

Footprints in Time: physical activity levels and socio-demographic and movement-related associations within the Longitudinal Study of Indigenous Children

Abstract

Background

Emerging evidence suggests that Indigenous children have higher physical activity levels than non-Indigenous children, yet little is known of the factors that influence these levels or how they may be optimised. This study examines correlates of achieving ≥ 1 hour/day of physical activity among Indigenous Australian children aged 8-13 years.

Methods

Data were collected through parental self-report in the Longitudinal Study of Indigenous Children. Proportions of children achieving ≥ 1 hour/day physical activity, approximating the Australian aerobic physical activity recommendations, were calculated and associations with sociodemographic, family composition and movement-related factors were quantified using multiple logistic regression analyses.

Results

Half of the 1233 children achieved ≥ 1 hour/day physical activity. Children from families with *low* parental education and unemployment, *remote* residence, *low* socioeconomic status and *without a father* in the household were more likely to meet the recommendations. Achieving ≥ 1 hour/day of physical activity was also associated with low levels of playing electronic games and total screen time.

Conclusions

Socio-demographic correlates of physical activity among Indigenous Australian children run counter to those typically found in non-Indigenous Australian children. Further longitudinal

examination of the predictors of these associations would provide a greater understanding of Indigenous physical activity determinants, to inform strategies to facilitate participation.

1 Introduction

2 The Aboriginal and Torres Strait Islander population, respectively henceforth referred to as
3 Indigenous, has a relatively young age profile where one third (36%) are aged under 15 years
4 old, compared with 18% of non-Indigenous Australians.¹ Indigenous Australians are
5 collectively the oldest continuous culture in the world comprising over 250 different language
6 groups at the time of colonisation and diversity with regard to culture, history, social factors
7 and spirituality.² Understanding this diversity and how Indigenous children can grow up
8 strong is essential to their health and wellbeing as well as cultural continuation.²

9 There are many health and wellbeing benefits from children being physically active;
10 including cardiorespiratory and muscular fitness, bone health, and cardiovascular and
11 metabolic health biomarkers.³ Physical activity in childhood may track into adulthood,⁴
12 therefore establishing regular physical activity participation among young people is important
13 for future adult health. Australia has National Physical Activity, Sedentary Behaviour, and
14 Sleep Recommendations for Children and Young People aged 5-17 years, for optimal health
15 and wellbeing,⁵ that include the recommendation of at least an hour a day of moderate to
16 vigorous intensity physical activity.

17 Australian Bureau of Statistics (ABS) data for Indigenous people indicates that children (5-17
18 years) have higher physical activity levels than non-Indigenous children. These data, from
19 non-remote areas, show that 48% of Indigenous children met the national recommendations
20 at the time of the study,⁶ compared to only 35% of non-Indigenous children.⁷ Physical
21 activity levels of Indigenous children living in remote areas were higher still than those of
22 non-remote Indigenous children. Among those living in remote areas, 86% aged 5-14 years

and 66% aged 15-17 years met the recommendations.⁷ However, for Indigenous people over 15 years in non-remote areas, data from 2018-2019 shows that only 11% are meeting national recommendations.⁸ In remote areas, the most recent data from 2012-2013 shows that 55% of adults 18 years and above achieved a level of physical activity meeting the recommendations. A larger secondary analysis of national ABS data from over 12,000 Aboriginal and Torres Strait Islander children aged 5-17 years found a similar gender association, and that physical activity levels decreased with age, particularly around puberty.¹³ High levels of physical activity were associated with low socioeconomic status (SES) in remote, but not non-remote, areas. Taken together, these data indicate that the teenage years are likely to be a critical time period to prevent declines in children's physical activity and establish strategies for lifelong participation.

The social–ecological model has been used to review the literature about Indigenous Australians and physical activity.⁹ The review found that an Indigenous standpoint, or perspective, is essential to understanding socioecological models and their value in capturing and promoting issues relating to physical activity engagement. An Indigenous standpoint or perspective is a different world view to a western biomedical model, where social and cultural aspects of health are considered holistically.⁹ When applied to physical activity research and practice, an Indigenous perspective considers a family and community focus, socioeconomic and behavioral factors as interrelated. The socio-ecological model, in the context of this Indigenous physical activity review,⁹ can inform methodological aspects, such as variable selection and the interpretation of findings, of research that explores Indigenous children's physical activity levels.

Previous cross-sectional and repeat cross-sectional studies have provided some understanding of physical activity levels and patterns,¹⁰ and associations between physical activity and sociodemographic factors among Indigenous children and adolescents.^{11,12} Boys were found

to be more active than girls,^{11,12} physical activity levels were higher among younger children and those living in remote areas,¹² and physical activity declines over time were more pronounced for non-organized activities.¹⁰ However, these studies were conducted in just one Australian state. Collectively, these findings from previous studies identify influencing factors that could be targeted in future initiatives to prevent physical activity declines, but higher quality confirmatory evidence from larger, Australian-wide studies is required.

The *Footprints in Time* Longitudinal Study of Indigenous Children (LSIC),¹⁴ follows the development of around 1,700 Indigenous children and families in urban, regional and remote Australia and is one of the largest longitudinal studies of Indigenous people worldwide.¹⁵ LSIC aims to improve understanding of the lives of children, their families and communities to inform better policy and program development.¹⁶ The study was developed through extensive community engagement processes with Indigenous families and stakeholders in over 20 locations.¹⁴ LSIC includes two groups of children who were aged 6 to 18 months (B cohort) and 3.5-5 years (K cohort), from 11 community sites, when the study began in 2008 (Wave 1), representing between 5% and 10% of Australian Indigenous children in these age groups, and socioeconomic and cultural diversity.¹⁴ The cohort offers an alternative to conducting additional individual studies that further increase participant burden.¹⁴ For the first time in Wave 9, in 2016, data were collected about whether children achieved an hour a day of physical activity every day, as well as several other movement behaviors. This study aims to examine the associations between a series of sociodemographic, family composition and movement-related variables and achieving an hour a day of physical activity every day among Indigenous children aged 8-13 years.

Methods

Design

Cross-sectional analysis of Wave 9 LSIC participants.

Participants

The present study includes 1,233 children age 8-13 years at the time of Wave 9 in 2016, who provided valid physical activity data. In 2008, two-staged, purposive sampling was used to recruit children from 11 diverse Aboriginal and Torres Strait Islander community sites across each state and territory in Australia, who were followed up during subsequent waves.¹⁴ Indigenous families, as identified through Australia's publicly funded universal health care database, were invited to participate by Indigenous Research Administration Officers (RAOs). Wave 1 comprised 1671 children, with retention rates from the previous wave ranging from 81.9% (Wave 4) to 89.0% (Wave 9) and some additional interviews with new participants in each wave (ranging from 88 in Wave 2 to 179 in Wave 7).¹⁶

Measures

LSIC data are primarily collected via annual face-to-face interviews with study children and one of their parents, described as Parent 1 or P1, conducted by Indigenous RAOs in English or Aboriginal language when appropriate.¹⁴ A detailed cohort profile paper describing community engagement and governance in all aspects, design, community and participant sampling, questionnaire development, piloting, data collection procedures, baseline and early wave follow-up characteristics has been published previously.¹⁴ For the majority of participating families (1,048; 82.7%) the child's mother is P1.¹⁶

In Wave 9, parents were asked several questions about physical activity and other movement related behaviors. The inclusion of these questions was led by the Indigenous (Wiradjuri) senior study author of the paper and LSIC steering committee section chair. The question 'How often does (study child) do an hour or more physical activity?' gives a variable

‘achieving ≥ 1 hour of physical activity every day’, the *main outcome variable* for this study that approximate Australian aerobic physical activity recommendations.

A series of six *movement co-variables* were also examined. Parents were asked about their own physical activity participation, ‘Do you play sport or have a regular exercise routine?’ (Yes; No). They were asked about organized sport/dance as a family activity in the last week (Yes; No). Parents were also asked two questions on sedentary behavior, ‘How many hours on a typical weekday does (study child) watch TV or movies?’ and ‘How many hours on a typical weekday does (study child) spend playing electronic games on weekday?’ and asked to indicate the number of hours (0; less than 1 hour; 1 hour; 2 hours etc.). Both variables were dichotomized (0-2 hours; 2+ hours) and a new variable, ‘total weekday screen time’ was derived from the sum of the original responses to give a further dichotomized variable (0-2 hours; 2+ hours) to approximate national recommendations.⁵ The variable ‘Usual hours of sleep’ was also derived from parents indicating their child’s usual bedtime and waking time and categorized according to recommended levels (9-11 hours/night; <9 or <11 hours/night).

⁵ Parents were asked whether there were ‘Good places to play in this community’, dichotomized as ‘Yes lots of parks, playgrounds; Yes a few places that are good’ and ‘Some places that are OK; no not many; no none’.

Nine *sociodemographic and family composition variables* were collected in Wave 9 and used as covariates in this study, as each have established associations or relationships with physical activity participation.^{10-13, 26-28} These included the child’s sex (male; female), and age (8 to 12 years). Current parental employment status was collapsed into ‘Yes’ or ‘No’, and this variable, as well as the highest education level of the responding parent were used to represent individual-level socioeconomic status. Parental education responses were collapsed into three categories: Low (up to Year 10 at school); Medium (Year 11-12) at school or trade certificates I or II; and High (anything higher).¹⁷ Remoteness of residence was characterised

using the Australian Statistical Geography Classification (ASGC) Remoteness area 2016,¹⁷ and collapsed into three categories: Urban (major cities and inner regional); Regional (outer regional); and Remote (remote and very remote).^{15, 17} An area-level socioeconomic variable was Decile of Relative Indigenous Socioeconomic Outcomes (IRISEO),¹⁸ that is specifically derived for Indigenous Australians, from on nine measures of socioeconomic status. Deciles were collapsed into three categories: most advantaged (IRISEO 8–10), mid-advantaged (IRISEO 4–7), and most disadvantaged (IRISEO 1–3).¹⁹ The remaining three variables asked about presence in the household of the child's father, sister(s) and brother(s) (Yes; No).

Data analysis

The number and percentage of children achieving ≥ 1 hour/day physical activity across categories of explanatory sociodemographic, family composition and movement-related variables were calculated. Chi-squared tests (based on testing an overall association or trend) were used to test the unadjusted differences between each explanatory variable and the main outcome variable of achieving ≥ 1 hour/day physical activity among Wave 9 participants.

Generalised linear mixed models were used to examine the associations between explanatory *sociodemographic and family composition variables* that were statistically significant in the unadjusted tests and achieving ≥ 1 hour/day physical activity. These comprised of: sex (reference group (ref.): 'male'); age (ref.: '8 years'); parental education level (ref.: 'low'); parental employment (ref.: yes); ASGC Remoteness area 2016 (ref.: urban); IRISEO (ref.: most advantaged IRISEO 8–10); presence in household: Child's father (ref.: yes). The model was adjusted for each variable within the model. Analyses were adjusted for study sample site clustering according to Indigenous Area (IARE).²⁰

A series of generalised linear mixed models examined the associations between each *movement-related co-variable* that was statistically significant in the unadjusted tests and

1 achieving ≥ 1 hour/day physical activity. These models were initially adjusted for sex, age and
2 five subsequent models were additionally adjusted for parental education level, parental
3 employment, remoteness and IRISEO and presence in household: child's father. Adjusted
4 odds ratios and their 95% CIs were reported, noting that these do not approximate risk ratios.
5 Analyses were adjusted for study sample site clustering according to IARE.²⁰ We conducted
6 additional analyses stratified by two remoteness groups (urban versus rural and remote) but
7 encountered statistical power issues (supplementary file).

8 Statistical analyses were conducted using IBM SPSS 26.0 statistical software (SPSS Inc. an
9 IBM Company, Chicago, IL). We conducted a complete case analysis where participants with
10 missing data were removed, as data were missing at random and could be considered
11 representative of the study population. In the missing values analysis, crosstabulations of
12 categorical variables versus indicator variables revealed no differences exposure-outcome
13 differences greater than 1.4%. For all statistical tests, a p-value of <0.05 was used to indicate
14 statistical significance.

15 **Ethics**

16 The LSIC survey was conducted with ethical approval from the Departmental Ethics
17 Committee of the Australian Commonwealth Department of Health, and from the Human
18 Research Ethics Committees of each state and territory. Ethics approval for the present study
19 was given by The University of Technology Sydney Human Ethics Research Committee
20 (HREC): ETH 17-1842. Informed consent to participate in the study was provided by each
21 study child's parent and engagement with RAOs guided the study development and meaning

22 **Results**

23 A total of 1233 participants provided data on achieving ≥ 1 hour/day physical activity (data
24 missing for 35 participants, 2.8%). Six hundred and thirty-nine children (50.4%) achieved ≥ 1

hour of physical activity every day. In the chi-squared analyses, there was no significant variation in achieving ≥ 1 hour of physical activity every day by sex or age. In contrast, there was significant variation by the socioeconomic variables of parental employment, parental education levels, remoteness, IRISEO and presence in household of the child's father (Table 1).

Insert Table 1: Prevalence of achieving ≥ 1 hour of physical activity every day and associations with sociodemographic, family composition and movement-related variables among Wave 9 participants of the Longitudinal Study of Indigenous Children

Among children whose parent (P1) was currently employed, 44.3% achieved ≥ 1 hour of physical activity every day, which was lower than among children whose parent was not currently employed (59.0%; $p < 0.05$). Sixty-three percent of children whose parent had a low education level achieved ≥ 1 hour physical activity every day, decreasing to 58.9% among children whose parents had a medium education level and 42.6% among children whose parents had a high education level ($p < 0.05$). Among children living in urban areas, 37.7% achieved ≥ 1 hour of physical activity every day, increasing to 47.8% among children in regional areas and to 81.2% in remote areas ($p < 0.05$). There was also significant variation by (IRISEO. Among children living in the most advantaged areas, 33.7% achieved ≥ 1 hour of physical activity every day, increasing to 50.1% among the mid-advantaged children and to 79.0% among the most disadvantaged children ($p < 0.05$).

Fifty-seven percent of children whose parent plays sport or exercises and 46.3% whose parents did not play sport or exercise achieved ≥ 1 hour of physical activity every day ($p < 0.05$). A higher percent of children who spent less than two hours playing electronic games on weekday achieved ≥ 1 hour physical activity every day than those who spent over

two hours on a weekday (66.4% and 33.6%, respectively; $p<0.05$). A higher proportion of children with total weekday screen time below two hours achieved ≥ 1 hour of physical activity every day than those with total weekday screen time of less than two hours (59.5% and 40.5%, respectively; $p<0.05$). The proportion of children who achieved ≥ 1 hour physical activity every day was lower where parents indicated that there were lots of parks, playgrounds or a few places to play in this community than where parents indicated otherwise (some places are ok, no not many, no none); 46.1% and 61.3%, respectively ($p<0.05$).

In the adjusted analysis (Table 2), children whose parent had a high education level were less likely to achieve ≥ 1 hour physical activity every day (OR=0.59, 95% CI: 0.36-0.96) than children whose parent had a low education level. Children whose parent was not currently employed were more likely to achieve ≥ 1 hour of physical activity every day (OR=1.53, 95% CI: 1.12-2.09) than children whose parent was currently employed. Compared to children living in urban areas, children living in remote areas were over five times more likely to achieve ≥ 1 hour of physical activity every day (OR=5.87, 95% CI 3.04-11.34). Compared to children living in the most advantaged areas, children living in the most disadvantaged areas were over twice as likely to achieve ≥ 1 hour physical activity every day (OR=2.25, 95% CI: 1.10-4.61). Absence of the child's father in the household was associated with higher odds of achieving ≥ 1 hour of physical activity every day (OR=1.37, 95% CI: 1.02-1.84).

Table 2: Odds ratios (OR), and their 95 % confidence intervals (95 % CI) of achieving ≥ 1 hour of physical activity every day, adjusted for sociodemographic and family composition variables and study site clustering

Table 3 presents the fully adjusted analysis of achieving ≥ 1 hour of physical activity every day by physical activity and movement factors, after adjusting for sex, age, parental education and employment levels, remoteness, IRISEO. The fully model is presented only as

results did not significantly differ to the partially adjusted models. Children who spent over two hours on a weekday playing electronic games were less likely to achieve ≥ 1 hour of physical activity every day (OR=0.71, 95 % CI: 0.52-0.97) compared to children who spent less than two hours. Children whose total screen time on a weekday was over two hours were less likely to achieve ≥ 1 hour of physical activity every day (OR=0.65, 95 % CI: 0.48-0.87) compared to children whose screen time was less than two hours.

Table 3: Multivariate odds ratios (OR), and their 95% confidence intervals (95% CI) of achieving ≥ 1 hour physical activity every day for movement-related variables, adjusted for sex, age, parental education and employment, remoteness, IRISEO and presence in household: child's father and study site clustering.

Discussion

These results indicate that half of the 8-13 year old children within the Longitudinal Study of Indigenous Children achieved ≥ 1 hour physical activity every day, the Australian aerobic physical activity recommendations.⁵ Children's physical activity levels were higher in families with low parental education and employment, low socioeconomic position, living in remote areas, which did not have a father present. Physical activity levels were also higher in families where children spent less than two hours on a weekday playing electronic games and had lower levels of total screen time.

Inequitable treatment of Indigenous peoples since colonisation has led to socioeconomic inequities experienced today that contribute to poor broad health outcomes experienced by adults and children.²¹ The review of Indigenous physical activity using the socio-ecological model⁹ highlights how physical activity could help overcome socio-economic issues. The LSIC findings presented here demonstrate that Indigenous children experiencing low socioeconomic environments have high physical activity levels, which confers both health,³

1 and social benefits.²² This is a promising finding for the future health of Indigenous children
2 as the commence adolescence if physical activity participation levels can be maintained, and
3 increased among those not currently meeting recommendations. While broadscale efforts to
4 reduce socioeconomic disparities currently experienced by Indigenous people are essential,
5 such efforts should ensure that these optimal physical activity levels among Indigenous
6 children experiencing disadvantage in remote areas can be maintained. Co-designed
7 programs to facilitate physical activity participation for Indigenous children and adolescents
8 are important across the socioeconomic spectrum.

9 We found that boys and girls had similar levels of physical activity, in contrast with previous
10 studies of Indigenous children and adolescents.¹¹⁻¹³ We also did not find evidence of age
11 differences, suggesting that physical activity levels within this largely pre-teen age group are
12 stable. These previous studies included teenage participants and it may be that sex and age
13 differences in physical activity levels become apparent among Indigenous children beyond
14 the age of children in the present study, 8-13 years. It is important that these age and sex
15 associations be investigated through future follow-up of LSIC participants throughout their
16 teenage years.

17 Using the social–ecological model to review the literature about Indigenous Australians and
18 physical activity highlighted the importance of social connections, including family and
19 community focussed physical activity and individual level socioeconomic and behavioral
20 characteristics.⁹ This study examined multiple sociodemographic, family composition and
21 behavioral variables through this social–ecological lens and the findings will be discussed in
22 the context of the model.

23 LSIC is the only known study to give rates of recommended levels of physical activity
24 nationally, for Indigenous children or adults, and contributes important new physical activity

data for children aged 8-13 years. The 50% achievement of physical activity recommendations in the present study is similar to national government ABS data for Indigenous children aged 5-17 years from non-remote areas of 48% but is lower than the 86% of Indigenous children aged 5-14 years living in remote areas.⁷ The secondary ABS analysis revealed a prevalence of 64–84%, with higher physical activity levels among children from remote areas.¹³ We believe our findings reflect diversity in physical activity levels among children from urban, regional and remote levels although the sample was not sufficiently powered to examine exposure-outcome associations by remoteness. Overall, the LSIC data appear to indicate higher Indigenous physical activity levels than recent self-reported Australia-wide estimates among mostly non-Indigenous children which give a range from 15-41% among 5-17 year olds,²³ although the differing age ranges warrant further reflection. The differing data sources and sampling of LSIC and these national representative data should also be acknowledged and an advantage of LSIC data is the ability to examine the correlates of these physical activity levels.

The LSIC physical activity findings depict counter-intuitive sociodemographic associations. Lower levels of parental education and employment, living in a remote location, and lower area-level SES were associated with a *greater* likelihood of meeting the recommendations. The direction of these individual- and community-level associations is opposite to most previous Australian evidence for the overall population,²⁴ and to that from other high-income countries, but is similar to associations typically found in low- and middle-income countries and other emerging evidence from Indigenous population studies.

Internationally, a U-shaped relationship between socioeconomic indicators and physical activity has been observed. Activity levels are higher among low-income than higher-income children in low-income countries, but the relationship is reversed in high-income countries. In middle-income countries, physical activity levels are relatively consistent across socio-

economic bands.²⁵ Among Australian Indigenous children, one study found high levels of physical activity were associated with low socioeconomic status (SES) in remote, but not non-remote, areas.¹³ Another recent large study of over 36,000 Indigenous children in Australia's most populous state, New South Wales (NSW) study found higher physical activity levels among children in both regional and remote areas.¹² Together, these studies and findings from LSIC suggest that physical activity among Indigenous Australians is impacted by socio-geographic factors, with different sub-populations, particularly remote and non-remote children, positioned on different parts of the U-shaped relationship. Socio-geographic factors are related to different types of physical activity participation, including sport and active transport. Although these have not been captured in the LSIC dataset, other Australian evidence indicates that lower socioeconomic position is associated with higher levels of active transport, but lower levels of sports participation.²⁶

The presence of the child's father within their household was found to be associated with lower levels of physical activity. This was somewhat surprising as previous research has shown higher physical activity levels among children from dual, rather than single, parent households,²⁷ or no association among Indigenous families.¹¹ This finding may suggest a strength of Indigenous single parent families in supporting children's physical activity, perhaps with support from extended family that is consistent with Indigenous family values and involvement.² A previous study that also examined parental associations found that having an employed mother was associated with higher levels of physical activity among Indigenous teenagers.¹¹ LSIC indicates that parental employment and higher education levels were associated with lower levels of children's physical activity, which again may reflect different parental influences for younger children and teenagers. Future, in-depth qualitative research is needed to unravel the relationships between parent and child activity domains,

socio-geographic factors, and the interesting associations between parent and child activity identified here.

The movement-related findings reveal largely similar findings to other studies in Australia and globally, of associations that have not been previously examined comprehensively for Indigenous children. Spending over two hours on a weekday playing electronic games and total screen time, but not watching TV/movies, were associated with lower odds of achieving ≥ 1 hour of physical activity every day. This is consistent with existing evidence; in a study of children of a similar age in the same 12 countries that included Australia both screen time and total sedentary time were found to be associated with a reduced likelihood of meeting physical activity recommendations.²⁸ These findings add to the emerging evidence of Indigenous children's screen time and associations with physical activity. Investigations in previous LSIC waves identified that high sports participation was associated with low screen time.¹⁷ A recent repeat cross-sectional study in NSW indicated that Indigenous children had improved weekday screen time behaviors over a five year period but less than half met screen time recommendations; although associations with physical activity behaviors were not examined.²⁹

Strengths and Limitations

The LSIC is a well-established dataset and has been adopted across a range of academic disciplines. The strengths of this study include its high participant follow-up rates and the advantages afforded by data from the largest existing cohort study of Australian Indigenous children or indeed Indigenous children internationally. A further strength is the representation of Indigenous children from diverse urban, rural, and remote areas although the sample size did not allow for examination of exposure-outcome associations by remoteness. While the LSIC survey questions on physical activity have not been formally validated, they

approximate the duration of physical activity that is consistent with recommendations. Further weakness are that intensity and type, or setting, of physical activity are not captured and that the self-reported data from parents relies on accurate recall of behaviours. The findings provide baseline data from an important age group of children, 8-13 year olds, whose physical activity levels may have peaked. Examination of significant factors in physical activity of older age groups is also needed. Physical activity during teenage years should be measured in follow-up LSIC waves to determine longitudinal trends and predictors of these trends to inform strategies to facilitate physical activity participation for health and broader social benefits.

While variables in this study are situated within several different layers of the social–ecological model as it relates to Indigenous physical activity,⁹ the structural model layers, particularly ‘macro-social’ factors such as culturally relevant physical activities could be much more adequately captured. Future investigations using mixed methods, that bring a greater understanding of the unique context and geographical and socioeconomic diversity of Indigenous physical activity, could yield more comprehensive understandings. This is an Australian study, but the findings may have wider relevance for other Indigenous populations worldwide, particularly those with similar settler-colonial histories like Aotearoa (New Zealand), the USA and Canada.

Conclusion

These findings give an important understanding of Indigenous Australian children’s physical activity prevalence levels and associations with sociodemographic, family composition and movement-related factors. Higher physical activity levels were associated with living in a remote, low SES area, and lower screen time. Further research is needed to understand the complex relationships within socio-ecological understandings of Indigenous physical activity,

so that these can inform geographically and socioeconomically targeted programs and strategies to support health, wellbeing and cultural sustainability in Indigenous communities.

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Table 1: Prevalence of achieving ≥ 1 hour of physical activity every day and associations with sociodemographic, family composition and movement-related variables among Wave 9 participants of the Longitudinal Study of Indigenous Children

	LSIC Wave 9		Achieving ≥1hr physical activity every day			
			Yes		p value	
	N	%	N	%		
Total	1233	n/a	639	50.4		
<i>Sociodemographic variables</i>						
Sex						
Male	617	50.0	331	51.8	0.2	
Female	616	50.0	308	48.2		
Age (years)						
	8	36	2.9	23	63.9	0.25
	9	582	47.2	295	50.7	
	10	125	10.1	75	60.0	
	11	46	3.7	23	50.0	
	12	375	30.4	186	49.6	
	13	69	5.6	37	53.6	
Parental* employment						
	Yes	551	43.3	239	44.3	<0.05
	No	636	50.0	366	59.0	
Parental* education level						
	Low	128	10.8	80	62.5	<0.05
	Medium	455	38.3	268	58.9	
	High	606	51.0	258	42.6	
ASGC Remoteness area 2016						
Urban	673	54.6	254	37.7	<0.05	
Regional	209	17.0	100	47.8		
Remote	351	28.5	285	81.2		
2006 Decile of Relative Indigenous Socioeconomic Outcomes (IRISEO)						
most advantaged (IRISEO 8–10)	276	22.4	93	33.7	<0.05	
mid-advantaged (IRISEO 4–7)	728	59.0	365	50.1		
most disadvantaged (IRISEO 1–3)	229	18.6	181	79.0		
Presence in household: Child's father						
Yes	627	50.9	288	45.9	<0.05	
No	606	49.1	351	57.9		
Presence in household: Child's sister(s)						
Yes	799	64.8	411	51.4	0.71	
No	434	35.2	228	52.5		

Presence in household: Child's brother(s)					
Yes	832	67.4	420	50.5	0.17
No	401	32.5	219	54.6	
<i>Movement co-variables</i>					
Parent 1 ^a plays sport or exercises					
Yes	667	54.4	379	56.8	<0.05
No	562	45.7	260	46.3	
Hours spent watching TV or movies on weekday					
0-2 hr	513	41.8	282	55.0	0.08
2+ hr	715	58.2	357	49.9	
Hours spent playing electronic games on weekday					
0-2 hr	812	66.4	454	55.9	<0.05
2+ hr	411	33.6	182	44.3	
Total weekday screen time ^b					
0-2 hr	495	40.5	296	59.8	<0.05
2+ hr	727	59.5	340	46.8	
Usual hours of sleep				0.96	
9-11 hours/night	1032	85.6	530	51.4	
<9 or <11 hours/night	174	14.4	89	51.1	
Good places to play in this community					
Yes lots of parks, playgrounds and Yes a few places that are good	749	57.7	345	46.1	<0.05
Some places that are OK, no not many, no none	480	39.1	294	61.3	

^a For over 95% of the sample, the responding parent (P1) was the child's mother

^b Total weekday screen time = hours spent watching TV or movies AND playing electronic games on weekday

Table 2: Odds ratios (OR), and their 95 % confidence intervals (95 % CI) of achieving ≥ 1 hour physical activity every day, adjusted for sociodemographic and family composition variables and study site clustering (N=1077)

Variable	OR (95 % CI)
Sex (ref: male)	
Female	0.93 (0.70-1.25)
Age in years (ref: 8)	
9	0.96 (0.41-2.25)
10	1.23 (0.48-3.13)
11	1.07 (0.35-3.24)
12	0.91 (0.38-2.17)
13	1.15 (0.34-2.19)
Parental education level (ref: Low (up to Year 10 at school))	
Medium (Year 11-12) at school or trade certificates I or II;	0.75 (0.45-1.23)
High (anything higher)	0.59 (0.36-0.96)
Parent 1 currently employed (ref: yes)	
No	1.53 (1.12-2.09)
ASGC Remoteness area 2016 (ref: urban)	
Regional	1.43 (0.83-2.48)
Remote	5.87 (3.04-11.34)
2006 Decile of Relative Indigenous Socioeconomic Outcomes (IRISEO) (ref: most advantaged (IRISEO 8–10))	
mid-advantaged (IRISEO 4–7),	1.35 (0.86-2.10)
most disadvantaged (IRISEO 1–3)	2.25 (1.10-4.61)
Presence in household: Child's father (ref: yes)	
No	1.37 (1.02-1.84)

1 Table 3: Multivariate odds ratios (OR), and their 95% confidence intervals (95% CI) of
 2 achieving ≥ 1 hour physical activity every day for movement-related variables, adjusted for
 3 sex, age, parental education and employment, remoteness, IRISEO, presence in household:
 4 child's father and study site clustering (N=1077)

Variable	OR (95 % CI)
Parent 1 plays sport or exercises (ref: yes)	
No	0.79 (0.59-1.06)
Hours child spends playing electronic games on weekday (ref: 0-2hr) (N=1077)	
2+ hr	0.71 (0.52-0.97)
Total screen time (ref: 0-2hr)	
2+ hr	0.65 (0.48-0.87)
Good places to play in this community (ref: yes)	
No (some places that are OK, no not many, no none)	1.32 (0.97-1.81)