

Children with disabilities are left behind where schools promote physical activity: intervention-generated inequalities in a national survey of Chilean children and adolescents

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Abstract

Background

Public health interventions can widen inequalities when their benefits accrue mainly to groups already advantaged. Whether school-based physical activity promotion reaches children with disabilities as it reaches their peers has not been examined with population data.

Objective

To test whether the disability gap in physical activity and organized sport differs according to the physical activity promotion measures implemented in the school.

Methods

Cross-sectional analysis of 4,032 schoolchildren aged 5 to 17 years from the 2024 Chilean National Survey of Physical Activity and Sport. Weighted Poisson models with robust variance estimated prevalence ratios (PR) for disability within schools with and without promotion measures, and ratios of prevalence ratios (RPR) for their interaction, adjusted for sex, age group, socioeconomic level and area.

Results

Children with disabilities more often attended schools with promotion measures (40.3% vs 29.5%; PR 1.37, 95%CI 1.22–1.53). In schools without measures there was no disability gap in organized sport (PR 0.98, 0.89–1.07), inactivity (PR 0.90, 0.81–1.01) or sedentary time (PR 0.91, 0.71–1.17). In schools with measures, children with disabilities had lower organized sport participation (PR 0.65, 0.55–0.77), more inactivity (PR 1.27, 1.07–1.50) and more sedentary time (PR 1.37, 1.16–1.62); interactions were significant (RPR 0.67, 1.42 and 1.57). The gap widened with each additional measure and was confined to adolescents.

Conclusions

Where schools promote physical activity, the benefit accrues to children without disabilities. Promotion measures should be designed and monitored for inclusion rather than assumed to be neutral.

1 Introduction

Children and adolescents with disabilities are among the least physically active groups in every country with data. The first global matrix of Para Report Cards, covering 14 countries, assigned the lowest

available grades to overall physical activity and organized sport,[1] people living with disabilities are between 16% and 62% less likely to meet activity guidelines than their peers,[2] and only 4.6% of Canadian children and youth with disabilities meet the three movement guidelines combined.[3] International guidelines recommend an average of 60 minutes per day of moderate-to-vigorous activity for all children, explicitly including those with disabilities.[4, 5]

Schools are the setting where most policy responses are placed. Physical education, sports workshops, gyms and health talks reach children regardless of family income, and structured programs have shown physical and psychosocial benefits for children with disabilities when they are actually delivered to them. [6, 7, 8] Yet the evidence for these benefits comes almost entirely from targeted programs designed for disabled children. Most school promotion measures are universal: they are offered to the whole student body, and whether they reach children with disabilities in the same way is an empirical question rather than a design feature. Qualitative syntheses show that school-based factors, including teacher preparation, adapted equipment and the social organization of activity, determine whether disabled children take part at all.[9] For some groups the school is also where fitness itself is sustained: Chilean schoolchildren with intellectual disabilities show low reference values of muscular strength,[10] and the closure of schools during the COVID-19 lockdown was followed by declines in their strength and functional capacity.[11]

Public health research has a name for the risk this creates. Interventions that are effective on average can widen inequalities when their benefits are captured disproportionately by groups who are already advantaged, a pattern described as intervention-generated inequalities.[12] The concept has been documented mainly for socioeconomic position, for instance in media campaigns and in voucher schemes for community sport, whose uptake has favored families already engaged in sport.[12, 13] Participation equity in organized sport is itself unequal in the general child population.[14] Whether universal school promotion measures generate inequalities by disability has not, to our knowledge, been examined, and it is the question that matters most for a policy that relies on schools as its main vehicle.

Latin America adds urgency to the question. The region accounts for a substantial share of the world's children with disabilities,[15] regional evidence is limited to clinical or convenience samples,[16] and Chile's first Para Report Card could not grade most indicators for lack of population data,[17] a gap also noted for the general child population.[18] In the same national survey analyzed here, children with disabilities report similar access to neighborhood spaces and similar enjoyment of physical education, with gaps concentrated in organized sport,[19] and in the general child population liking physical education is closely tied to being active during school recess.[20] and adults with disabilities perceive similar availability of spaces but use them less.[21] Chile's national physical activity policy for 2026 to 2037 places schools at the center of its strategy but does not set inclusion indicators for school provision.[22]

The 2024 Chilean National Survey of Physical Activity and Sport records, for the same children, disability status, the physical activity promotion measures implemented in their school, and a range of activity and

participation outcomes.[23] This study tested whether the disability gap in physical activity, organized sport and sedentary time differs between children attending schools with and without promotion measures. We hypothesized that, if school measures are inclusive, the gap would be smaller where measures exist; if they generate inequalities, it would be larger.

2 Methods

2.1 Design and data source

Cross-sectional analysis of the 2024 National Survey of Physical Activity and Sport (Encuesta Nacional de Actividad Física y Deporte, ENAFyD), conducted by the Chilean Ministry of Sport through face-to-face household interviews. The survey used a probabilistic sample stratified by region, age group, sex, urban or rural area and socioeconomic level, with the 2017 Census as sampling frame; regions received equal allocation, which produces a substantial design effect.[23] The questionnaire for people aged 5 to 17 years comprised 4,150 participants. The analytical sample included the 4,032 children and adolescents who attended school and had a valid response to the school promotion item. The distributed database contains a single normalized expansion weight and no stratum or cluster identifiers. Reporting follows the STROBE statement for cross-sectional studies.

2.2 Exposure and effect modifier

Disability was defined as the report of at least one visual, hearing, physical, cognitive or other disability in a multiple-response item answered for the child. School physical activity promotion was assessed with a multiple-response item asking which measures had been implemented in the child's school: gym or weight room, swimming pool, sports workshops, sports scholarships, and talks or courses on physical activity and health. The main effect modifier was the presence of any of these measures; the number of measures (0 to 5) was used for a dose analysis, and sports workshops alone for a sensitivity analysis. Respondents who answered that they did not know which measures existed were retained in the main analysis and excluded in a sensitivity analysis.

2.3 Outcomes

Nine binary outcomes were analyzed: participation in any organized sports workshop or club, in school workshops, and in workshops outside school; membership of a sports organization; classification as active and as inactive by the official survey index, which accumulates moderate and vigorous activity across contexts against the international recommendation for this age group;[4] four or more hours of daily sedentary time, the highest category recorded; liking physical education classes; and active recess, defined as running, playing sport or dancing during school breaks.

2.4 Statistical analysis

Prevalences were estimated with the survey weight and 95% confidence intervals (95%CI) by the Wilson method on the Kish effective sample size. Prevalence ratios (PR) for disability were estimated with

Poisson regression using the weight as a frequency weight and HC1 robust variance, preferred to logistic regression because the outcomes are common.[24] Models were adjusted for sex, age group (5–11, 12–17 years), socioeconomic level as distributed with the survey, and urban or rural area, with reference categories set explicitly (boys, 5–11 years, high socioeconomic level, rural area, no disability). Effect modification was assessed on the multiplicative scale by adding a disability-by-promotion product term; its exponentiated coefficient is the ratio of prevalence ratios (RPR), the factor by which the disability PR in schools with measures differs from that in schools without them. Models were also fitted separately within each stratum. Sensitivity analyses excluded respondents who did not know which measures existed, replaced any measure with sports workshops alone, modeled the number of measures as a continuous term, and repeated the interaction models within each age group.

3 Results

Of the 4,032 children and adolescents analyzed, 463 had a reported disability. Those with disabilities were somewhat older and less often in the high socioeconomic category (Table 1). Overall, 30.9% (95%CI 28.5–33.3) attended a school with at least one promotion measure, most often sports workshops (27.5%), talks on physical activity and health (15.2%) and a gym (14.3%); 9.7% did not know which measures existed.

Children with disabilities were more likely, not less, to attend schools with promotion measures: 40.3% against 29.5% (adjusted PR 1.37, 95%CI 1.22–1.53). The difference held for sports workshops (38.7% vs 25.9%; PR 1.49, 1.33–1.68), talks (22.3% vs 14.1%; PR 1.57, 1.31–1.87), gyms (PR 1.24, 1.01–1.52) and swimming pools (PR 2.12, 1.25–3.59) (Table 2).

In schools without promotion measures, children with and without disabilities were statistically indistinguishable in organized sport participation (60.7% vs 62.3%; PR 0.98, 0.89–1.07), inactivity (53.3% vs 60.2%; PR 0.90, 0.81–1.01) and sedentary time (18.4% vs 20.2%; PR 0.91, 0.71–1.17). In schools with measures, a gap appeared in each of these outcomes. Organized sport participation was 42.4% among children with disabilities against 64.2% among their peers (PR 0.65, 0.55–0.77), inactivity 47.2% against 37.8% (PR 1.27, 1.07–1.50), and sedentary time 46.3% against 32.4% (PR 1.37, 1.16–1.62). The interaction terms were significant for organized sport (RPR 0.67, 0.56–0.81), inactivity (RPR 1.42, 1.16–1.73), sedentary time (RPR 1.57, 1.16–2.12) and being active (RPR 0.68, 0.49–0.94) (Table 3).

The gap in organized sport did not arise within school workshops, where the interaction was not significant (RPR 0.91, 0.69–1.19), but in workshops outside school (RPR 0.59, 0.46–0.77). The pattern of inactivity shows how the gap forms: across school strata, inactivity among children without disabilities fell from 60.2% to 37.8%, whereas among children with disabilities it fell only from 53.3% to 47.2%. Liking physical education and active recess did not differ by stratum, consistent with the close link between the two reported for the national child population.[20]

The results were robust (Table 4). Excluding respondents who did not know which measures existed, and using sports workshops alone as the exposure, left the interaction estimates practically unchanged. The

gap widened with the number of measures implemented: each additional measure multiplied the disability PR by 0.89 (0.83–0.96) for organized sport, 1.16 (1.06–1.26) for inactivity and 1.17 (1.07–1.28) for sedentary time. The interaction was confined to adolescents. Among children aged 5 to 11 years, it was absent for organized sport (RPR 1.01, 0.76–1.33) and reversed for inactivity (RPR 0.62, 0.41–0.94), whereas among those aged 12 to 17 years it was strong for both (RPR 0.50, 0.38–0.64, and 2.29, 1.80–2.91).

Table 1

Characteristics of the analytical sample according to disability status. Chile, 2024 (n = 4,032)

Characteristic	With disability (n = 463), %	Without disability (n = 3,569), %
Girls	49.8	51.5
Aged 12–17 years	56.8	51.7
Socioeconomic level, high	14.9	21.2
Socioeconomic level, medium	50.6	47.2
Socioeconomic level, low	34.5	31.7
Urban area	84.1	82.2

Percentages are weighted. Source: ENAFyD 2024, authors’ analysis.

Table 2

School physical activity promotion measures according to disability status. Chile, 2024 (n = 4,032)

Measure implemented in the school	With disability, %	Without disability, %	Adjusted PR (95%CI)
Any measure	40.3	29.5	1.37 (1.22–1.53)
Sports workshops	38.7	25.9	1.49 (1.33–1.68)
Talks or courses on physical activity	22.3	14.1	1.57 (1.31–1.87)
Gym or weight room	17.2	13.9	1.24 (1.01–1.52)
Sports scholarships	6.5	4.8	1.29 (0.90–1.85)
Swimming pool	3.5	1.6	2.12 (1.25–3.59)
Does not know	9.2	9.8	0.93 (0.70–1.24)

PR: prevalence ratio; 95%CI: 95% confidence interval. Weighted Poisson regression with robust variance, adjusted for sex, age group, socioeconomic level and area; reference: children without disability. Percentages are weighted.

Table 3

Disability gap in physical activity outcomes according to school promotion measures, with interaction.
Chile, 2024 (n = 4,032)

Outcome	No measures: % D / ND	No measures: PR (95%CI)	Measures: % D / ND	Measures: PR (95%CI)	RPR (95%CI)	P interaction
Any organized sports workshop	60.7 / 62.3	0.98 (0.89–1.07)	42.4 / 64.2	0.65 (0.55–0.77)	0.67 (0.56–0.81)	< 0.001
School sports workshop	33.8 / 39.2	0.87 (0.74–1.02)	30.0 / 38.2	0.78 (0.63–0.96)	0.91 (0.69–1.19)	0.481
Out-of-school workshop	41.7 / 38.7	1.06 (0.93–1.22)	29.1 / 45.1	0.63 (0.51–0.79)	0.59 (0.46–0.77)	< 0.001
Member of a sports organization	12.7 / 10.5	1.19 (0.87–1.64)	31.2 / 36.2	0.83 (0.67–1.02)	0.72 (0.49–1.05)	0.088
Active (general index)	24.2 / 19.4	1.18 (0.96–1.46)	25.9 / 31.4	0.82 (0.64–1.04)	0.68 (0.49–0.94)	0.019
Inactive (general index)	53.3 / 60.2	0.90 (0.81–1.01)	47.2 / 37.8	1.27 (1.07–1.50)	1.42 (1.16–1.73)	0.001
Sedentary time ≥ 4 h/day	18.4 / 20.2	0.91 (0.71–1.17)	46.3 / 32.4	1.37 (1.16–1.62)	1.57 (1.16–2.12)	0.003
Likes physical education	78.2 / 79.4	0.99 (0.93–1.05)	75.6 / 82.7	0.92 (0.85–0.99)	0.93 (0.84–1.03)	0.144
Active recess	74.8 / 71.1	1.05 (0.98–1.13)	77.8 / 77.8	1.03 (0.95–1.11)	0.95 (0.86–1.06)	0.383

D: with disability; ND: without disability; PR: adjusted prevalence ratio for disability (reference: without disability); RPR: ratio of prevalence ratios from the disability-by-promotion product term. Weighted Poisson regression with robust variance, adjusted for sex, age group, socioeconomic level and area. Percentages are weighted.

Table 4
Sensitivity analyzes of the disability-by-promotion interaction. Chile, 2024

Analysis	Organized sport RPR (95%CI)	Inactive RPR (95%CI)	Sedentary ≥ 4 h RPR (95%CI)
Main analysis (any measure)	0.67 (0.56–0.81)	1.42 (1.16–1.73)	1.57 (1.16–2.12)
Excluding "does not know" (n = 3,589)	0.68 (0.56–0.82)	1.39 (1.14–1.69)	1.58 (1.15–2.17)
Sports workshops as exposure	0.64 (0.53–0.77)	1.48 (1.21–1.81)	1.49 (1.10–2.01)
Per additional measure (0–5)	0.89 (0.83–0.96)	1.16 (1.06–1.26)	1.17 (1.07–1.28)
Aged 5–11 years (n = 1,929)	1.01 (0.76–1.33)	0.62 (0.41–0.94)	-
Aged 12–17 years (n = 2,103)	0.50 (0.38–0.64)	2.29 (1.80–2.91)	-

RPR: ratio of prevalence ratios for the disability-by-promotion interaction. All models adjusted for sex, age group, socioeconomic level and area, except age-stratified models, which omit age group. Dashes indicate analyzes not performed.

4 Discussion

In a national sample of Chilean schoolchildren, the disability gap in physical activity was absent where schools had no promotion measures and present where they had them. In schools with measures, children with disabilities were a third less likely to take part in organized sport, more often inactive and more often sedentary, and the gap widened with each additional measure. This is the configuration that defines an intervention-generated inequality: the measures coincide with large gains among children without disabilities, 22 percentage points less inactivity, and small gains among children with disabilities, 6 points.[12]

The finding is not explained by unequal access. Children with disabilities were 37% more likely to attend schools with promotion measures, a pattern consistent with the resources that schools serving these children may receive. Provision reached them; its benefits did not. The distinction matters because most monitoring frameworks, including the Para Report Cards, grade provision and policy rather than differential uptake. [1, 25, 26] A school system could therefore score well on the indicator that is measured while widening the inequality that is not.

The gap did not arise inside school workshops, where the disability PR was below one in both strata and the interaction was not significant, but in participation outside school and in overall activity and sedentary time. One reading is that schools with promotion measures are embedded in environments richer in physical activity opportunities, which children without disabilities convert into participation in

clubs and activity outside school, and children with disabilities do not. This is consistent with evidence that organized sport is the domain in which participation inequities are most persistent in the general child population,[14] that uptake of financial incentives for community sport has concentrated among families already engaged,[13] and that adolescents with autism and intellectual disability face widening participation gaps as sport becomes more competitive.[27] Clinical samples show the same contrast between structured and unstructured activity across neurodevelopmental conditions,[28] and in this same survey organized sport participation was associated with a distinct motivational profile among children and adolescents,[29] which suggests that what is lost when disabled adolescents drop out of clubs extends beyond minutes of activity.

The restriction of the interaction to adolescents is the result with the clearest implications. Among children aged 5 to 11 years there was no inequality generated, and inactivity even ran in the opposite direction. Among those aged 12 to 17 years, children with disabilities in schools with measures had half the probability of organized sport participation and more than twice the relative risk of inactivity. Adolescence is when school and community sport shift from play to selection and competition, a transition that frameworks of sport participation for people with disabilities identify as the stage at which entry and continued participation diverge.[30] Recreational and inclusive formats in that age band, rather than more provision, are the plausible lever.

The sedentary time finding reinforces the interpretation. Screen time averaged 3.3 to 3.7 hours per day in pooled estimates for children with autism, attention deficit hyperactivity disorder and cerebral palsy,[31] and in this sample 46.3% of children with disabilities in schools with measures spent four hours or more sedentary, against 32.4% of their peers. The children missing from organized sport are not simply missing an activity; they are replacing it with the behavior that promotion measures are meant to displace.

For policy, the results argue against evaluating school promotion by coverage alone. Chile's national policy for 2026 to 2037 creates a monitoring system centered on schools[22] and the national Para Report Card has already identified surveillance gaps for this population.[17] Adding one indicator, the disability gap in participation within schools that implement measures, would make it possible to detect the inequality described here and to evaluate whether inclusive designs close it. Evidence from targeted programs shows that structured activity benefits children with disabilities when it is designed for them; [6, 7, 8] the challenge revealed by these data is to make universal measures behave the same way.

5 Limitations

The design is cross-sectional, so the interaction describes a pattern across schools rather than the effect of introducing measures. The main threat to interpretation is that school type is not recorded: children with more severe disabilities may attend special schools or schools with integration programs that also have more resources, which would produce more measures and lower participation without implying exclusion. The concentration of the effect in adolescents and its gradient with the number of

measures are less easily explained by this alternative, but they do not rule it out. Promotion measures were reported by respondents rather than audited, and one in ten did not know which existed, although excluding them did not change the results. Disability was measured with a brief dichotomous battery without severity grading, and our figures are not directly comparable with the national disability survey.[32] Activity was self- or proxy-reported, which in Chilean children overstates activity relative to accelerometry,[33] sedentary time is censored at four hours, and the survey contains no measure of physical fitness, so the findings concern participation and activity rather than fitness itself, although school-based evidence in Chilean children with intellectual disabilities links reduced school activity to losses in strength and function.[11] Finally, the database contains only a normalized weight without stratum or cluster identifiers, so confidence intervals rest on an effective sample size rather than on design-based variance.

6 Conclusions

Chilean children with disabilities are more likely than their peers to attend schools that promote physical activity, yet it is precisely in those schools, and among adolescents, that they fall behind in organized sport, activity and sedentary time. School promotion measures are not neutral with respect to disability: without an explicit inclusion design, they concentrate their benefits among children who need them least. Monitoring the disability gap within schools that implement measures, rather than coverage alone, is a low-cost step that would allow this inequality to be detected and addressed.[22]

Declarations

Ethics approval and consent to participate.

The ENAFyD 2024 was approved by the Ethics Committee of the Chilean Ministry of Sports, Subsecretaría del Deporte (ID 799595-2-LQ24), in accordance with the Declaration of Helsinki, and written informed consent was obtained from legal guardians, with assent from children and adolescents. The present study used anonymized secondary data.

Clinical trial number.

Clinical trial number: not applicable.

Use of artificial intelligence (AI) tools.

The authors declare that a generative artificial intelligence tool was used to support language editing under the full supervision and responsibility of the authors, who verified all data, analyzes, and references.

Consent for publication.

Not applicable.

Competing interests.

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Author Contribution

J.S.-L. conceived and designed the study, curated the data, performed the statistical analysis, interpreted the results and wrote the main manuscript text. D.G.-R., M.P.-S., C.F.-V., A.G.-C. and P.V.-M. contributed to the interpretation of the results and critically revised the manuscript for important intellectual content. All authors reviewed and approved the final manuscript and agree to be accountable for all aspects of the work.

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Data Availability

The data that support the findings of this study are available from the Ministry of Sport of Chile, but restrictions apply to the availability of these data, which were used under license for the current study and are not publicly available. The ENAFyD 2024 microdata can be requested from the Ministry of Sport of Chile. The authors are not authorized to redistribute them. The analysis code is available from the corresponding author on reasonable request.

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