

## WORKING PAPER SERIES

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# DO EXTRACURRICULAR ACTIVITIES CONTRIBUTE TO POSITIVE ADOLESCENT DEVELOPMENT? LONGITUDINAL EVIDENCE FROM AUSTRALIA

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## NON-TECHNICAL SUMMARY

Prior research suggests that adolescents who participate in extracurricular activities have better academic outcomes, more academically oriented and less delinquent peers, reduced risk of substance use, and fewer behavioural problems. These benefits appear to be especially pronounced for adolescents from socioeconomically disadvantaged background. Therefore, subsidising participation in these activities for disadvantaged youth presents an appealing policy lever for governments and non-government organisations aiming to ameliorate inequalities.

However, it is increasingly acknowledged that the existing evidence on the benefits of extracurricular activity participation is based on cross-sectional studies of questionable validity. When longitudinal data have been analysed, the observed effects of extracurricular activity participation are typically weaker. This suggests that at least some of the cross-sectional associations reported in previous studies may be confounded. More robust evidence is clearly needed before public investments in adolescent extracurricular activity participation can be advocated with confidence.

In this paper we employ individual fixed-effects models to offer stronger evidence on potential effects of extracurricular activity participation than previous evidence drawn from cross-sectional studies. By doing this for a wide range of activities and outcomes, our study also permits straightforward comparison of which activities are most influential for which outcomes. We analyse data drawn from 3,885 adolescents aged 12-15 in a nationally representative cohort of Australian children.

Strong bivariate relationships between all forms of activity participation and positive adolescent development were found. However, these associations were much smaller in the fixed-effects analysis. Beneficial effects of sports for mental health and arts for peer behaviour remained statistically significant in fixed-effects models. In contrast, minimal effects of extracurricular activity participation for academic achievement were found. We conclude that extracurricular activity participation has small, beneficial effects on adolescents' mental health and peer behaviour, but not their academic achievement.



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## ABSTRACT

Extracurricular activity participation is associated with positive academic, health, and behavioural outcomes for adolescents, but these findings may reflect unobserved confounding rather than participation effects. To address this, we modelled the effects of participation in three kinds of extracurricular activity (team sport, individual sport, and arts) on an array of developmental outcomes using fixed-effects regression to account for potential unobserved confounding. Data were drawn from 3,885 adolescents aged 12-15 in a nationally representative cohort of Australian children. Strong bivariate relationships between all forms of activity participation and positive adolescent development were found. These associations were much smaller in the fixed-effects analysis, but beneficial effects of sports for mental health and arts for peer behaviour remained statistically significant. Minimal effects of extracurricular activity participation for academic achievement were found. We conclude that extracurricular activity participation has beneficial effects on adolescents' mental health and peer behaviour.

**Keywords:** Extracurricular activities, adolescent wellbeing, academic achievement, fixed-effects regression.

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## 1. Introduction

The large literature on the effects of participation in extracurricular activities children's and young people's academic and social outcomes seems generally encouraging: Adolescents who participate in extracurricular activities have better academic outcomes, more academically oriented and less delinquent peers, reduced risk of substance use, and fewer behavioural problems (see Bohnert et al., 2010; Farb & Matjasko, 2012; Shulruf, 2010 for recent reviews). While adolescents from socioeconomically disadvantaged backgrounds appear to reap these benefits the most, they are also the least likely to participate in extracurricular activities (Heath et al., 2018; O'Flaherty & Baxter 2020)—an unsurprising trend given how prohibitive costs of such activities can be in terms of both finances and time. Subsidising participation in these activities therefore presents a potentially appealing policy lever for governments and non-government organisations aiming to ameliorate inequalities and break the cycle of disadvantage.

Before such investments can be advocated with confidence, however, there are some methodological weaknesses in the literature that need to be addressed. Most prior studies of the associations between extracurricular activities and youth outcomes have been cross-sectional, and it is increasingly acknowledged that the validity of these studies suffers from problems of reverse causality, endogeneity, and selection bias. Adolescents' academic achievement, non-cognitive skills and socioemotional wellbeing are often outcomes of interest. Yet, these same variables are likely to predict selection into extracurricular activities to begin with. Moreover, families that enrol their children in extracurricular activities might systematically differ from other families on unobserved factors that promote positive youth outcomes, such as parental attitudes and practices (Carbonaro & Maloney, 2019). When longitudinal data have been analysed, the observed effects of extracurricular activity participation are typically weaker (e.g., Carbonaro & Maloney, 2019; Coulangeon, 2018). This suggests that at least some of the cross-sectional associations reported in previous studies may be confounded.

In this paper we present a systematic empirical analysis of the relationships between adolescents' participation in a range of extracurricular activities and developmental outcomes including test scores, peer characteristics, non-cognitive skills, and socioemotional wellbeing. In doing so, we make two important contributions to the literature. First, by employing



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individual fixed-effects models that rule out time-invariant unobserved confounding, we offer stronger evidence on potential effects of extracurricular activity participation than previous evidence drawn from cross-sectional studies. Second, the previous literature has covered a broad range of activities and outcomes but is spread over many studies with diverse methods and participant groups. This makes it challenging to compare effects for different activity-outcome combinations. By using the same data and analytic technique for a wide range of activities and outcomes, our study permits straightforward comparison of which activities are most influential for which outcomes.

## 1.1. Background

Extracurricular activity participation is thought to facilitate positive youth outcomes via four broad mechanisms (e.g., Carbonaro & Maloney, 2019; Coulangeon, 2018; Morris, 2016). First, the “transfer paradigm” suggests that adolescents learn and practice skills during participation in extracurricular activities that are then transferred to other contexts such as the classroom. This includes both cognitive and non-cognitive skills (e.g., perseverance, time management, locus of control). Second, participation in extracurricular activities might help young people build positive relationships with peers and adults and increase their sense of belonging within the broader school community. Third, extracurricular activity participation could act as a signal of status, informing teachers and college selection panels that youth possess the required cultural capital and should be rewarded accordingly. Finally, it has been suggested that extracurricular activity participation might be beneficial due to the mere fact that it substitutes for unstructured time, which is presumed to provide fewer developmental benefits and could otherwise be filled with risk-taking and delinquent behaviours.

Leveraging the advantages of longitudinal data, several studies have found associations between extracurricular activity participation and positive youth outcomes whilst controlling for prior achievement and other factors likely to predict selection into extracurricular activities. The associations identified in these longitudinal studies—while generally smaller in magnitude—are substantively consistent with those from earlier cross-sectional studies. Together, they provide evidence that extracurricular activity participation promotes positive academic and socioemotional outcomes in adolescents. For example, Crosnoe et al. (2015) analysed data from the NICHD Study of Early Child Care and Youth Development in the United States. They found that participation in structured activities outside of school between



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1st and 5th grades predicted higher grade point average in 9th grade, controlling for neighbourhood affluence, individual sociodemographic traits, and academic and socioemotional skills prior to school entry. Meanwhile, two studies analysed data from the Educational Longitudinal Study, also in the United States, and found that time spent in extracurricular activities in 10th grade predicted maths achievement and grade point average in 12th grade, as well as attendance at a 4-year college two years after high school graduation (Fredricks, 2012; Morris, 2016). These analyses controlled for individual sociodemographic traits, school characteristics, and 10th grade math achievement.

A further two studies have used longitudinal data to examine changes in extracurricular activity participation and adolescent socioemotional outcomes (Oberle et al., 2019; O'Donnell & Barber, 2021). Using Latent Transition Analysis, Oberle and colleagues (2019) compared young people in Canada according to their extracurricular activity participation trajectories between grades 4 and 7. Controlling for baseline mental health and peer belonging, they found that young people who transitioned from “non-participation” in 4th grade to “all activities” or “sports only” in 7th grade had significantly better mental health compared to youth with persistent non-participation. These associations were fully mediated by higher levels of peer belonging in 7th grade. Looking in the other direction, O'Donnell and Barber (2021) compared young people in Australia who discontinued extracurricular activity participation to those who continued across grades 8 to 9. They found that youth who ceased extracurricular activity participation exhibited higher levels of externalizing (delinquent) behaviours in 9th grade, controlling for behaviour in 8th grade.

However, as Carbonaro and Maloney (2019) have argued, the use of lagged variables as controls does not prevent potential confounding from unobserved variables affecting extracurricular activity participation and youth outcomes independently at both points of observation. To provide a stronger test of causal relationships between extracurricular activity participation and youth outcomes, more robust analytic methods are needed. A growing number of scholars have risen to meet this challenge, using methods including instrumental variables analysis (Han et al., 2017) and fixed-effects models (Carbonaro & Maloney, 2019; Coulangeon, 2018; Lipscomb, 2007). The results of these studies suggest benefits for academic achievement and delinquency. For example, adolescent participation in sports has been linked to higher academic achievement in France (Coulangeon, 2018). More broadly, extracurricular activity participation was found to have a positive relationship with academic



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achievement in the United States (Carbonaro & Maloney, 2019; Lipscomb, 2007). Han et al.'s (2017) instrumental-variables study of the relationship between extracurricular activities and delinquency finds a significant reduction in adolescents' risks of delinquency, which notably reverses the *increased* risk of delinquency found in their cross-sectional analysis. While these results are encouraging, they cover only a limited subset of potential activity-outcome relationships. Moreover, differences in country context, sample composition, and operationalisation of extracurricular activity participation (type, breadth, intensity) make it difficult to draw firm conclusions from this evidence. By using fixed-effects models to examine associations between three types of extracurricular activities and a wide range of youth outcomes, our study builds on this literature.

## 1.2. The Australian context

In some countries, notably the United States, extracurricular involvement is a common and seemingly effective strategy for bolstering the competitiveness of a college application (Wolniak et al., 2016). This is not the case in Australia where tertiary education admission is decided on the basis of academic results from the final years of high school. Nevertheless, extracurricular activity is widely promoted as a means to improve children's school results and wellbeing and to enhance their chances of improving academic achievement outcomes (Raising Children Network, 2019). As in other countries, opportunities for such activities vary according to the resources and geographical location of families with children growing up in higher socio-economic and urban families enjoying much greater access to extracurricular activities than their counterparts (Baxter et al., 2011).

Data from the Australian Institute of Health and Welfare (AIHW) shows that in 2018 the most popular extracurricular activity for Australian children aged 0–14 years was swimming, with 34 percent doing an organised swimming activity at least once a week. This was followed by soccer (15 percent), recreational dancing (10 percent), gymnastics (10 percent) and football (8 percent) (AIHW, 2020). The AIHW also report that nearly two-thirds (63 percent) of children aged 5–14 participated in one or more creative activities outside of school hours, such as drama, singing, playing a musical instrument and dancing (AIHW, 2020).

For some schools, particularly independent schools where parents pay substantial school fees, extracurricular activities such as music lessons, singing, and team sports, are more likely to



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be organised onsite and may be integrated into school activities and culture. For government schools where no or minimal fees are required, extracurricular activities are less likely to be integrated into the school culture, more likely to take place off school grounds and may require parents to be more actively involved in seeking out opportunities and helping to transport children. In 2020 about 15 percent of children attended private schools, 66 percent attended government schools and 19 percent attended Catholic schools (Australian Bureau of Statistics, 2021).

Australian families are eligible for means-tested subsidised childcare fees for children under the age of 13 years, but there are no government subsidies for the costs of extracurricular activities. Full costs for these must be covered by families unless, as noted above, the activities are provided as part of a school fee system. The opportunities for Australian children to participate in extracurricular activities will therefore be dependent on the availability of activities in their area, parental resources and time, as well as children's interests and desires.

## 2. Methods

### 2.1. Data and sample

We use data from the Longitudinal Study of Australian Children (LSAC), a dual-cohort study that has collected data on a nationally representative sample of Australian children biennially since 2004 (for details, see Australian Institute of Family Studies, 2015). LSAC data are collected from parents, teachers and study children via a combination of interviews and self-complete questionnaires. With permission, LSAC survey data are also linked to data held in government administrative databases—including, for example, the child's results in the National Assessment Program, Literacy and Numeracy (NAPLAN). In this paper we use data from the 'K' cohort of children born between March 1999 and February 2000 and aged 4 to 5 years in wave 1 of the study. The baseline sample for K cohort comprised 4,983 children, based on a response rate of 57% (Gray & Sanson, 2005). As our focus is on adolescence, we analyse data from waves 5 (2012) and 6 (2014) when study children were aged 12-13 and 14-15 respectively. Data on extracurricular activity participation was available for a total of 3,992 children (7,365 child-years) in these waves. We excluded 463 child-years with missing data on control variables, primarily parent income. After this restriction, there are 3,885 children (6,902 child-years) in the analytical sample, although the number of participants



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included varies by outcome due to different patterns of missing data. Data on academic test scores in particular suffer from a comparatively high rate of missing data due to misalignment of the testing schedule (which is based on grade at school) and the LSAC data collection schedule (which is biennial), resulting in a situation where many children complete the tests in the year preceding data collection (described in more detail below). To mitigate against potential reverse causality, analysis of test score items is therefore based on children who complete the test in the same or following year as data collection (3,387 children [5,174 child-years] to 3,401 children [5,206 child-years] depending on the specific test). For most other outcomes, there is relatively little missing data, with analysis based on 6,534-6782 child-years depending on the outcome in question.

## 2.2. Outcome variables

We examined a range of adolescent outcomes within the broad domains of academic achievement and psychosocial health. In selecting outcomes, we focussed attention on continuous measures to allow sensible comparison of the magnitude of effects across outcomes. In all cases, outcomes are standardized prior to analysis to have mean zero and standard deviation one. Where necessary, outcomes are also reverse coded such that high values represent better developmental outcomes. This was the case for measures of depressive symptoms, internalizing behaviour, externalizing behaviour, and introversion.

Academic achievement. Adolescents' academic achievement was measured via standardised test scores (NAPLAN) and parent and teacher reports. NAPLAN is a national test undertaken by all Australian students in Years 3, 5, 7 and 9. Permission was given to link NAPLAN scores to survey data in the vast majority of cases (Daraganova et al., 2013). We used NAPLAN numeracy, reading and writing results from Years 7 and 9, as these broadly correspond with LSAC waves 5 and 6 respectively. Approximately 25% of our sample were in Year 10 during wave 6 and therefore did not have a corresponding NAPLAN score. These children were excluded from analyses of these outcomes. For the remaining 75% of the sample, we used NAPLAN scores from the same year as LSAC data collection (93% of cases) or the year following (7% of cases).

Psychological sense of school membership. The Psychological Sense of School Membership (PSSM: Goodenow, 1993) scale is a validated instrument measuring the extent to which adolescents feel supported, included, and accepted by others at their school. Adolescents



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rated their level of agreement with 12 items, such as “Other students here like me the way I am” and “The teachers here respect me” ( $\alpha = 0.87$ ). Responses were measured on a scale of 1 (not true at all) to 5 (completely true), with higher scores denoting a greater sense of school belonging.

Psychosocial health. We derived measures for a comprehensive range of psychosocial health outcomes. First, we constructed three outcomes based on subscales of the School-Age Temperament Inventory (SATI; McCloskey, 1995). Reported by parents, each subscale comprised 4 items measuring adolescents’ reactivity (e.g., “When angry, yells or snaps at others”:  $\alpha = 0.87$ ), persistence (e.g., “Goes back to the task at hand (chore, housework, etc.) after an interruption”:  $\alpha = 0.81$ ) or introversion (e.g., “Is shy with adults he/she doesn’t know”:  $\alpha = 0.81$ ). Responses were measured on a scale of 1 (never) to 5 (always), with higher scores indicating higher levels of that trait in the child. Second, we used information from the adolescent-reported Short Moods and Feelings Questionnaire (SMFQ; Messer et al., 1995), a 13-item validated instrument measuring levels of depressive symptoms over the previous two weeks (e.g., “I felt miserable or unhappy”,  $\alpha = 0.96$ ). Possible responses ranged from 2 (true) to 0 (not true). Higher scores indicate higher levels of depressive symptoms. Third, we used the parent-reported version of the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997), a 25-item validated instrument capturing adolescents’ social, emotional and behavioural functioning over the previous six months (e.g., “Constantly fidgeting or squirming”,  $\alpha = 0.84$ ). Possible responses ranged from 1 (not true) to 3 (certainly true), with higher scores indicating worse socio-emotional functioning. Fourth, to measure adolescents’ health-related quality of life, we used the adolescent-reported Paediatric Quality of Life Inventory (PedsQL; Varni et al., 2001). PedsQL is a 23-item validated instrument ( $\alpha = 0.90$ ) capturing how often the child had a problem functioning across four domains over the previous month: physical (e.g., “Walking more than one block”), emotional (e.g., “Feeling afraid or scared”), social (e.g., “Getting along with other children”) and school (e.g., “Paying attention in class”). Possible responses ranged from 1 (never) to 5 (almost always), with the overall score recoded to range from 0-100 with higher scores indicating higher health-related quality of life. All items are standardized to mean zero and standard deviation 1 prior to analysis.

Peer behaviours: We constructed a summary scale capturing positive and negative peer behaviours. Adolescents were asked how many of their friends were characterised by a list of



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5 positive behaviours (e.g., “They read books for fun”) and 7 negative behaviours (e.g., “They get into trouble”). Possible responses ranged from 1 (none of them) to 5 (all of them). Alpha for the scale was 0.79.

### 2.3. Extracurricular activity variables

In waves 5 and 6, children’s primary caregivers were asked, “In the last week, has study child participated in any of the following activities?” From responses to this item, we created dummy variables for the following three activity types, with children scoring a one if they had participated in the activity over the past week and a zero if they had not: team sports (e.g., football, cricket or netball), individual sports (e.g., swimming, tennis, karate or gymnastics) and art, music or performance lessons (e.g., piano, dance, choir or drama). We chose to focus on these activity types as they are consistent with the majority of the existing literature. Several other activity types that were both less commonly reported and exhibited minimal bivariate associations in preliminary analyses were excluded from further consideration. These included community groups/clubs (e.g., scouts, guides, or cultural group), academic classes, new skill classes (e.g., computing or learning another language), and religious groups. In supplementary analyses, we also considered a dummy indicating participation in any of the three activity categories within the past week, and a count of the number of different activity categories within the past week.

### 2.4. Control variables and moderators

We controlled for a range of time-varying factors that may confound the relationship between extracurricular activity participation and adolescent outcomes. Child age was measured in months at the time of the interview. Parent income was a measure of the child’s mother’s and father’s combined income, measured in \$10,000s (2018 AUD), top-coded to \$450,000. Financial hardship was a variable indicating the number of financial hardships the family reported experiencing in the past year (e.g., not able to pay rent or mortgage on time, went without meals; possible range = 0–6). School type was coded as a dummy, with zero representing public school and one representing private (either Catholic or independent) school. Family structure was a four-category measure, including 1) resident with both biological parents, 2) resident with one biological and one non-biological parent, 3) resident with one biological parent, and 4) other family structures. Finally, to allow for possible



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seasonal variations related to data collection, we controlled for the month the interview was completed.

## 2.5. Analysis method

We model the effects of extra-curricular activity participation using fixed-effects panel models (Allison, 2009). Fixed-effects models rule out time-invariant confounders by estimating effects using only within-person variation in the outcome and predictors. Given likely strong confounding of the relationship between extracurricular activity participation and children's development, this represents an important advantage. Only a limited number of previous studies have adopted this approach to study effects of extracurricular activity participation (Carbonaro & Maloney, 2019; Coulangeon, 2018; Lipscomb, 2007), and as such there is a need for further studies adopting this methodology. Despite the important advantages of the fixed-effects approach, it is important to acknowledge that effects may still be biased by omitted time-varying confounders, and by possible reverse causality. All analysis was conducted in Stata 16.

## 3. Results

Summary statistics for variables included in the analysis are presented in Table 1 on the following page. The most common type of extracurricular activity in the sample was team sport (44.9% of child-observations), followed by arts (30.4%) and individual sports (24.3%).

**Table 1: Summary statistics**

	Mean or %	Std. Dev.	N (obs.)
<i>Outcomes</i>			
NAPLAN Reading score	0	1	5206
NAPLAN Writing score	0	1	5201
NAPLAN Numeracy score	0	1	5174
Sense of school membership	0	1	6534
PEDS Emotional functioning	0	1	6776
PEDS School functioning	0	1	6774
PEDS Social functioning	0	1	6766
PEDS Psychosocial health summary	0	1	6776
SMFQ Depressed feelings	0	1	6711
SDQ Externalizing behaviour	0	1	6779
SDQ Internalizing behaviour	0	1	6779
SATI Reactivity	0	1	6782
SATI Introversion	0	1	6780
SATI Persistence	0	1	6781
Positive peer behaviours	0	1	6716
<i>Extracurricular Activity Participation</i>			
Team sport last week	44.9		6902
Individual sport last week	24.3		6902
Arts last week	30.4		6902
<i>Demographics</i>			
Child age (months)	165.8	12.5	6902
<i>Family socioeconomic status</i>			
Parent income (\$10,000 units)	12.6	8.5	6902
Financial hardships (0 to 6)	.3	.7	6902
Private school	47.8		6902
<i>Family structure</i>			
Two biological parent family	73.8		6902
Step family	8.7		6902
Single parent family	16.9		6902
Other family structure	.6		6902

Table 2 presents two estimates for each activity-outcome pair: (1) unadjusted random-effects estimates of the effects of extracurricular activity participation and (2) fixed-effects estimates adjusted for observed time-varying confounders.



**Table 2: Effects of extracurricular activity participation**

	Team sport		Individual sport		Arts	
	RE	FE	RE	FE	RE	FE
NAPLAN Reading score	0.02	-0.00	0.06	-0.02	0.18***	-0.02
NAPLAN Writing score	0.06*	-0.02	0.08**	-0.00	0.31***	0.08
NAPLAN Numeracy score	0.08***	0.04*	0.07**	0.01	0.14***	0.03
Sense of school membership	0.20***	0.07*	0.08**	0.01	0.11***	0.06
PEDS Emotional functioning	0.18***	0.09**	0.11***	0.09**	0.06*	0.07
PEDS School functioning	0.23***	0.10**	0.15***	0.04	0.13***	0.01
PEDS Social functioning	0.23***	0.08*	0.13***	0.10**	0.07**	0.01
PEDS Psychosocial health summary	0.21***	0.09**	0.14***	0.09**	0.12***	0.05
SMFQ Depressed feelings	0.15***	0.02	0.07*	-0.05	0.07**	-0.01
SDQ Externalizing behaviour	0.06**	0.02	0.04	-0.00	0.11***	0.03
SDQ Internalizing behaviour	0.23***	0.08**	0.07**	0.02	0.08**	0.03
SATI Reactivity	0.08***	0.03	0.00	-0.04	0.03	0.03
SATI Introversion	0.10***	0.01	0.07**	0.05	0.08**	0.09**
SATI Persistence	0.10***	0.07**	0.04	-0.01	0.16***	0.03
Positive peer behaviours	0.07**	0.05	0.12***	0.04	0.28***	0.09*

Note: \* p < 0.05, \*\* p < 0.01, \*\*\*, p < 0.001. Parameters are expressed in standard deviation units of the outcome in all cases. *RE*: Random-effects model, no controls. *FE*: Individual fixed-effects regression model, controls for child age, private school attendance, family structure, parent income, financial hardships, month of interview.



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The unadjusted random-effects estimates confirm the expectation of substantial positive associations between extracurricular activity participation and child developmental outcomes across several domains. The pattern of effects differs notably between activity type, with a group of outcomes representing socio-emotional wellbeing and school connectedness exhibiting the strongest associations with sports (both team and individual) participation. This includes outcomes such as (low) internalizing behaviours, PEDS school, social, and emotional functioning, sense of school membership, and depressive symptoms. Associations between extracurricular activity participation and these outcomes are generally stronger for team sport than individual sport – effect size point estimates range from roughly 0.14 to 0.23 of a standard deviation for team sport, compared to a range of 0.09 to 0.14 for individual sport. Relatively smaller associations were found between sports participation and NAPLAN results, externalizing behaviours, and SATI reactivity scores.

In contrast to results for sports participation, test scores and positive peer characteristics stand out as being particularly strongly associated with arts participation. Raw effect sizes of arts participation on both NAPLAN (writing) scores and peer characteristics are in excess of one-quarter of a standard deviation. Effects on other test-scores and persistence are also among the strongest associations with arts participation. On the other hand, associations of arts with outcomes indicative of socio-emotional wellbeing are, while positive, notably smaller than what we observe for team sports. These results therefore indicate clear differentiation between the activity types and the kinds of outcomes they are most strongly associated with – team sport is linked to better socio-emotional functioning and school connectedness across several indicators, whereas arts participation is more clearly related to academic outcomes (test scores) and peer characteristics. Individual sport exhibits a similar pattern to team sport, albeit with generally weaker associations.

Although the above results are consistent with previous literature reporting associations between extracurricular activity and positive adolescent outcomes, we stress they are unadjusted for any potential (observed or unobserved) confounding. As such, they are best viewed as a ‘baseline’ for comparison with our main fixed-effects results. These models adjust for a) observed time-varying demographics and family background (child age, family structure, parental income, financial hardship, and month of interview), and b) all time-invariant confounding. Effects are much smaller in magnitude across the board, and in most cases are both substantively close to,

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and statistically consistent with, zero. This suggests that a large part of the observed associations between extracurricular activity participation and child development is likely due to confounding rather than causal effects of participation per se. Supplementary analysis (not shown) using the random-effects estimator with observed controls for demographic and family background resulted in an intermediate pattern – smaller effects than the unadjusted baseline estimates, but still considerably larger than the fixed-effects estimates. This indicates that controls for potential observed confounders (as is common in the literature) is unlikely to be sufficient to reliably estimate causal effects of extracurricular activity participation.

Nonetheless, a number of associations remain after the switch to the fixed-effects approach. Results for team sports are consistent with small, but meaningful, positive effects of participation on the same set of socio-emotional and school functioning items which showed the strongest associations in the unadjusted analyses. This includes (reduced) internalizing behaviours (0.08,  $p < 0.01$ ), PEDS school (0.10,  $p < 0.01$ ), social (0.08,  $p < 0.05$ ), and emotional functioning (0.09,  $p < 0.01$ ), sense of school membership (0.07,  $p < 0.05$ ), and SATI persistence (0.07,  $p < 0.01$ ). We find also a marginally significant positive effect of team sport participation on numeracy test scores (0.04,  $p < 0.01$ ). By comparison, effects for individual sport and arts participation are generally smaller and more limited in scope. For individual sport, we find positive effects for PEDS social functioning (0.10,  $p < 0.01$ ), the PEDS psychosocial summary (0.09,  $p < 0.01$ ), and PEDS emotional functioning (0.09,  $p < 0.01$ ), with no other effects significantly different from zero. For arts participation, we find positive effects on peer behaviours (0.09,  $p < 0.05$ ) and (reduced) introversion (0.09,  $p < 0.01$ ) in the fixed-effects analysis.

#### 4. Discussion

This study investigated the effects of participation in three kinds of extracurricular activity – team sport, individual sport, and arts – on Australian adolescents' academic achievement, psychosocial health, and peer networks. Bivariate analyses confirmed the expectation of widespread associations between extracurricular activity participation and positive developmental outcomes. In fixed-effects analyses, however, most of these associations were not statistically distinguishable from zero. Those effects that retained statistical significance in the fixed-effects analysis were substantially smaller in magnitude. Overall, our results suggest that most – but not all – of the relationship between extracurricular activity participation and positive



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adolescent development is driven by selection rather than causal effects of activity participation per se.

Most strikingly, we find a consistent pattern of small beneficial effects on mental health linked to sports participation. Both team and individual sports were found to have positive effects on three of the PEDS domains – social functioning, emotional functioning, and the overall psychosocial score. Participation in team sports was also related to PEDS school functioning, positive sense of school membership, persistence (SATI), and reduced internalizing behaviours (SDQ). This suggests potentially broader benefits of team-based sports in integrating adolescents in school- and peer-networks, and echoes Oberle et al.'s (2019) findings that activity participation carries mental health benefits through mediating pathways of peer belonging.

No effects of sports participation were found for outcomes measuring reactivity (SATI), externalizing behaviours (SDQ), introversion (SATI), or depressive symptoms (SMFQ). The failure to find an effect of sports participation on depressive symptoms seems contradictory given the strong substantive overlap with items in the SDQ internalizing behaviour and PEDS emotional functioning measures. It is possible that this reflects differences in the reporter: both the SDQ and PEDS measures are parent reported, while the SMFQ is child reported. Parents may be less reliable reporters of a child's thoughts and emotional states and could (mis)interpret sports participation as an indicator of positive child well-being. Future research should further investigate potential reporter-dependent effects of extracurricular activities.

Arts participation, meanwhile, was associated with distinct benefits – reduced introversion and better peer behaviours. The finding that arts participation increases positive peer behaviours is notable in light of previous research that has linked sports participation to peer networks characterized by negative behaviours such as alcohol consumption and delinquency (Gardner et al., 2009). Arts participation may bring involvement in peer networks and social contexts that are less likely to involve such behaviour, suggesting that arts and sports participation support different dimensions of positive adolescent development.

Notably, we found minimal effects of extracurricular activity participation on academic achievement – team sports participation was found to have a marginally significant positive effect on numeracy test scores, with no other statistically significant findings in the fixed-effects analysis. This represents an important departure from previous longitudinal studies of US

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(Carbonaro & Maloney, 2019; Lipscombe, 2007) and French (Coulangeon, 2018) adolescents, which have consistently reported beneficial effects of extracurricular activity participation on academic achievement, academic self-concept, and expectations for educational attainment. If transferrable adolescent skill development were the primary mechanism, it is unclear why these effects should differ cross-nationally – indeed, the nature of adolescents' lived experiences of activity participation is likely very similar across contexts. Alternatively, differences between our findings and previous work may reflect distinct processes of unobserved time-varying selection into extracurricular activity participation. In the Australian context, there is little direct incentive for adolescents to pursue extracurricular activity to advance their post-school study (as is the case in the US). This could weaken selection into activity participation by time-varying factors related to academic achievement.

#### **4.1. Limitations and directions for future research**

The fixed-effects approach employed in this paper has the great strength of eliminating time-invariant unobserved confounding, thereby offering a stronger test of the effects of extracurricular activity participation than most previous literature. Nonetheless, there are important limitations. First, our analysis cannot account for unobserved time-varying confounders, nor reverse causality. Second, we study contemporaneous effects, whereas benefits of extracurricular activity participation may persist or accumulate over time. While some previous research has linked trajectories of activity participation to adolescents' wellbeing (e.g., Crosnoe et al., 2015), this work has yet to grapple with the conditions required for causal inference, particularly the problem of dynamic 'feedback' between activity participation and confounders over time. Future work could study cumulative effects of activity participation using techniques such as marginal structural models (Robins et al., 2000) or the regression-with-residuals approach of Wodtke (2020).

#### **4.2. Conclusion**

Participation in extracurricular activities has important benefits for adolescents' mental wellbeing, with the largest benefits attributable to team sports. Previous findings linking extracurricular activity participation to academic achievement in other national contexts were not replicated for a large cohort of Australian adolescents. Policy should aim to increase adolescents'



participation in extracurricular activities, particularly among disadvantaged groups that are currently less likely to participate.



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