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A Study of the Effects of a Structured Daily Physical Activity Intervention in Schools in Malta

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Abstract: The measurement of daily step counts is a widely adopted and efficacious approach for assessing children's physical activity levels. With the aim of finding out the effect of daily PA sessions in schools on the total PA levels in terms of steps taken, two (treatment and control) Year Four classrooms (with students aged from eight to nine years old) in three participating schools in Malta participated in this study. A random sample of 45 children across all the treatment and control groups wore pedometers for five continuous school days. Additional data were logged to facilitate data analysis. Statistical analysis was conducted on data from 18 participants, as incomplete data were eliminated. The findings show that a daily physical activity programme was sufficient to make a significant difference in the number of steps taken at school. It also made the difference between Maltese schools being either under par (if not engaged in daily PA at school) or among high-performing nations (if engaged in daily PA at school) in terms of the proportional contribution of steps taken at school to children's total PA. However, the capacity for school-based activity to exert wider effects on total steps taken throughout the entire day appears to be limited. Reported engagement in additional formal sports activities outside school also had limited effects on steps overall. Finally, a statistical model incorporating sex, daily PA, sports participation, and BMI as exogenous variables accounted only for around a quarter of the variation in average daily pedometer-measured PA, leaving approximately 75% of the variation unexplained. Implications of the findings are discussed, including recommendations for alternative ways of conceptualising and promoting health-related physical activity and exercise.

Keywords: pedometer; daily physical activity; children; Malta; state schools

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1. Introduction

Researchers have dedicated much attention to exploring factors surrounding the implementation of programmes and initiatives designed to increase physical activity (PA) levels in schools [1–3]. Typically, issues and concerns are raised about barriers obstructing the process of involving more school children in more physical activity [4–6]. The assumption is presupposed, however, that such policies are a priori, entirely sound in scope, and well worth implementing. If accepted guidelines concerning minimum recommended amounts of PA are fundamentally sound, then by extension, any initiative must also be looking to effectively realise such guidelines. In this sense, children in Malta have compared poorly with other European Union countries in terms of overall PA [7], lending special credence to the general enterprise of organising school-based PA promotion initiatives, projects, and programmes on a national scale. If increased PA engagement by children is to be achieved on a broad national scale, state schools are a natural and ideal place to start. Indeed, several projects were underway during the 2022/23 academic year (when this study was conceived and carried out), and these were designed to increase physical education (PE) lessons, PA sessions, and sports participation by various means inside selected Maltese state schools.

Some notable studies have indicated such interventions to be beneficial. Varela Garrote et al. [8], for instance, found that, on days when PE lessons were held, 10-year-old students in Spain accumulated significantly more steps than on days without PE. Similarly, Resaland et al. [9] showed that 60 min of structured PA per day considerably improved cardiorespiratory fitness in Scandinavian school children. However, a closer examination of the literature indicates that such findings are not conclusive, and findings on the efficacy of school-based PA promotion programmes are, in fact, mixed. In a meta-analysis of 40 effects across 14 studies, Russ et al. [10] described school-based interventions as only minimally effective in the context of PA performed throughout the entire day. Similarly, in a meta-analysis of 33 studies in the US, Pfledderer et al. [11] found that school-based interventions were only marginally effective in urban and suburban settings and not effective at all in rural areas. Even where results were statistically significant, the meta-analyses show that studies rarely detect effect sizes any greater than mild (<0.20). Therefore, while attaining PA guidelines may be desirable, we know less about the efficacy of interventions designed to bolster PA in children, particularly when these take the form of school-based programmes.

With various national programmes ongoing in Maltese schools, one of which involved the holding of daily PA sessions in three treatment classes across three state schools, we aimed to discover if such sessions had any effect on daily total PA levels in some systematic and significant way. In other words, what is the effect of a daily PA programme in Maltese state primary schools on children's overall PA levels? More specifically, how do total steps taken by Year Four students in Maltese state schools vary between those engaged in a daily PA programme at school and those not? These research questions led to the following testable hypotheses:

RH_1. *Mean steps at school vary across the treatment and control groups.*

RH_2. *Mean total steps vary across the treatment and control groups.*

RH_3. *Mean steps outside school are associated with the weekly frequency of extra PA or sport sessions.*

RH_4. *Mean total steps are associated with the weekly frequency of extra sport sessions.*

RH_5. *Mean steps outside school are associated with BMI.*

RH_1 and RH_2 were intended to address the study's main aim by ascertaining if the daily PA sessions had an effect, first, on steps performed at school, and second, on daily steps overall. RH_3 and RH_4 used the same logic to ascertain the effects of extra sports/PA performed outside of school both in terms of the remaining time beyond school hours and overall. RH_5 was intended to help determine if activity patterns outside school were related to BMI.

2. Materials and Methods

2.1. Setting

This study was only one part of a more extensive national research study focused on the influence of daily PA in schools, on the academic, physical, and wellness domains [12]. Three state schools from mainland Malta participated in this national study. Specific selection criteria were used to obtain a demographic representation, including the size of the school and the geographical location. In fact, a large school from the southern region, a medium-sized school from the central region, and a small school from the northern region of Malta were eventually selected to participate in this study (Table 1). A treatment Year Four class (8- to 9-year-old students) in each school participated in daily PA sessions, while a second class carried on with their regular daily routine, acting as controls.

The control class followed their usual routine of one to two PE lessons per week delivered by the school's PE teacher and/or class teacher. Current practice involves the provision of one PE lesson per week by the class teacher and another by a visiting peripatetic PE teacher. However, there is little evidence to indicate the extent to which these practices

are upheld. No studies to date have explicitly investigated whether local schools are meeting PE and PA guidelines, and ethical issues were predicted in relation to measuring and reporting the activities of the control group. However, we could assume that our control group was representative of normal practices in Maltese state schools and was a valid baseline from which to differentiate the clear policy of one PA session per day.

Table 1. Table showing the selection of schools participating in this study.

	Large School	Medium School	Small School
Northern Area			SNC Rabat Primary School
Central Area		SGPC Pieta' Primary School	
Southern Area	STMC żejtun B Primary School		

The daily PA sessions undertaken by the treatment classes were approximately 40 to 45 min in duration, consisting of activities planned around the normal PE curriculum, and were delivered by sports coaches. This was intended to provide participants with a format of activity they were already fully accustomed to. These sessions were delivered daily for a whole scholastic year between October 2022 and May 2023. All sessions were delivered during school hours, and hence replaced time which would have otherwise been dedicated to academic subjects, but, in this case, they were used for PA sessions, which were often delivered in the school yard, unless the weather conditions dictated the use of indoor spaces.

2.2. Participants

We took advantage of the ongoing national research study involving the delivery of daily PA sessions in three different Year Four classrooms (children between eight to nine years of age) in each of the three participating Maltese state primary schools. Determined by the provision of 45 pedometers by the Maltese Health Promotion and Disease Prevention Directorate, a sample of n = 45 students was selected using the random number generator at www.random.org. The study, therefore, took the form of a direct group comparison quasi-experiment. To maintain empirical integrity, the final dataset containing no missing data points included only n = 18 complete cases; 11 were in the treatment group, and 7 were in the control group (Table 2).

Table 2. Sample distribution by condition and school.

Condition	Distributed Pedometers	Retained Pedometer Data			
		School 1	School 2	School 3	Total
Control	22	0	5	2	7
Treatment	23	3	7	1	11
Total	45	3	12	3	18

2.3. Data Collection

Many large-scale studies on PA levels in children have made use of wearable pedometers [13]. The device represents a simple and inexpensive tool for researchers interested in studying the effects of PA and allows for convenient comparisons across studies [14–16]. Over the past decade, there has been a shift to other types of trackers and wearable devices [3,7,8], although these still contribute comparable data in the form of steps. The units in question were U-Track 763 pedometers, with a total data storage capacity of up to 30 days. The units store a variety of data, including calorie expenditure, distance, and

active time; however, we took step count exclusively as the main dependent variable for the study to enable meaningful comparisons with the existing literature.

The pedometer units were tested by the lead researcher for a whole week prior to the start of the study and eventually distributed on a Friday for familiarisation by the participants. The actual collection of data began the following Monday. Intra-unit validity was measured to within less than a single percentile of discrepancy, indicating extremely high validity. Participants did not need to recharge the units or interact with them in any way. The data collection period covered a full five-day typical school week in March 2023, Monday to Friday, with no missing sessions or extraordinary activities (e.g., sports days, outings, etc.) taking place at any of the schools throughout the week. The daily PA sessions for the treatment group were retained accordingly, while control cases retained their usual routine, as explained earlier. The pedometers were worn first thing in the morning by all 45 participants in the six treatment and control classes over the entire week and taken off only at night. Additional instrumentation included a data collection logbook issued to each of the six teachers. The teachers were instructed to take two measurements from each participant in their class every day and record these in the logbook. One entry was made first thing in the morning upon the students' arrival in class and the other at the end of the school day immediately before their departure. Each reading involved logging the number of steps appearing on each of the units at that particular moment in time. These readings allowed us to ascertain the proportion of total daily steps completed exclusively during school hours and, hence, those steps completed before and after school hours.

The following week, anthropometric testing (specifically weight and height measurements) was conducted to ascertain each participant's body mass index (BMI). Finally, the participants were asked to self-report the frequency of sessions per week of any additional sports of formal/structured PA performed throughout the week after school hours.

Ethical clearance was obtained from both the Ministry of Education, Sports, Youths, Research and Innovation (MEYR) and the appropriate research ethics committee at the Malta College of Arts, Science and Technology (MCAST) in September 2022. Information and consent (and assent) forms were issued and subsequently collected from all participating parents and students.

2.4. Data Analysis

The multiple points of measurement by the teachers resulted in several missing readings. Furthermore, some participants were absent for at least one day throughout the week, resulting in more missing data. To maintain empirical integrity and base our analysis on complete, reliable, real-world (not imputed) data, the decision was taken to eliminate and delete all incomplete cases listwise. To achieve a final dataset containing no missing data points, attrition rates were high, and only n = 18 complete cases were retained; 11 were in the treatment group, and 7 were in the control group. Data fidelity was ultimately prioritised over statistical power in our attempts to maximise ecological validity. Table 3 shows how the participants were distributed across the treatment and control groups by gender.

Table 3. Sample distribution by condition and gender.

	Sex		
Condition	**Male**	**Female**	**Total**
Control	5	2	7
Treatment	5	6	11
Total	10	8	18

The data were collated directly from the pedometer units for total daily readings and from the two logbooks maintained by the teachers covering step counts at the start and end of each school day. The data were organised in a spreadsheet and cleaned, and all cases containing missing data were deleted listwise. The final remaining dataset with

18 complete cases was imported into JASP (v0.17.2), an open-source statistical analysis software. To address the main questions driving the study, the five testable hypotheses were formulated to direct the analysis.

Assumptions about the distribution of data across all main variables were tested to select appropriate statistical procedures for testing the null hypothesis of no effect in each instance. According to the Shapiro–Wilk test H_1 and H_2, steps performed at school as well as overall were normally distributed in both treatment and control conditions. Levene's test also revealed a satisfactory homogeneity of variances for steps at school ($F = 0.52$, $p = 0.48$) as well as overall ($F = 1.21$, $p = 0.29$). With these assumptions met, Student's t-test was selected to test the null of equal group means in the case of both H_1 and H_2. For H_4, frequency data for additional sport/PA performed throughout the week were not normally distributed ($SW = 0.83$, $p < 0.01$), so we tested the null hypotheses of no association in the case of H_3 and H_4 using Spearman's rank correlation coefficient. And finally, since neither steps performed outside school overall ($SW = 0.89$, $p = 0.04$) nor BMI scores ($SW = 0.84$, $p < 0.01$) were normally distributed, Spearman's correlation coefficient was again used in the case of H_5.

3. Results and Discussion

3.1. Descriptives

No significant discrepancies emerged in the distribution of data by condition and gender ($\chi^2 = 1.169$, $df = 1$, $p = 0.28$). Likewise, Tables 2 and 4 show that those participants who either did or did not do additional PA or sport beyond school hours (Table 4) did not significantly disrupt or affect the distribution across treatment and control groups ($\chi^2 = 1.169$, $df = 1$, $p = 0.28$). Participant distribution across treatment and control was also not affected by school affiliation ($\chi^2 = 2.922$, $df = 2$, $p = 0.23$).

Table 4. Sample distribution by condition and participation in additional sport or PA.

	Additional Sport		
Condition	**No**	**Yes**	**Total**
Control	2	5	7
Treatment	6	5	11
Total	8	10	18

The frequency of additional sport/PA sessions carried out during the week is shown in Table 5. The inclusion of BMI added an additional element of control to the study. Table 6 displays how the measure was differentiated across the treatment and control groups. The overlapping confidence intervals clearly indicate homogeneity in this respect across the two groups, reducing the risk of extra confounding effects.

Table 5. Sample distribution by condition and weekly frequency of additional sport or PA.

	Additional Sport Sessions per Week				
Condition	**0**	**1**	**2**	**3**	**4**
Control	2	1	3	1	0
Treatment	6	1	2	1	1
Total	8	2	5	2	1

Table 6. BMI by condition.

	BMI						
	n	**M**	**95% CI**	**SD**	**Shapiro–Wilk**	**Min**	**Max**
Control	7	17.284	14.13, 20.439	4.258	0.81 ($p = 0.06$)	13.831	25.845
Treatment	11	19.655	16.175, 23.136	5.89	0.85 ($p < 0.05$)	13.693	33.304

3.2. Number of Steps

The participants took, on average, 12,034 steps per day. Total steps reported elsewhere in the international literature approximately range anywhere from 10,000 to 16,000 [13], 10,906 to 12,259 [15], or 9377 to 10,738 [8]. The steps observed in this study (Table 6) suggest that, in terms of their overall pedometer-measured PA, children in Malta are generally at par with those in other countries.

It could be argued that participants in both the treatment and control groups demonstrated the attainment of over 10,000 steps. Within the framework specified by Naseer [17], all students participating in the study conducted in Malta could be classified as physically active. This assertion aligns with criteria established in international literature, which categorises students aged 13–16 as inactive if they achieve fewer than 10,000 daily steps and as physically active if they surpass this threshold on all days of the week. While the 10,000 steps/day was recognised as a cut-off point [18], on the basis of the data presented in the literature, Gomersall et al. [19] indicated that we could expect boys (typically between 6–11 years) to average 12,000 to 16,000 daily steps and girls to average 10,000 to 13,000 daily steps. There is scant evidence that maintaining total daily physical activity within the range of 10,000 to 14,000 steps is correlated with engaging in 60 to 100 min of moderate to vigorous physical activity [20].

With an average of 5215 steps taken exclusively during school hours, the percentage of total steps taken at school was 43%. In their systematic review of 31 pedometer-based studies worldwide, out of a total of 12k to 16k steps per weekday for boys, and 10k to 14k for girls, Tudor-Locke et al. [13] reported that 42–48% of total steps occurred at school in the case of boys and 41–47% for girls. The 4239 steps taken by those in the control group and 5836 by those in the treatment group represent 35% and 48% of total average daily steps, respectively. This suggests that, with a daily PA programme in place, Maltese state primary schools, at least in the case of Year Four classes, fall on the low side of international conventions (41 to 48%). In the context of the relevant literature, Malta's closest neighbour, Cyprus, reported 41 to 44% among children aged 10 to 12. Therefore, introducing a daily PA programme in schools pulls Maltese schools up to the high end of Tudor-Locke et al.'s proportion range in terms of contribution to overall daily PA. Relative to other countries, with daily PA sessions in place, Maltese schools have the potential to attain world-leading capacity in terms of PA provision.

While, as shown in Table 7, there was a difference between girls (M = 10,794) and boys (M = 13,026) in absolute terms, as reported elsewhere [8,14,17], the difference (−2232) was not statistically significant (t = 47, df = 16, p = 0.89). It cannot be claimed with confidence, therefore, that PA differs systematically between girls and boys attending primary state schools in Malta.

Table 7. All the descriptive statistics.

		n	M	95% CI	SD	Shapiro–Wilk	Min	Max
Average Daily Steps	All	18	12,033.86	10,310.94, 13,756.77	3729.51	0.92 (p = 0.13)	6314	21,485
	Girls	8	10,793.85	9136.56, 12.451.14	2391.64	0.91 (p = 0.33)	8256	15,673
	Boys	10	13,025.86	10,298.48, 15,753.24	4400.46	0.95 (p = 0.61)	6315	21,485
	Control	7	13,126.57	9836.89, 16,416.25	4440.74	0.87 (p = 0.19)	8559	21,485
	Treatment	11	11,338.49	9428.52, 13,428.46	3232.02	0.96 (p = 0.71)	6315	17,803
Average School Steps	All	18	5214.87	4427.40, 6002.34	1704.60	0.97 (p = 0.81)	2466	8498
	Girls	8	4768.03	3565.43, 5970.62	1735.47	0.96 (p = 0.81)	2466	7621
	Boys	10	5572.34	4530.34, 6614.34	1681.21	0.94 (p = 0.57)	3508	8498
	Control	7	4238.77	2870.58, 5606.96	1846.92	0.87 (p = 0.19)	2466	7883
	Treatment	11	5836.02	5042.82, 6629.22	1342.25	0.94 (p = 0.52)	4044	8498

Table 7. *Cont.*

		n	M	95% CI	SD	Shapiro–Wilk	Min	Max
Average Other Steps	All	18	6818.99	5225.04, 8412.94	3450.34	0.89 (p = 0.04)	1560	17,170
	Girls	8	6025.83	4447.00, 7603.65	2276.97	0.90 (p = 0.31)	2179	8351
	Boys	10	7453.52	4864.59, 10,042.45	4177.08	0.89 (p = 0.17)	1560	17,170
	Control	7	8887.80	6004.07, 11,771.53	3892.74	0.75 (p = 0.01)	5795	17,170
	Treatment	11	5502.47	4025.84, 6979.11	2498.74	0.96 (p = 0.72)	1560	9305

3.3. Effects of School Intervention on the Step Count

H_1 posited that mean steps performed during school hours varied across the treatment and control groups. This hypothesis sought to test whether school days with or without structured daily PA sessions resulted in significant differences in overall pedometer-measured activity. There was a mean difference of 1597 steps per day between the treatment (M = 5836) and control (M = 4239) groups, which was statistically significant (p = 0.03) (Table 7). Figure 1 provides a visual illustration of this difference.

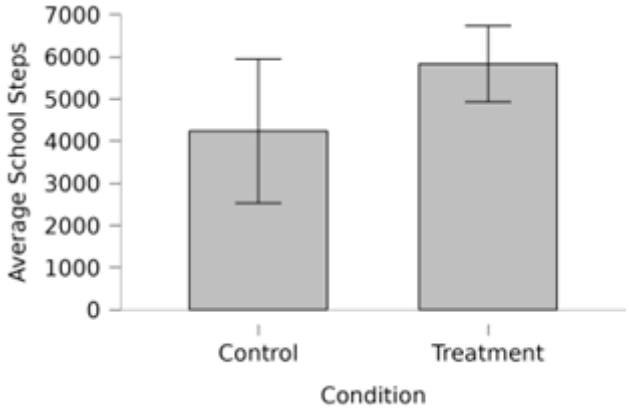

Figure 1. The difference in average steps at school between treatment and control groups.

Our findings support those of Varela Garrote et al. [8], in that school days with structured PA sessions systematically differ from those without. However, our results differ regarding whether such a difference holds in the context of overall steps performed throughout the day. H_2 posited that the mean total daily steps varied across the treatment and control groups. In order to make the evidence-based claim that a school-based PA intervention exerts a significant effect on overall PA, it would be necessary to reject the null hypothesis of no difference between the treatment and control groups in terms of overall daily steps. However, the evidence was insufficient to reject this null hypothesis (p = 0.83) (Table 7). Although statistically insignificant, the descriptives actually reveal more steps in the control group (M = 13,127) than in the treatment group (M = 11,338). Bars and confidence bands are shown in Figure 2.

The results suggest that, while PA sessions at school significantly increase steps taken during school hours, such an effect becomes dissipated when considering overall variations in steps that take place throughout the day. In other words, the results suggest that total variations in PA occurring naturally among children in Malta are sufficient to mask any significant, systemic effect of structured PA carried out at school. At this stage, our results diverge from Varela Garrote et al. [8], who reported that, on weekdays, Spanish 10-year-olds took a significantly different amount of total daily steps on days with (10,738) and without (9377) PE lessons. Given the relatively low number of steps taken overall by children in the Varela Garrote et al. study, it is likely that the steps associated with a normal structured PE session at school were equivalent to a higher proportion of total steps and, therefore, a stronger effect size. In other words, the more steps children take overall, the less significant the contribution of a single PE/PA lesson at school is likely to be.

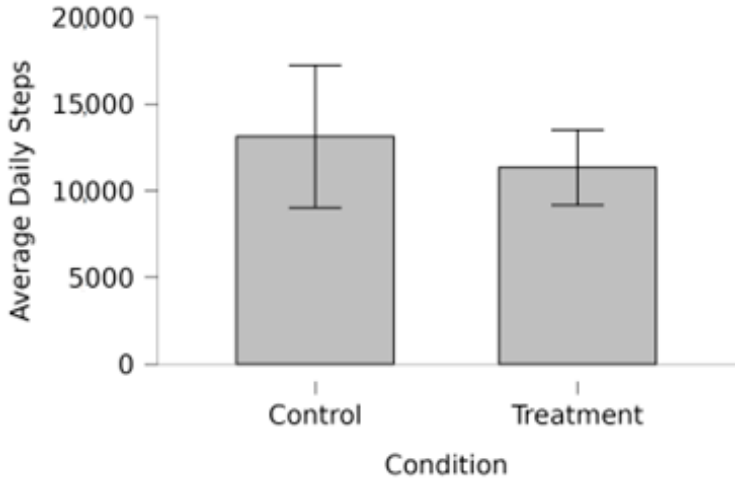

Figure 2. The difference in average daily steps between treatment and control groups.

H_3 posited that mean steps beyond school hours are associated with the weekly frequency of structured sports or PA sessions performed outside of school (Figure 3). This hypothesis looked to ascertain if the number of daily steps taken, on average, corresponds to how active children are in terms of their participation in structured sports or PA outside of school. The evidence was not sufficient to reject the null hypothesis of no association (r_s = 0.43, p = 0.07). In other words, the evidence does not support the idea that structured sports/PA among children in Malta has any significant and systemic impact on the amount of PA children engage in after school hours. Additional research has posited a link between socioeconomic status and participation in sports among children in Malta [21]; therefore, future studies might investigate whether the effect of sports participation on PA among the entire population is confounded by restricted access to sports participation among those children raised in low socioeconomic conditions.

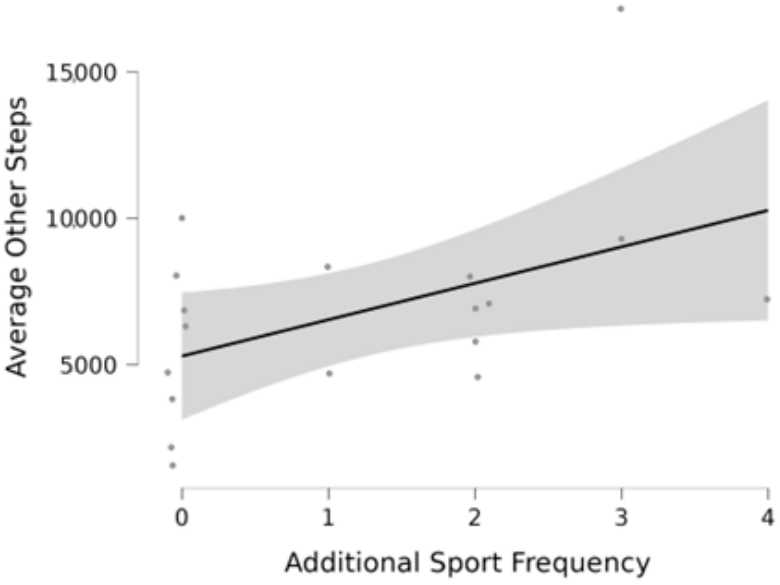

Figure 3. Scatter plot for additional sport/PA frequency and average steps outside school, with confidence band.

H_4 further posited that mean total steps are associated with the weekly frequency of extra sport sessions (Figure 4). Given that the frequency of structured sport/PA participation outside of school was not sufficient to predict overall activity outside of school hours, it was not surprising that no significant effect was observed on overall daily steps (r_s = 0.40, p = 0.10). As was the case for school-based PA, the effects of participation in structured

sports/PA outside of school tended to become washed out by the natural variations in overall step counts in the broader sense.

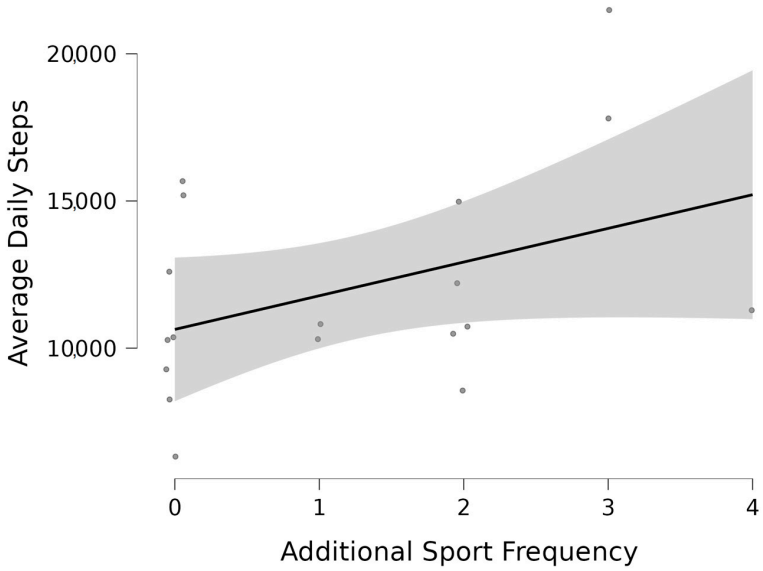

Figure 4. Scatter plot for additional sport/PA frequency and daily steps outside school, with confidence band.

Finally, H_5 posited that mean steps beyond school hours are associated with BMI. The aim here was to ascertain if activity levels beyond the structured routine of the school environment are related to body composition. More specifically, rejection of the null hypothesis of no association would suggest that body weight influences how much activity children perform in the home environment, in which parents and children likely have a stronger influence on behaviour than school administrators. The evidence, however, was insufficient to reject the null hypothesis ($r_s = 0.15$, $p = 0.55$), suggesting that body mass is unrelated to optional, structured sports and PA participation outside of school (Figure 5). In other words, it is unlikely that a high BMI is a result of home-based inactivity or vice versa (a high BMI does not likely influence home-based inactivity). Similarly, one can argue that a low BMI does not predispose a child to participate in more sports or PA outside school, and sports participation outside school likewise does not cause low BMI.

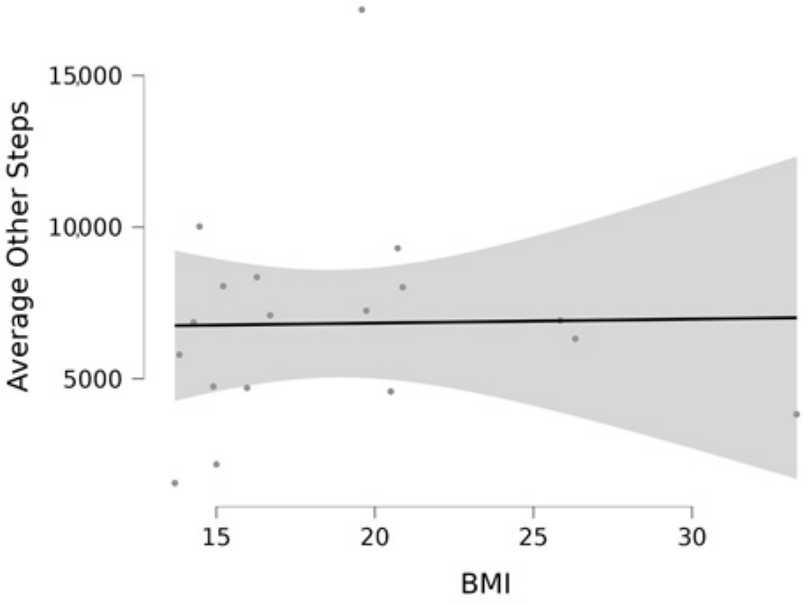

Figure 5. Scatter plot for BMI and daily steps outside school, with confidence band.

Table 8 summarises the results of the hypotheses tests performed. Finally, a model is presented (numerically in Table 9 and visually in Figure 6 below), explaining average daily steps as a function of treatment (participating in a daily school-based PA intervention), extra sport after school, and BMI. Standardised regression coefficient estimates and associated p values showed no significant effects of the relevant factors on the outcome of average steps overall.

Table 8. All hypothesis test results.

Hypothesis	Variables	Statistic	Significance
RH_1	Mean steps ← Condition	$t = -2.13$, $d = 1.03$	$p = 0.03$ *
RH_2	Total steps ← Condition	$t = 0.99$	$p = 0.83$
RH_3	Other steps ← Extra sport/PA	$r_s = 0.43$	$p = 0.07$
RH_4	Total steps ← Extra sport/PA	$r_s = 0.40$	$p = 0.10$
RH_5	Other steps ← BMI	$r_s = 0.15$	$p = 0.15$

* Indicates significance at the 95% confidence level.

Table 9. Full model terms for all exogenous variables with total steps as the main endogenous variable.

Predictor	Estimate	SE	z	p	95% Confidence Interval Lower	95% Confidence Interval Upper	Standardised All
Condition	−0.279	0.436	−0.639	0.52	−1.134	0.576	−0.140
Additional Sport/PA Frequency	0.276	0.159	1.739	0.08	−0.035	0.588	0.362
BMI	0.007	0.040	0.181	0.86	−0.071	0.085	0.038
Sex	−0.479	0.413	−1.162	0.24	−1.288	0.329	−0.245

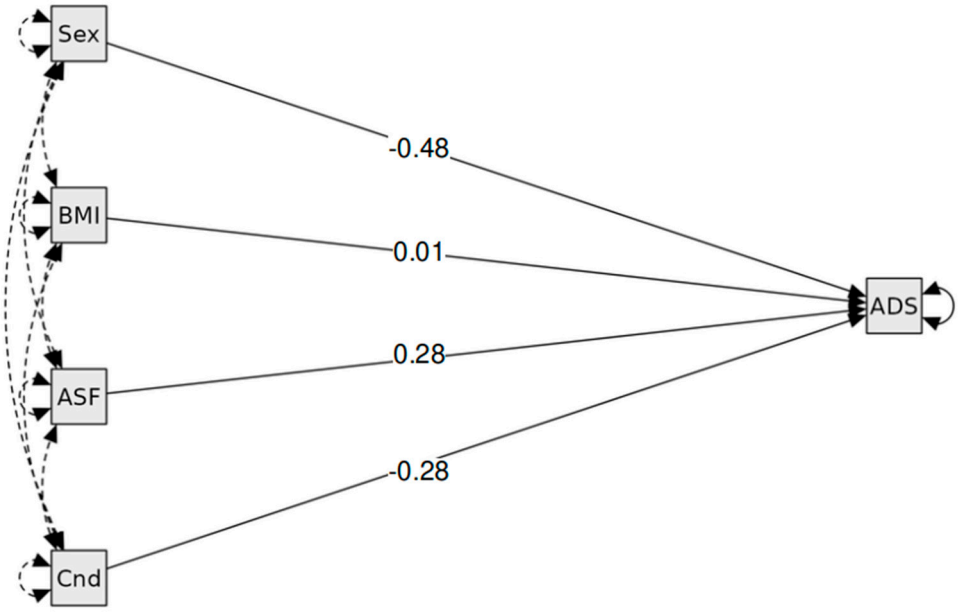

Figure 6. Path diagram for full model where ADS is average daily steps, ASF is additional sport frequency, and Cnd is condition.

The model accounted for only a quarter of the variation in mean daily steps ($R^2 = 0.26$), with none of the factors included representing significant predictors. In other words, the treatment did not have an effect on total average daily steps, controlling for BMI regardless of additional sports participation. The model also shows that, when controlling for additional sports participation and doing daily PA in school, BMI is not associated with total steps performed daily, on average.

4. Conclusions

Missing data was a major limitation, resulting in the listwise deletion of 60% of the original cases due to absenteeism and students not being present in class at least momentarily when partial step count readings were taken. Therefore, the relatively small sample size should be kept in mind when interpreting any generalised claims about the broader population of Year Four students in Maltese state schools. Nevertheless, the results show the participants compared favourably with other countries, and while, similarly to international research [20], a trend towards higher PA in boys was noted, its significance should be accepted with caution. Also, the main dependent variable for this study was the number of steps performed by participants. It should be noted that other forms of PA exist that do not necessarily result in steps measurable by a pedometer. Therefore, broader claims about PA based on step counts should be treated with caution. Nevertheless, based on our findings, we posit a number of key concluding insights.

First, relative to primary schools in other countries, a daily PA programme appears to make the difference between Maltese schools being either under par [13] or among the high-performing nations in terms of the proportional contribution of steps taken at school to children's total PA. Second, while a daily PA programme in schools makes a significant difference in terms of steps taken throughout the school day, its effects are obscured by the greater degree of variation in PA among children across the overall average daily accumulation of PA. Third, structured sport/PA participation after school similarly appears to exert only a limited effect on total activity. Finally, a statistical model incorporating sex, daily PA, sports participation, and BMI as exogenous variables accounted only for around a quarter of the variation in average daily pedometer-measured PA, leaving approximately 75% of the variation unexplained. This suggests much is left to do to understand how children accumulate their total daily step-based PA.

As a follow-up to this study, continued access to the same participants would enable the collection of more fine-grained data pertaining to additional modes of activity contributing to global step counts. Insight into the level of PA during the weekends—hence, a minimum of seven days of data collection [20]—would provide a more comprehensive understanding of children's PA and the contribution of school programmes towards that. Interviews with parents would similarly facilitate far richer insights into how their children achieved and enacted their PA. Future studies might investigate informal activity in more detail, with less dependence on the concept of PA delivery strictly through structured sessions. Observation studies in conjunction with pedometry could lead to interesting discoveries about where children conduct the majority of their PA. We can report, anecdotally, that, when asking children about their participation in sports and PA beyond school hours, several children provided in-depth descriptions of unstructured PA they performed informally, not with a nursery, club, or any other service provider. It was interesting to note that our insistence on structured as opposed to unstructured PA rested on a distinction they did not always recognise. Perhaps less distinction between structured and unstructured modes of PA is precisely what is called for in our attempts to promote and bolster PA across the board. Furthermore, it is imperative to highlight the important understanding that school PA programmes are not a 'pill' to a better level of PA. They need to be considered a contributory part of an active lifestyle, and hence, while PA programmes in school are important, in no way can they be seen as absolute solutions. This highlights the importance of families and life outside school hours, and hence the importance of a more holistic–ecological philosophy of a healthy and active society.

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Data Availability Statement: Data collected from the studied intervention programme was analysed for this paper. Data source is shared on https://osf.io/p3naj/?view_only=b24ac98ea11c43bdb3005d7bb54ee99a (accessed on 1 November 2023).

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