception. (Graph 1) Adolescents perceive the level of MVPA of their peers as much lower. While majority of adolescent (57.7%) have reported 60 minutes of MVPA at least 4 times a week, only 35.9% believe that their peers have 60 minutes of MVPA at least 4 times a week. This misperception is present both for boys and girls and across all grades (Tables 1 and 2).



In order to identify which adolescents misperceive MVPA, we performed binominal logistic regression. Sample was dichotomized into two groups underestimated MVPA (1) vs. rest of the sample (0). In four steps we entered sex, grade, school and own MVPA.

According to results girls and older students tend to significantly more underestimate the prevalence of MVPA among their peers. School had no effect perception of MVPA. After entering the own self-perceived MVPA into the model almost all variance is explained and the most gradient appeared. Adolescents who have 0 days of MVPA weekly underestimate the MVPA of their peers almost 9 times more compared to their peers who have daily 60 minutes MVPA (OR 8.974). The more passive adolescents are, the more they tend to perceive this behaviour as less frequent, normal.

Table 3. Underestimation of norms in Moderate to Vigorous Physical Activity (results of logistic regression).

		OR(95% C.I.)		p
Model 1	Gender	Boys	ref.	
		Girls	1.469(1.169 - 1.846)	0.001
Model 2	Gender	Boys	ref.	
		Girls	1.468(1.166 - 1.847)	0.001

		6th	ref.	0.002
	Grade	7th	0.876(0.640 - 1.200)	0.410
		8th	1.052(0.770 - 1.437)	0.752
		9th	1.670(1.193 - 2.339)	0.003
	Gender	Boys	ref.	
		Girls	1.474(1.171 - 1.855)	0.001
Model 3	Grade	6th	ref.	0.003
		7th	0.875(0.639 - 1.199)	0.407
		8th	1.043(0.763 - 1.426)	0.790
		9th	1.647(1.174 - 2.309)	0.004
	School		0.984(0.954 - 1.015)	0.306
	Gender	Boys	ref.	0.030
		Girls	1.317(1.026 - 1.690)	
	Grade	6th	ref.	0.164
		7th	0.841(0.597 - 1.184)	0.321
		8th	0.948(0.676 - 1.330)	0.758
		9th	1.282(0.888 - 1.851)	0.185
Model 4	School		0.992(0.960 - 1.026)	0.660
		7 days	ref.	0.000
		6 days	0.843(0.516 - 1.377)	0.495
	MVPA	5 days	1.354(0.923 - 1.988)	0.121
		4 days	2.549(1.725 - 3.764)	0.000
		3 days	5.402(3.548 - 8.223)	0.000
		2 days	7.735(4.706 - 12.714)	0.000
		1 days	9.754(4.908 - 19.383)	0.000
		0 days	8.974(3.636 - 22.153)	0.000

OR - odds ratio. MVPA - Moderate to Vigorous Physical Activity.

VPA

According to results showed in Table 4, 29.8% of Czech adolescents reported VPA at least 4 times a week. Significantly more boys than girls had VPA at least 4 times a week ($\chi^2 = 23.03$; $p = 0.001$). Levels VPA gradually and significantly decreased from 6th grade to 9th grade ($\chi^2 = 50.51$; $p < 0.001$). While in 6th grade 13% of adolescents had daily VPA, in 7th grade it was 10%, in 8th 8% and in 9th it was only 4%.

Table 4. Self-perceived VPA among Czech adolescents according to gender and school class grade.

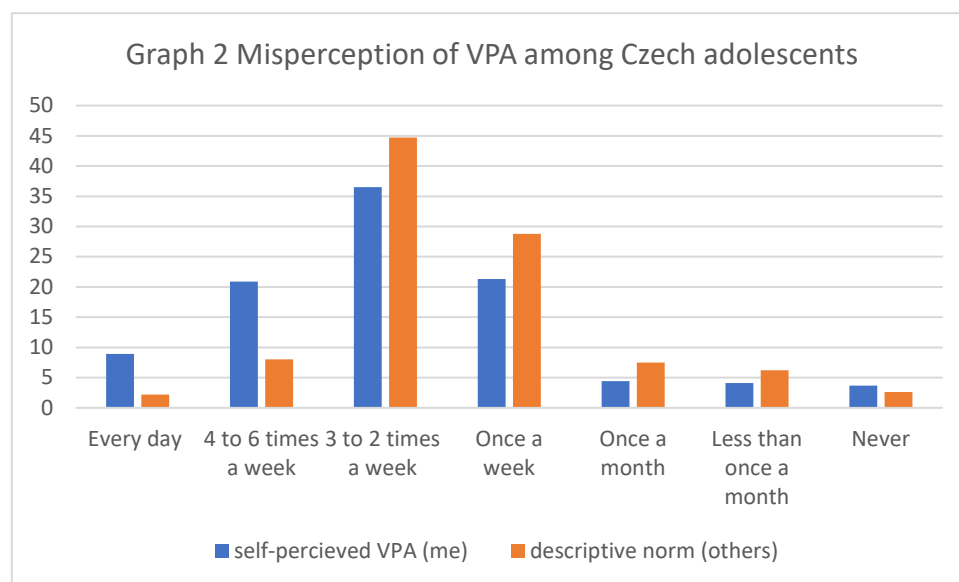
	Every day		4 to 6 times a week		3 to 2 times a week		Once a week		Once a month		Less than once a month		Never		χ^2 (p)	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
Total	115	8.9%	269	20.9%	470	36.5%	274	21.3%	57	4.4%	53	4.1%	48	3.7%		
Boys	64	10.8%	136	23.1%	218	36.9%	94	15.9%	27	4.6%	25	4.2%	26	4.4%	23.036	
Girls	51	7.3%	133	19.1%	252	36.2%	180	25.9%	30	4.3%	28	4.0%	22	3.2%	(<0.001)	
Grade	6th	45	13.0%	74	21.4%	130	37.6%	61	17.6%	5	1.4%	18	5.2%	13	3.8%	
	7th	30	9.7%	83	26.9%	110	35.6%	51	16.5%	13	4.2%	11	3.6%	11	3.6%	50.548
	8th	27	8.1%	61	18.3%	121	36.3%	86	25.8%	16	4.8%	10	3.0%	12	3.6%	(<0.001)
	9th	13	4.4%	51	17.1%	109	36.6%	76	25.5%	23	7.7%	14	4.7%	12	4.0%	

Regarding perceived descriptive norms in VPA, only 10% of adolescents believed that their peers VPA everyday (Table 5). Boys perceived their peers as having more VPA compared to girls ($\chi^2 = 22.67$; $p = 0.001$). Levels VPA gradually and significantly decreased from 6th grade to 9th grade ($\chi^2 = 39.86$; $p < 0.002$).

Table 5. Perceived descriptive norms on VPA among Czech adolescents according to gender and school class grade.

	Every day		4 to 6 times a week		3 to 2 times a week		Once a week		Once a month		Less than once a month		Never		χ^2 (p)	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
Total	28	2.2%	103	8.0%	575	44.7%	370	28.8%	97	7.5%	80	6.2%	33	2.6%		
Boys	19	3.2%	53	9.0%	271	45.9%	146	24.7%	47	8.0%	31	5.3%	23	3.9%	22.677	
Girls	9	1.3%	50	7.2%	304	43.7%	224	32.2%	50	7.2%	49	7.0%	10	1.4%	(<0.001)	
Grade	6th	12	3.5%	42	12.1%	147	42.5%	98	28.3%	19	5.5%	21	6.1%	7	2.0%	
	7th	9	2.9%	30	9.7%	150	48.5%	76	24.6%	18	5.8%	18	5.8%	8	2.6%	39.865
	8th	5	1.5%	17	5.1%	154	46.2%	97	29.1%	31	9.3%	23	6.9%	6	1.8%	(0.002)
	9th	2	0.7%	14	4.7%	124	41.6%	99	33.2%	29	9.7%	18	6.0%	12	4.0%	

When comparing self-perceived VPA and perceived descriptive norm in VPA (i.e., adolescents own behaviour vs. behaviour of their peers) we found clear misperception. (Graph 2) While almost 30% of adolescent have reported VPA at least 4 times a week, only 10% believe that their peers have VPA at least 4 times a week. This misperception is present both for boys and girls and across all grades (Tables 4 and 5).



In order to identify which adolescents misperceive VPA, we performed binominal logistic regression. Sample was dichotomized into two groups underestimated VPA (1) vs. rest of the sample (0). In four steps we entered sex, grade, school and own VPA.

In general, the results were very similar to what we reported for MVPA above, although less expressive. Girls and older students tend to significantly more underestimate the prevalence of VPA among their peers. School had no effect on perception of VPA. After entering the own self-perceived VPA into the model almost all variance is explained and the most gradient appeared. Adolescents who had no VPA during last month underestimate the VPA of their peers more than 9 times compared to their peers who had daily VPA (OR 3.134). As for MVPA, the less VPA adolescents have, the more they tend to perceive this behaviour as less frequent, normal.

Table 6. Underestimation of norms in Vigorous Physical Activity (results of logistic regression).

		OR(95% C.I.)		p
Model 1	Gender	Boys	ref.	0.032
		Girls	1.274(1.021 - 1.589)	
Model 2	Gender	Boys	ref.	

		Girls	1.273(1.020 - 1.590)	0.033
		6th	ref.	0.003
	<i>Grade</i>	7th	0.88(0.643 - 1.204)	0.423
		8th	1.24(0.915 - 1.68)	0.165
		9th	1.562(1.143 - 2.135)	0.005
	<i>Gender</i>	Boys	ref.	
		Girls	1.274(1.020 - 1.592)	0.033
		6th	ref.	0.003
Model 3	<i>Grade</i>	7th	0.88(0.643 - 1.204)	0.423
		8th	1.238(0.914 - 1.679)	0.168
		9th	1.558(1.138 - 2.132)	0.006
	<i>School</i>	<i>School</i>	0.997(0.968 - 1.027)	0.850
	<i>Gender</i>	Boys	ref.	
		Girls	1.238(0.981 - 1.563)	0.073
		6th	ref.	0.056
	<i>Grade</i>	7th	0.885(0.639 - 1.227)	0.464
		8th	1.161(0.846 - 1.593)	0.357
		9th	1.387(0.998 - 1.927)	0.051
Model 4	<i>School</i>		0.999(0.968 - 1.03)	0.941
		Every day	ref.	0.000
		4 to 6 times a week	0.493(0.312 - 0.781)	0.003
		3 to 2 times a week	0.862(0.568 - 1.309)	0.487
	<i>VPA</i>	Once a week	1.45(0.927 - 2.269)	0.104
		Once a month	4.521(2.148 - 9.518)	0.000
		Less than once a month	2.941(1.465 - 5.905)	0.002
		Never	3.134(1.513 - 6.489)	0.002

VPA - Vigorous Physical Activity

4. Discussion

Our primary aim was to investigate whether Czech adolescents misperceive their peers' PA behaviours. Furthermore, we aimed to investigate the associations between their self-perceived PA and descriptive social norms PA and whether these associations differed with gender and class grade. Thus, we were able to evaluate the suitability of utilizing the Social Norms Approach as an intervention strategy for promoting sufficient PA among adolescents. Perkins[22] has identified two pre-conditions that must be met before implementing SNA properly. The first condition necessitates a discrepancy between perceived and actual behaviour, which indicates overestimation of problem conduct. The second condition demands that at least half of the population behaves responsibly; given that individuals strive to conform with societal norms, employing a social norms message campaign may inadvertently encourage harmful conduct if most people engage in it. Hence, if more than 50% violate desirable behaviours targeted by the intervention program, recognizing SNA's limitations would prove critical in decision-making regarding its implementation potentiality.

Our study points out that there is a discrepancy between the self-perceived levels of own MVPA and VPA and the perceived descriptive norms of peers' MVPA and VPA. Adolescents underestimate the prevalence of sufficient MVPA and VPA, and thus perceived descriptive norms in MVPA and VPA are worse than levels of own MVPA and VPA. Girls and older students tend to significantly more underestimate the prevalence of VPA among their peers. School had no effect on perception of VPA. We confirmed clear relation between descriptive norms and PA. According to our findings, the more passive adolescents are, the more they tend to perceive this behaviour as less frequent, normal. In previous literature, there is general support for the notion that social norms can influence individual decisions to be physically active [4]. Several studies have explored the correlation between descriptive social norms and physical activity, concluding that the perceived behaviour of one's peers strongly influenced their likelihood to engage in PA [23,24]. Ball et al [23] also concluded that descriptive norms had an impact separate from social support and proposed adjusting social norms in interventions aimed at encouraging higher levels of physical activity.

We found that grade had effect on misperception of MVPA and VPA. On the contrary school had no effect. If may define a grade as more proximal and school more distal norms, our findings would be in line with previous research which indicates that norms closer to an individual have a greater impact on their behaviour than those further away. For example, studies by Yun and Silk [9] showed that proximal descriptive and injunctive norms had more predictive power in promoting healthy food choices compared to distal norms. Likewise, Koruska and Thombs [25] found that college students' alcohol use was more influenced by perceived normative behaviours of close friends than the typical student.

In general, we found that unfortunately very low number of adolescents fulfilled the recommendations for sufficient physical activity, both MVPA and VPA. We also confirmed that boys are more active than girls and that PA level gradually decrease with older age. These findings are fully in line with other Czech [3,26,27] studies but also with wider regional [28–31] and global situation [1].

The study has a number of strengths and limitations that must be considered. A limitation worth noting is that the results rely on self-reported data, which may produce reporting biases or various alternative explanations (such as social pressure to respond in particular ways). Our participants reported their own physical activity levels along with their peers. Also, due to our cross-sectional approach, we cannot conclude any causal relationship between actual PA levels and perceived norms among adolescents. Another limitation could be that we focused solely descriptive norms. It was revealed that modifying descriptive norms alone may not be sufficient in changing behaviour [32]. The direct impact of descriptive norms on actions is considered unlikely, as there are likely moderators or mediators involved between these norms and conduct. In this context, injunctive norms, outcome expectations, and group identity have been identified as key normative mechanisms [33], while peer communication and issue familiarity have also received some attention in related research studies [34].

Nonetheless, this research highlights the significance of analysing adolescents' physical activities while contemplating their perceptions towards social conventions when physically active - an area relatively less researched so far according to existing literature.

5. Conclusions

Our study points out that there is a discrepancy between the self-perceived levels of own MVPA and VPA and the perceived descriptive norms of peers' MVPA and VPA. Adolescents underestimate the prevalence of sufficient MVPA and VPA, and thus perceived descriptive norms in MVPA and VPA are worse than levels of own MVPA and VPA. These findings indicate room for targeted intervention based on the social norms based approaches to increase the physical activity of adolescents or at least strengthen their actual positive behaviour.

Author Contributions: F.S. conceptualized and designed the study, conducted the data collection, and drafted the manuscript. D.K. assisted in writing the manuscript. M.V. assisted with the statistical analysis and writing of the manuscript. L.R. and J.V. assisted with the data collection and writing of the manuscript. J.M. assisted with the study design, data collection, and writing of the manuscript. All authors have read and agreed to the published version of the manuscript.

Funding: This paper was supported by the research grants of the Czech Science Foundation (No. 17-24378S) "Social norms intervention in the prevention of excessive sitting and promotion of physical activity among Czech adolescents", and the Technology Agency of the Czech Republic (No. TL02000033) "Primary prevention of sedentary behavior and promotion of school-based physical activity based on social norms and a social marketing approach and using elements of e-health/m-health systems".

Institutional Review Board Statement: The study was approved under reference number 38/17 by the Ethics Committee of the Faculty of Physical Culture, Palacký University Olomouc, which is governed by the ethical standards set out in the World Medical Association Declaration of Helsinki and its later amendments.

Informed Consent Statement: The data presented in this study are available on request from the corresponding author.

Conflicts of Interest: The authors declare no conflict of interest.

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