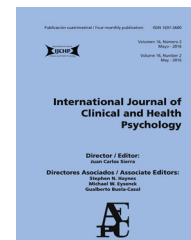




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## Can a before-school physical activity program decrease bullying victimization in disadvantaged children? The Active-Start Study

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### KEYWORDS

School health;  
Physical exercise;  
Traditional bullying;  
Student behaviour;  
Experimental study

### Abstract

**Background/Objective:** To test the effectiveness of an 8-week before-school physical activity program to reduce bullying victimization among a group of socially disadvantaged children in the Active-Start study.

**Method:** A non-blinded randomized controlled trial was conducted in three public schools classified as highly vulnerable and located in a deprived area of Santiago (Chile). A total of 5 classes participated, totaling 170 fourth grade children. The intervention was delivered before starting the first school-class (8:00–8:30 a.m.). The program lasted for 8 weeks. Primary outcome measurement on bullying victimization was assessed by the CUBE questionnaire at baseline and post-intervention.

**Results:** There was a statistically significant reduction in the probability of suffering physical bullying (OR= 0.18, 95% CI, 0.04-0.82;  $p= .027$ ) and verbal bullying (OR=0.13, 95% CI, 0.02-0.97;  $p= .046$ ) after the 8-week program.

**Conclusions:** Participation in an 8-week before-school physical activity intervention implemented in schools located in a disadvantaged district in Santiago (Chile) resulted in lower levels of bullying victimization among study participants. The Active-Start program may be a feasible and potentially scalable intervention option to improve the climate and pro-sociality environment at schools.

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**PALABRAS CLAVE**

Salud escolar;  
ejercicio físico;  
bullying tradicional;  
conducta del  
estudiante;  
estudio experimental

**¿Puede un programa de actividad física antes de la escuela disminuir la victimización por bullying en niños desfavorecidos? Estudio Active-Start**

**Resumen**

*Antecedentes/Objetivo:* Evaluar la efectividad de un programa de actividad física antes de la escuela de ocho semanas para reducir el *bullying* en niños en desventaja social del estudio *Active-Start*.

*Método:* Se realizó un ensayo controlado aleatorio no ciego en tres escuelas públicas vulnerables y ubicadas en Santiago (Chile), con un total de cinco clases e incluyendo 170 niños de Cuarto Grado. La intervención de ocho semanas se realizó cinco veces por semana antes de comenzar la primera clase (8:00–8:30 a.m.). La medida de resultado primaria fue la victimización por *bullying* evaluado a través del cuestionario CUBE al inicio y después de la intervención.

*Resultados:* Hubo una reducción estadísticamente significativa en la probabilidad de sufrir *bullying* físico (OR= 0,18, IC 95%, 0,04-0,82;  $p= 0,027$ ) y verbal (OR= 0,13, IC 95%, 0,02-0,97;  $p= 0,046$ ) después del programa de ocho semanas.

*Conclusiones:* La participación en una intervención de actividad física antes de la escuela de ocho semanas implementada en escuelas ubicadas en una comuna desfavorecida en Santiago (Chile) dio lugar a niveles más bajos de victimización por *bullying* entre sus participantes. El programa *Active-Start* puede ser una opción de intervención viable y potencialmente escalable para mejorar el clima y el ambiente escolar.

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Despite public health concerns and the extensively documented health benefits of physical activity (PA), a large proportion of Chilean children do not meet the PA recommendations (Aguilar-Farias et al., 2018). Since most children spend a majority of their waking hours at school, this environment is appropriate for the implementation of preventive interventions, particularly those that include activities promoting PA (Naylor & McKay, 2009). With the absence of opportunities for PA during the school day, before-school programs have become a popular option to help children increase their PA levels (Stylianou, van der Mars et al., 2016). Although several recent studies support a positive effect of before school-based PA on health (Westcott, Puhala, Colligan, Loud, & Cobbett, 2015) and children's classroom behavior (Stylianou, Kulinna et al., 2016), less literature has evaluated the social-behavioral outcomes of these programs (Whooten, Perkins, Gerber, & Taveras, 2018).

Bullying has been recognized as an important and pervasive problem among children internationally (Juvonen & Graham, 2014). Bullying victimization is present in different settings, including the home, workplace, community settings, through the use of electronic devices (i.e., instant messaging, websites, chat room) (Sánchez, Muñoz-Fernández, & Vega-Gea, 2017), and mainly in schools (Jiménez & Estévez, 2017; Kupferman-Meik, Burris-Warmoth, Rapaport, Roychoudhury, & Javier, 2013). Recent literature continues to confirm that many bullying victims experience serious mental and physical health problems (Van Geel et al., 2014). Some of the recognized risk factors that contribute to bullying victimization are: being seen as different or weak (e.g., being obese or disabled), being depressed, anxious, having low self-esteem or not socializing. However, much less attention has been given to

the relationship between health-promoting behaviors such as PA with bullying. At present, only few cross-sectional studies have explicitly examined PA as a risk factor of bullying victimization, and findings from these studies have been mixed (Demissie, Lowry, Eaton, Hertz, & Lee, 2014; Hertz, Everett Jones, Barrios, David-Ferdon, & Holt, 2015; Peltzer & Pengpid, 2016; Roman & Taylor, 2013; Rudatskira et al., 2014). It is also important to note that the majority of previous studies were conducted in high-income countries and less is known about these relationships in low and middle-income nations. Other studies from high-income countries such as in USA (Demissie et al., 2014; Merrill & Hanson, 2016; Roman & Taylor, 2013) have found that accumulating the recommended level of PA was associated with lower odds of being bullied. Henriksen, Rayce, Melkevik, Due, and Holstein (2016) reported that self-reported physical inactivity is related with higher odds ratio for exposure to bullying victimization among Danish adolescents. However, according to these authors and others the prevalence of bullying victimization is higher in more disadvantaged areas and among lower social classes (Elgar, Craig, Boyce, Morgan, & Vella-Zarb, 2009).

Despite this evidence and the potential of PA related to bullying victimization, the effects of a before-school PA program on bullying victimization remains unknown. As far as we know, the present randomized controlled trial is the first study to test the effect of a PA program to reduce bullying victimization. In this regard, a previous study using play-based structured recess environment provided positive reductions in bullying victimization and improvements on school climate environment (Bleeker et al., 2012). On the basis of the cumulative results of the above-mentioned studies, it is reasonable to expect that providing high-quality PA opportunities could reduce bullying victimization.

We hypothesized that participating in an 8-week before-school PA program, based on recreational and cooperatives activities, will result on self-reported bullying victimization reduction among vulnerable Chilean children. Therefore, the aim of the study was to test the effectiveness of an 8-week before-school physical activity program to reduce bullying victimization among a group of socially disadvantaged children.

## Method

### Participants

The Active-Start study was a non-blinded randomized controlled trial (NCT03893149), conducted with children from three public schools classified as high vulnerable and located in a deprived area of Santiago (Chile). All students in fourth grade (aged 8–10 years) within participating schools were eligible for participation. A total of 198 children from the 5 classes participating in the study were invited to take part in the Active-Start program. Out of the 198 children, only 170 (85.8%) agreed to the informed consent and were included in the study. From these, 146 had valid data for all measurements (baseline and at the end of the intervention) and were included in the analysis (intervention group,  $n=88$ , 41.2% girls,  $mean=10.12\pm0.79$  years; and control group,  $n=58$ , 50.9% girls,  $mean=9.97\pm0.51$  years). Exclusion criteria included (1) children with some physical pathology or medical contraindication to perform physical exercise or (2) diagnosed with learning disabilities or mental disorders. Both the intervention and control group continued to receive their standard physical education lessons (2 h/week).

### Procedure

Out of the 21 schools that were potentially available for participation in the study, four schools showed interest and were further informed about the study. Although the rest of the schools showed interest, time constraints or other logistic issues precluded them from participating in the study. Finally, only three schools accepted to participate in the program. There were five fourth-grade classes in total. Three of them were allocated to the intervention group and the two remaining were allocated to the control group. These groups were randomly selected on the basis of a computer-generated random number list. The randomization and intervention occurred at class level because of feasibility reasons.

The study protocol was approved by the University of Santiago Ethics Committee (Code number: 938) and conformed to the principles of the Declaration of Helsinki. Parents were asked to give their written informed consent before children enrolment in the study. The parents or children could revoke this consent and withdraw from the study at any stage.

### Intervention

The Active-Start intervention. Students participated in the Active-Start program during the spring semester of 2018.

The intervention was delivered 5 times per week before starting the first school-class (8:00–8:30 a.m.). The program lasted for 8 weeks. Each session was previously planned and described in a manual dedicated to the study. These sessions were designed by the research team and delivered by a graduate in Sport Sciences who was not directly involved in the research study and was previously trained on how to deliver the intervention so that it was standardized across the classes allocated to the intervention group. The intervention program included sports games adapted to the age of the participants, playground games, dance and other recreational and cooperatives activities. The intensity of the main part of the sessions was moderate-to-vigorous according to a previous study (García-Prieto et al., 2017) and this intensity was confirmed by accelerometry. Also, different activities favoring social interactions were performed to facilitate the interactions between the participants at the end of the sessions (cold-down). Each class allocated to the intervention group was exposed to approximately 39 Active-Start sessions.

### Instruments and measures

Recruitment occurred in August 2018, with baseline and follow-up measures collected in September and December 2018, respectively. Trained researchers measured the variables and outcomes of the study under standardized conditions. All data were collected at the same time in the morning, between 8:00 a.m. and 11:00 a.m.

**Bullying victimization.** To assess bullying victimization, this study used a scale extracted from the Single School Well-being Questionnaire-CUBE (in Spanish, Cuestionario Único de Bienestar Escolar—CUBE) (Ministerio de Educación del Perú—MINEDU, 2013). This scale has 10 items that explore the reason for experiencing bullying, however we excluded the cyberbullying questions (two items) due to the age of the children. Children were asked how often they had been bullied at school in the past seven days for a variety of bullying types including physical bullying; verbal bullying; and social exclusion bullying. Each bullying type was assessed using a 4-point Likert scale: *none*, *only once*, *twice to 4 times*, and *5 or more times*. We used the cut-off point of “twice to 4 times” or more to code a student as bullied in each particular category of bullying. The scale presents a Cronbach’s alpha of .81.

**Weight status.** Body weight was measured to the nearest 0.1 kg using a portable electronic scale (Seca 769, Hamburg, Germany), and height was measured to the nearest 0.1 cm using a portable stadiometer (Seca 220, Hamburg, Germany). Weight status was classified using the International Obesity Task Force age-specific and sex-specific thresholds (Cole, Bellizzi, Flegal, & Dietz, 2000).

**Biological maturation.** Peak height velocity (PHV) is a common indicator of maturity in children and adolescents (Malina, Rogol, Cumming, Coelho e Silva, & Figueiredo, 2015). Anthropometric variables (weight, height and seated height) were used to obtain PHV according to Moore’s equations (Moore et al., 2015). Years from PHV were calculated by subtracting the age of PHV from the chronological age.

The difference in years was defined as a value of maturity offset.

Physical activity. Moderate-to-vigorous PA (MVPA) was assessed using a GENEActiv (ActivInsights Ltd, Kimbolton, UK) tri-axial accelerometer previous to the program intervention. The GENEActiv was attached to a polyurethane strap, and worn at the wrist, like a watch. Data were collected at a rate of 85.7 Hz. Children were informed about the monitor placement and were asked to wear the monitors on their non-dominant wrist, continuously for a period of seven days (two weekend days) (Schaefer, Nigg, Hill, Brink, & Browning, 2014). Non-wear time was assessed over 60 minutes windows, using moving increments of 15 minutes. Data were downloaded using GENEActiv software version 1.4 and analyzed using the GGIR software package for R (cran.r-project.org). Children who achieved on average of  $\geq 60$  minutes of MVPA per day were categorized as active.

### Data analysis

Conventional summary statistics were used to describe participants in the study on key variables and demographics characteristics. First, we tested associations between bullying victimization, age, sex, weight status, PHV and MVPA at baseline by computing zero-order correlations using Pearson correlations. Intervention effects were estimated using logistic regression models and are presented as odds ratios (OR) with 95% CIs, with adjustment for baseline bullying victimization and MVPA, and with age, sex, weight status, PHV, and school as covariates. Data analyses were performed using the Statistical Package for Social Sciences (Version 23.0) software. Statistical significance was set at  $p < .05$ .

### Results

The descriptive baseline characteristics of the study sample are reported in Table 1. The compliance with the intervention program was 83.5%. No statistically significant

**Table 1** Characteristics of the study sample.

	Intervention group <i>n</i> = 88	Control group <i>n</i> = 58
Age (years)	10.12 ± 0.79	9.97 ± 0.51
Girls (%)	41.2	50.9
Foreign (%)	36.4	39.3
Body mass index (kg/m <sup>2</sup> )	20.44 ± 3.37	20.98 ± 4.98
Overweight/Obese (%)	49.0	52.7
Peak height velocity	-2.10 ± 1.26	-2.18 ± 1.43
Moderate-to-vigorous physical activity (min/day)	74.02 ± 33.12	75.77 ± 26.29
Active* (%)	58.5	61.2

Note. Results are shown as mean ± SD. \*  $\geq 60$  minutes of moderate-to-vigorous physical activity per day of average.

**Table 2** Correlations between physical, verbal, social exclusion bullying, age, sex, peak height velocity, weight status and MVPA at baseline.

	Physical	Verbal	Social exclusion
Physical	-		
Verbal	.56**	-	
Social exclusion	.44**		-
Age	.00	.04	.00
Sex	-.21*	-.10	.05
Peak height velocity	-.21*	-.11*	.12
Weight status	.15*	.11*	.10
MVPA	-.23	-.10	-.10

Note. \*  $p < .05$ ; \*\*  $p < .001$ .

differences were found between the intervention and control group for any baseline characteristic.

As presented in Table 2, there were positive zero-order correlations between physical and verbal bullying with weight status. Also, there were negative correlations between physical and verbal bullying with PHV, and sex only in physical bullying.

Table 3 shows the intervention effects on bullying victimization categories. There was a statistically significant reduction in the probability of suffering physical bullying (OR= 0.18, 95% CI, 0.04 to 0.82;  $p = .027$ ) and verbal bullying (OR=0.13, 95% CI, 0.02 to 0.97;  $p = .046$ ) after the 8-week program.

### Discussion

An 8-week before-school PA program resulted in physical and verbal bullying victimization reductions among children participating in the Active-Start trial. Additionally, teachers' feedback indicated that violent behavior among children was reduced during the program, which can be considered as additional benefits of the program. The present study, due to its design, setting, and population, may be replicated in other elementary schools with limited budget, which can positively impact on students' behavior.

Engaging in 60 minutes or more per day of MVPA is commonly recommended for better health and quality of life among children and adolescents (Piercy et al., 2018). Previous cross-sectional studies reveal that not meeting these PA guidelines lead to a significant risk effect for bullying victimization among children and adolescents (Demissie et al., 2014; Henriksen et al., 2016). As far as we know, few studies have analyzed the protection role of structured PA on bullying victimization. For example, Garnett et al. (2017) found that students reporting lesser amounts of bullying victimization had, on average, ran/walked more miles compared to their peers who reported greater odds of bullying victimization. Similarly, an US national school-based program, the Playworks study, which introduces social emotional learning activities into play-based structured recess environment, had documented positive reductions in bullying victimization and improvements on school climate environment (Bleeker et al., 2012). In this regard, recently another three days per week before-school PA program resulted on



**Table 3** Changes in bullying prevalence from baseline to 8 week' follow-up among intervention versus control children.

	Baseline		After intervention		Effect estimate		
	Intervention group	Control group	Intervention group	Control group	Adjusted analysis		
	%	%	%	%	OR	95% CI	p
Physical	30.9	28.8	6.8	27.6	0.18	0.04 to 0.82	.027
Verbal	29.3	24.5	5.7	19.0	0.13	0.02 to 0.97	.046
Social exclusion	17.2	11.5	11.2	8.6	0.74	0.08 to 6.66	.785

improvements of children well-being and peer relationship outcomes (Whooten et al., 2018).

The structure PA programs during school appear to develop social skills and strategies such as sharing, problem solving and conflict resolution (Pellegrini, Huberty, & Jones, 1995), potentially fostering a good school climate and reducing bullying victimization. Peers in general also play a key role in bullying victimization. Fitzgerald, Fitzgerald, and Aherne (2012) reported that PA has shown to be related with peer norms, friendship quality, acceptance, and peer crowd affiliation. Therefore, these aspects could influence the children who are witnessing the bullying situation to support the victim. As suggested by Søndergaard (2012), exposure to bullying is not only an individual problem, but also reflects the social climate in the school.

Our physical activities were not limited to improve fitness or skills, but also knowledge, following rules, fair play, respect, tactics, body and social awareness, personal interaction linked to social effort, conflict resolution skills and cooperative (team) gaming, which may partially explain bullying victimization reductions among children in the intervention arm of the study. Our findings indicate the importance to ensure that all children receive positive PA in the school environment (Gråstén & Yli-Piipari, 2019). Additionally, improving of motor skills (Barnett, Van Beurden, Morgan, Brooks, & Beard, 2009), physical fitness (García-Hermoso, Oriol-Granado, Correa-Bautista, & Ramírez-Vélez, 2019), and self-confidence to engage in PA during the school day (e. g., during the recess) among children in the intervention group can also influence the observed results.

Our study has several limitations. First, recruitment of schools was limited (i.e., 3 out of 18 schools volunteered to be part of this study) and therefore sample size may limit our ability to reject the null hypothesis. Second, the present study took place in disadvantaged communities and with fourth grade children, and therefore results are not generalizable to other subgroups of populations. However, the relatively low cost and simplicity of the Active-Start intervention may allow for an easy adaptation and implementation of the program in other schools environments.

## Conclusions

Participation in an 8-week before-school PA intervention implemented in schools located in a disadvantaged district in Santiago (Chile) resulted in lower levels of bullying victimization among study participants. The Active-Start program

may be a feasible and potentially scalable intervention option to improve the climate and pro-sociality environment at schools.

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