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Does artistic activity help kids avoid obesity? Emergent considerations in the ecology of childhood BMI

Baeksan Yu [a,b,*], Sean Kelly [c]

[a] Department of Mental Health and Suicide, Norwegian Institute of Public Health, Oslo, Norway
[b] PROMENTA Research Center, Department of Psychology, University of Oslo, Norway
[c] Department of Educational Foundations, Organizations, and Policy, University of Pittsburgh, PA, USA

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ABSTRACT

Although the positive relationship between arts engagement and mental health is well documented, arts participation may be an emergent factor in the ecology of childhood obesity. Prior research hypothesized several potential health benefits of arts participation including healthy diet and lifestyles, but the available evidence is mainly limited to cross-sectional covariate-adjustment models for the adult population. We employed a newly released panel of the Early Childhood Longitudinal Study kindergarten cohort (ECLS-K: 2011), which is a nationally representative sample of American children who entered kindergarten in 2010–2011 ($n = 15{,}820$). We applied both dynamic panel models with Maximum Likelihood estimation as well as difference-in-differences models to address unobserved heterogeneity. Our results showed that childhood arts activity is significantly associated with reduced weight status in elementary schooling. In particular, arts participation in elementary schooling reduced the risk of being overweight on a year-to-year basis; the effect size was between 12% and 23% of a SD of BMI for all children. Arts participation at kindergarten also had a significant relationship with cumulative changes in BMI over the course of elementary schooling, especially for female and White female children (about 22% and 32% of a SD of BMI). There are considerable arts participation gaps between families and regions, and these early artistic experiences appear to affect the risk of being overweight. This suggests the possibility of a larger social reproduction process via an ecological pathway that might be easily overlooked—the accumulation of arts experience and concurrent health inequalities in childhood.

1. Introduction

The Ecological Model of Childhood Obesity highlights the importance of child, family, community, and societal characteristics in determining body weight (DeMattia and Lee, 2008). These include race/ethnicity, socioeconomic status, parental health behaviors, and access to educational and recreational opportunities that affect diet and exercise. However, while prior research has primarily focused on family- and school-based interventions targeting diet and physical activity (Wang et al., 2015; Smith et al., 2020), this study focuses on the possible link between early arts experience and obesity as an explanation for increased health and social inequalities.

This study is set in the United States, which has the highest rate of obesity among OECD countries. By 2030, about 47% of the US population is expected to be obese (OECD, 2017). In particular, the percent of children and adolescents (2–19 years) with obesity in the US increased from 13.9% in 2000 to 18.5% in 2016, and 18.4% of school-aged children (6–11 years) had obesity in 2016. Previous studies also revealed differences in the prevalence of obesity by social class, race/ethnicity, and gender. In 2016 the prevalence of obesity among Hispanic (26%) and Black (22%) children and adolescents was almost twice that of Whites (14%) and Asians (11%) (Hales et al., 2017). Not only is obesity related to serious health conditions, it also affects educational and labor market outcomes, reinforcing existing social inequalities. Moreover, childhood obesity is a strong predictor of adulthood obesity. As such, childhood obesity has become one of the most pressing public health concerns (Kumar and Kelly, 2017).

Children's arts experiences, however, are not often raised in scientific discussions of obesity, perhaps because interventions concerning nutrition and exercise seem to efficiently target proximal causes. Yet, several previous studies report an association between artistic experiences and childhood health. One explanation for this association is that

* Corresponding author at: Norwegian Institute of Public Health, PO Box 222, Skøyen, 0213 Oslo, Norwary.
E-mail address: baeksan.yu@fhi.no (B. Yu).

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participation in arts reflects student and family cultural capital, but may not itself have a direct causal effect on health outcomes (Abel, 2008). For example, participation in the arts might be generally revealing parent socioeconomic status that provides and reinforces healthy behaviors, without any art-specific effect per se. On the other hand, the cultural capital literature argues that access to artistic culture creates and reinforces more global cultural differences associated with social class (Bourdieu, 1987; Pampel, 2012; Oude Groeniger et al., 2020), such that the effect of arts participation may not be entirely spurious but also have reciprocal effects on cultural capital and thus an indirect effect on health outcomes. For example, participation in exclusive cultural activities might expand children's social networks with children and adults that generally favor healthy lifestyles (Abel, 2008).

We also posit a potentially more direct effect of arts participation on health outcomes in childhood, through a set of social-psychological mechanisms. In particular, Hamilton, Fancourt, and colleagues have documented that arts engagement can promote self-confidence, psychological well-being, and mental health (Fancourt et al., 2020; Hamilton et al., 2003; Mak and Fancourt, 2019; Fancourt and Finn, 2019). Relatedly, although perhaps not entirely unique to the arts, arts participation may promote belonging and identity formation (e.g., by sharing interests with peers) (Stickley, 2010), reducing problems of not fitting-in and resulting negative coping mechanisms, particularly for girls (Crosnoe, 2011). Bone et al. (2022) and Winsler et al. (2011) also showed that children who participated in arts programs tend to have high self-regulation and control. These studies indicated that arts engagement may enhance self-control by providing opportunities for expressing emotions or by improving social and problem-solving skills. The increased psychological well-being and self-regulation may promote healthy body weight (Avila et al., 2015; Koike et al., 2016).

Yet, limitations in available data have restricted inquiry into the effects of participation in the arts and cultural activities to basic cross-sectional covariate-adjustment models for the adult population (Pampel, 2012; Oude Groeniger et al., 2020). Overall, although previous studies agree on the potential health benefits of artistic experiences, these effects on weight status have not been documented in large-scale, longitudinal data. Recently, Callinan and Coyne (2020) highlighted that more research on arts-based interventions are needed for children with long-term outcomes, including objective measures. The incorporation of high-quality body mass index (BMI) measures in the US National Center for Education Statistics (NCES)' early childhood longitudinal study program now provides robust data on the ecology of childhood obesity and arts participation.

The present study builds off of Oude Groeniger et al. (2020) and Pampel (2012) studies of the link between overall cultural capital and body weight. However, we particularly focused on the influence of early arts engagement, one essential component of cultural capital, on BMI. We proposed that early arts experience is part of an intertwined set of cultural processes that orient children to healthy lifestyles, but that also positively impact socialization, psychological well-being, and self-regulation, which in turn affects their BMI. Consequently, we posed two interrelated/reinforcing research questions: 1) What is the longitudinal relationship between artistic experiences and BMI in elementary schooling? 2) Can early participation in arts activities at kindergarten provide significant returns in reducing the risk of being overweight? Previous studies highlighted that culture and body image are tightly coupled in particular for girls (Wang et al., 2009) and that the prevalence of obesity itself is more pronounced for racial/ethnic minorities (Hales et al., 2017). These empirical regularities led us to further investigate the present relationships across gender and race/ethnicity.

2. Methods

2.1. Data source

The Early Childhood Longitudinal Study kindergarten cohort (ECLS-K: 2011) is a nationally representative sample of American children who entered kindergarten in 2010–2011. The ECLS-K followed the kindergarten cohort of 2010–2011 through the 2015–2016 school year, providing a comprehensive picture of children's academic development until secondary school. The study also included a wide range of data on the children, their homes, and school environments based on a three-step sampling design (Tourangeau et al., 2015). Approximately 18,170 kindergarteners from 1,310 schools were sampled in the baseline year. This study employed the data from kindergarten (mean age of 6.12 in spring) to fifth grade (mean age of 11.08 in spring). The final analytic sample was 15,820.

2.2. Measures

2.2.1. BMI

Following previous studies (Von Hippel et al., 2007), this study employed the standard definition of BMI (weight/height^2) raw score. Cole et al. (2005) argue that adiposity in growing children is well represented by the raw score as opposed to a standardized BMI z-score or other transformation. We used the composite BMI calculated by mean weight and height from two measurements at each time point (Hsu et al., 2019). To obtain accurate measurements, child's height was measured with a Shorr board and a digital scale for weight (Tourangeau et al., 2015).

2.2.2. Arts activity

In ECLS-K, after school participation in music, art, drama, and performing arts classes was measured annually beginning in kindergarten. However, among these indicators, drama lessons had an extremely low frequency of participation (2.18%). Additionally, performing arts programs may differ substantively from music and art lessons in that they often entail substantial physical activities (such that any effects on BMI may stem from a more direct set of mechanisms). In contrast, music and art lessons showed similar and higher participation rates (10%) and the highest Tetrachoric correlation (0.4) among the original four classes of after school activities. Thus, our composite measure includes only children's participation in art (e.g., painting or drawing) and music (e.g., piano or instrumental music) lessons outside of school hours, in a 0–2 scale (none, participation in one category, participation in both). We then controlled for participation in drama and performing arts activities as time-varying controls rather than include them in the arts activity composite measure.

2.2.3. Confounders

Since dynamic panel (DP) models and difference-in-differences (DID) models can effectively address unobserved time-invariant confounders (see more in the analytic section), we controlled several observed potential time-varying confounders, including family income, child's math, science, and reading item response theory scores, family size, and single parent status (see more on appendix A).

2.3. Statistical analysis

We first investigated the year-to-year, longitudinal association between arts participation and BMI in elementary school with DP modeling, and then investigated the short- and long-run returns of early arts participation with DID models. While the first set of models provides the most fine-grained assessment of the association controlling for multiple lagged effects, the DID models estimate the short- and long-run returns of early artistic experiences, by calculating the average difference in BMI for participants and non-participants over specific periods of time. Overall, the models used here capitalize on repeated measure to overcome inferential challenges plaguing data with only two time points (Kelly and Ye, 2017).

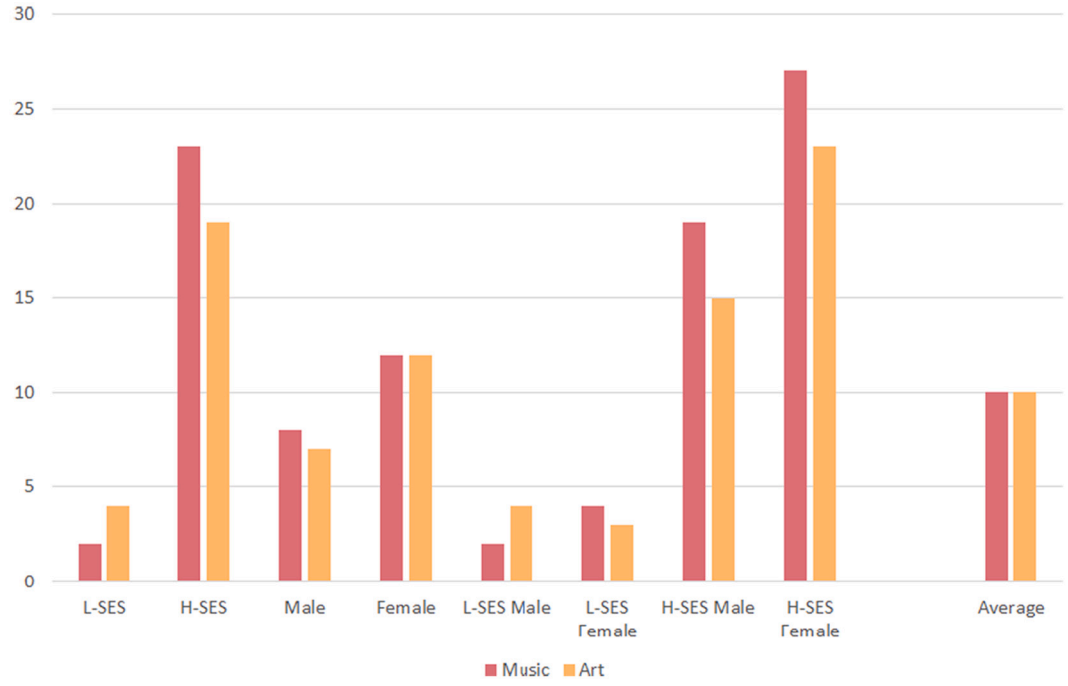

Fig. 1. Participation in Arts Activities (percent participating) by Family Background and Gender.

2.3.1. Modeling the longitudinal relationship between arts activity and BMI in elementary schooling

We employed recently developed dynamic panel models with maximum likelihood estimation (Allison et al., 2017). In observational studies, children in affluent families and schools may have more opportunities to participate in music or art activities. Moreover, overweight children may be encouraged to participate in physical activities to reduce their weights rather than arts activities (generating reverse causality). Dynamic panel modeling can effectively address this potential reverse causality in a fixed-effects model framework. The basic model can be written as follows:

$$Y_{it} = \alpha + \beta_1 X_{it-1} + \beta_2 Y_{it-1} + U_i + \varepsilon_{it},$$

where X_{it-1} and Y_{it-1} represent lagged arts activity and BMI respectively that change across t but not i; U_i represents student fixed-effects; ε_{it} is an idiosyncratic error term that varies across units and time. The lagged specification is of importance since it determines the direction of causality (Allison, 2009). Additionally, previous levels of BMI also determine current levels of BMI (Ng et al., 2012), and this was empirically modeled here. We also controlled for potential time-varying confounders (e.g., family income and academic achievement), and conducted several sensitivity analyses for our baseline estimates from DP models (for a detailed introduction to DP modeling see appendix B).

2.3.2. Modeling the short- and long-run returns to early arts participation

We then investigated the short- and long-run consequences of early participation in arts activity on BMI (at 1st and 5th grade) based on a school-fixed difference-in-differences specification as follows:

$$Y_{it} = \alpha + \alpha' S_i + \beta_1 C_i^1 + \beta_2 C_i^2 + \theta T_t + \delta_1 (C_i^1 \times T_t) + \delta_2 (C_i^2 \times T_t) + \beta' X_{it} + \varepsilon_{it},$$

where Y_{it} represents student BMI, C_i^1 (=1) and C_i^2 (=2) are counts of early participation in artistic cultural activities at kindergarten (ref = 0), T_t is a time-fixed effect which denotes 1st or 5th grade (ref = kindergarten), X_{it} is a vector of observed time-varying confounders, and S_i represents the schools in this sample. Thus, the α' coefficients capture differences between the means of each school and the omitted school; school fixed-effects help account for selection effects not fully accounted for by observable measures. In this double-treatments setup, we are particularly interested in the interaction effects of δ_1 and δ_2; the returns of arts participation measured at two levels. The interaction terms are identical to estimates calculating the average difference in BMI separately for participants and non-participants over periods (first difference) and then taking the difference between the average changes in BMI for the two groups (second difference). Since ECLS-K provided baseline BMI, it is also possible to control for a pre-trend of BMI as a robustness check (for details, see Raudenbush (2001)). Now using three time points of BMI data, we expanded the above equation by adding additional interaction effects estimating the treatment effect controlling for pre-trends.

$$Z_t + \delta_3 (C_i^1 \times Z_t) + \delta_4 (C_i^2 \times Z_t)$$

Here Z_t is a dummy variable taking on a value of 1 at only the last time point (i.e., 1st or 5th grade) and 0 otherwise, while T_t is now coded: 0, 1, 2 at each time point. Thus, δ_3 and δ_4 are the deflection experienced by child i between times 2 and 3, after accounting for different pre-treatment growth rates between treatment groups. Finally, the heterogeneous returns to arts participation were examined using interactions with student socio-demographic characteristics. Missing cases were imputed with full information maximum likelihood for DP models and multiple imputation for DID models generating 10 data sets (for details see appendix C). Mplus 8.0 and Stata/SE 17.0 were employed to carry out the proposed methods.

3. Results

3.1. Disparities in arts activity

Fig. 1 illustrates rates of participation in after-school arts activities by family SES and gender at the baseline. We use the composite family SES variable in the ECLS-K and generate high- and low-SES families based on a 20th percentile specification. There were considerable, even profound gaps in arts participation between low- and high-SES families; children from high-SES families were about 5 and 10 times more likely to participate in art and music classes, respectively. Female students were about 1.5 times more likely to participate in arts activities

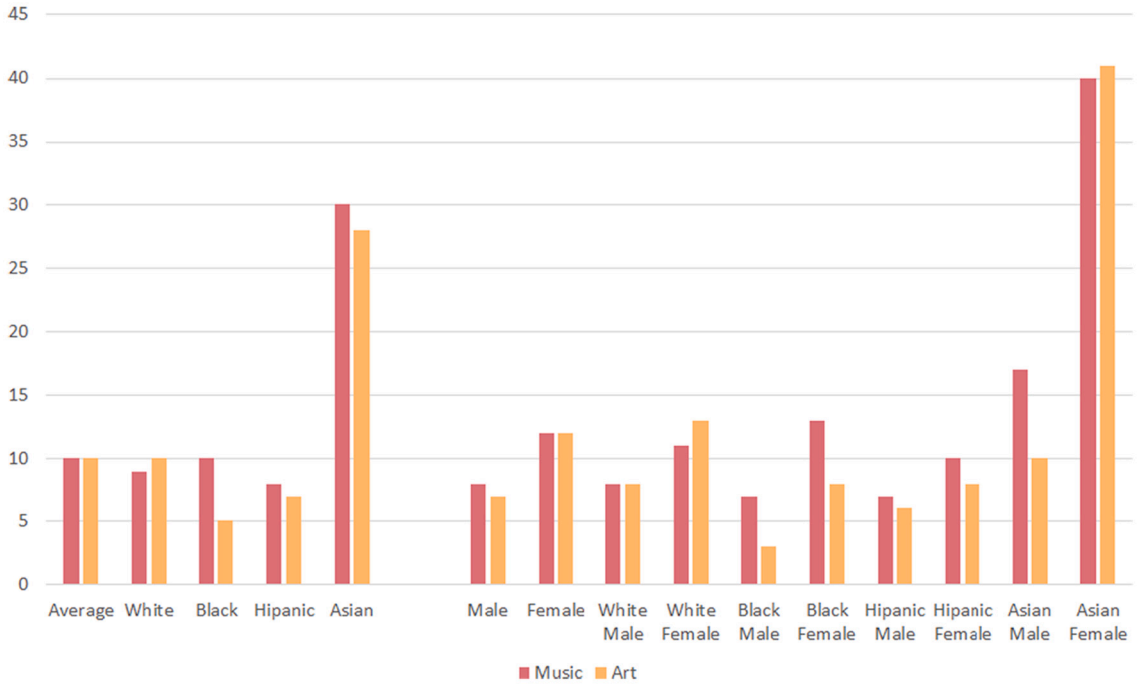

Fig. 2. Participation in Arts Activities (percent participating) by Race/Ethnicity and Gender.

Fig. 3. Participation in Arts Activities (percent participating) by School Locations and Regions.

compared to male students. Fig. 2 depicts the arts participation gaps between race/ethnicity and gender. It revealed that the high rates of arts participation among Asians is mainly due to female students' participation (about 40%). Regional gaps in the US in arts participation are illustrated in Fig. 3. Children living in the South and Midwest were less likely to participate in art or music class compared to those in the West and Northeast. Those children attending schools in towns also had considerable disadvantages for after-school arts education; the participation rates in music (5%) and art (4%) classes were, in general, two times lower than children from other school locations. Overall, we found considerable gaps in exposure to the arts between family backgrounds and even entire regions.

3.2. The longitudinal relationship between arts activities and BMI in elementary schooling

Table 1 provides results from DP models. The model fits were excellent in terms of CFI, TLI, RMSEA, implying that our proposed models are consistent with the ECLS-K data. Although DP modeling can effectively identify lagged effects of arts activity after accounting for reverse causality and unobserved time-invariant confounding, we conducted several sensitivity analyses for our baseline specification, M1. Specifically, in M2 we allowed time-invariant unobserved heterogeneity (U_i) to vary over time. By doing so, the time-varying parameter U_i may capture the influence of unobserved time-varying effects of time-invariant confounders. In M3, we further allowed the key IV to covary with not only past residuals but also contemporaneous residuals to address unobserved time-varying confounding presented in the time-specific current residuals (for more information on our sensitivity tests, see appendix D).

The estimates from M1 showed that those children who participated in at least one arts activity tend to have lower BMI with an annual average decline of 0.08 points. Thus, for those children who participated in both art and music lessons, the expected decrease of BMI for 4 years was about 16% of a SD of BMI ((−0.08*2)*4/4.11), and was robust to multiple specifications; M3 showed that our baseline estimate (M1) might be conservative. Interestingly, the observed returns were more pronounced for male (−0.09) and Hispanic male children (−0.17). Yet, the results became marginally significant at $p < .10$ in M2 and M3 specifications. Thus, more emphasis should be placed on the estimates for all students.

In Table 1, however, we implicitly assumed that influences of arts participation are constant over time, as in a traditional regression model. Yet, constraining the time-varying arts variable to be constant over time may not be realistic, if, for example, activities become more

Table 1
Results from Dynamic Panel Models with ML.

Sample	Model fit	M1	M2 (time-varying U_i)	M3 (endogenous)
Total (15,820)	CFI = 0.98; TLI = 0.97; RMSEA = 0.03	−0.08** [−0.13 to −0.03]	−0.06** [−0.10 to −0.01]	−0.12* [−0.21 to −0.03]
Male (8,070)	CFI = 0.98; TLI = 0.97; RMSEA = 0.03	−0.09* [−0.17 to −0.01]	−0.08* [−0.14 to −0.01]	−0.14 [−0.28 to 0.01]
Female (7,730)	CFI = 0.98; TLI = 0.97; RMSEA = 0.03	−0.06 [−0.13 to 0.01]	−0.07 [−0.14 to 0.00]	−0.09 [−0.21 to 0.03]
Black male (1,000)	CFI = 0.97; TLI = 0.95; RMSEA = 0.04	−0.11 [−0.35 to 0.12]	−0.04 [−0.21 to 0.14]	−0.27 [−0.76 to 0.22]
Black female (930)	CFI = 0.97; TLI = 0.96; RMSEA = 0.03	−0.05 [−0.28 to 0.19]	−0.08 [−0.32 to 0.15]	−0.05 [−0.43 to 0.32]
Hispanic male (2,110)	CFI = 0.97; TLI = 0.97; RMSEA = 0.03	−0.17* [−0.34 to −0.001]	−0.13 [−0.27 to 0.02]	−0.30 [−0.64 to 0.03]
Hispanic female (2,040)	CFI = 0.98; TLI = 0.98; RMSEA = 0.02	−0.03 [−0.16 to 0.11]	−0.10 [−0.25 to 0.06]	−0.02 [−0.27 to 0.24]
White male (3,830)	CFI = 0.98; TLI = 0.97; RMSEA = 0.03	−0.08 [−0.19 to 0.03]	−0.03 [−0.11 to 0.05]	−0.14 [−0.37 to 0.09]
White female (3,570)	CFI = 0.97; TLI = 0.97; RMSEA = 0.03	−0.09 [−0.18 to 0.003]	−0.06 [−0.13 to 0.01]	−0.18 [−0.41 to 0.05]
Asian male (640)	CFI = 0.97; TLI = 0.95; RMSEA = 0.04	−0.08 [−0.25 to 0.09]	−0.04 [−0.16 to 0.09]	−0.14 [−0.40 to 0.13]
Asian female (730)	CFI = 0.98; TLI = 0.97; RMSEA = 0.03	0.06 [−0.11 to 0.23]	0.02 [−0.12 to 0.17]	−0.01 [−0.27 to 0.26]

***$p < .001$ **$p < .01$ *$p < .05$. Note: 95% CI reported below each estimate. Standard errors were adjusted with cluster option. MLR estimator and subpopulation option were employed. Sample sizes were rounded to be nearest 10 in accordance with NCES secure data. Comparative fit index (CFI), Tucker–Lewis index (TLI), and root mean square error of approximation (RMSEA) reported for model fit indices.

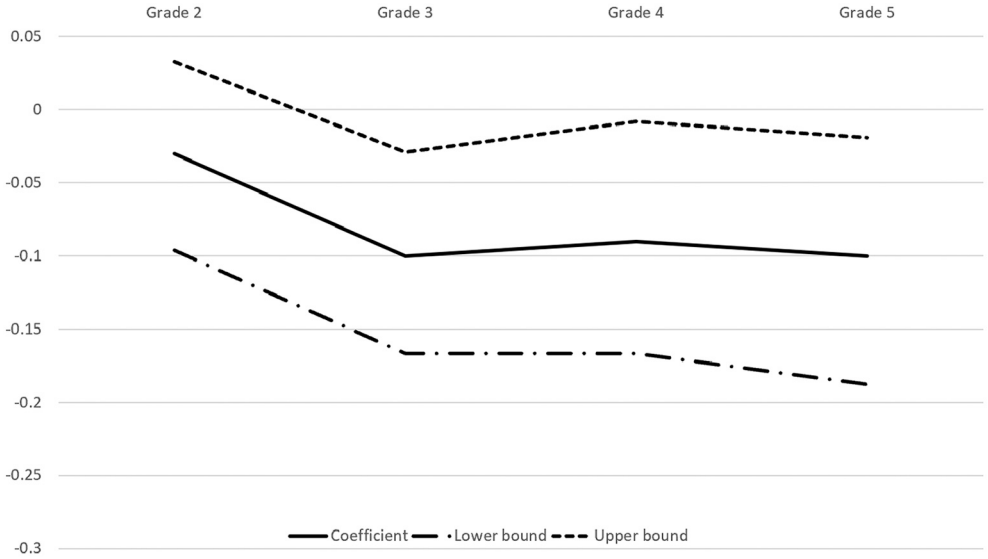

Fig. 4. Time-varying relationship between arts participation and BMI.

Table 2
Double-Treatment Difference-in-differences Model for short- and long-run changes in BMI.

Treatment level (number of activities)	Total	Total		White	
		Male	Female	Male	Female
Kindergarten to 1st grade					
1 Act.	−0.03	−0.03	−0.03	−0.10	−0.03
	[−0.09 to 0.04]	[−0.13 to 0.06]	[−0.11 to 0.04]	[−0.21 to 0.01]	[−0.13 to 0.07]
2 Act.	−0.10	0.02	−0.20*	−0.03	−0.22*
	[−0.23 to 0.04]	[−0.18 to 0.23]	[−0.36 to −0.04]	[−0.26 to 0.19]	[−0.43 to −0.02]
Kindergarten to 1st grade (pre-trend controlled)					
1 Act.	−0.04	−0.05	−0.03	−0.14	−0.08
	[−0.13 to 0.05]	[−0.20 to 0.09]	[−0.13 to 0.08]	[−0.30 to 0.02]	[−0.23 to 0.07]
2 Act.	−0.10	−0.02	−0.16	−0.14	−0.23
	[−0.30 to 0.09]	[−0.32 to 0.27]	[−0.40 to 0.08]	[−0.46 to 0.19]	[−0.48 to 0.01]
Kindergarten to 5th grade					
1 Act.	−0.28***	−0.27*	−0.31**	−0.36*	−0.27*
	[−0.43 to −0.13]	[−0.50 to −0.04]	[−0.50 to −0.11]	[−0.67 to −0.05]	[−0.53 to −0.01]
2 Act.	−0.66***	−0.36	−0.90***	−0.50	−1.17**
	[−0.99 to −0.33]	[−0.87 to 0.14]	[−1.33 to −0.46]	[−1.31 to 0.31]	[−1.84 to −0.50]
Kindergarten to 5th grade (pre-trend controlled)					
1 Act.	−0.29***	−0.28*	−0.31**	−0.39*	−0.33*
	[−0.45 to −0.13]	[−0.53 to −0.03]	[−0.52 to −0.10]	[−0.72 to −0.07]	[−0.60 to −0.06]
2 Act.	−0.66***	−0.39	−0.89***	−0.58	−1.22***
	[−1.02 to −0.30]	[−0.93 to 0.14]	[−1.35 to −0.43]	[−1.42 to 0.27]	[−1.88 to −0.57]

***$p < .001$ **$p < .01$ *$p < .05$. Notes: 95% CI reported below each estimate. Standard errors were adjusted with cluster option. Results were similar with the models based on the logarithm of BMI. Sample sizes were rounded to be nearest 10 in accordance with NCES secure data.

immersive or otherwise change over time. By exploiting the advantages of dynamic panel modeling with ML, we relaxed this assumption and illustrated how arts influences vary over time in Fig. 4, showing 95% CIs; results shown for all students (M1 in Table 1). Fig. 4 reveals a stronger effect on (reducing) BMI in grades 3–5 than in Grade 2.

3.3. The short- and long-run returns to early arts participation at kindergarten

Table 2 illustrates results from the double-treatment DID specification over two time gaps: Kindergarten to 1st grade, and Kindergarten to 5th grade. Table 2 shows that apart from female (−0.20) and White female children (−0.22), there were no observed significant returns to early arts activity for 1st graders (results for other groups see appendix E). After accounting for different pretreatment growth rates, the significant effects disappeared; this estimate calls into question the most immediate returns to early arts participation. After five years, however, significant returns were observed, more consistent with results from DP models. Specifically, the observed return for those children who participated in both art and music classes at kindergarten was about 16% (−0.66/4.11) of a SD of BMI, which is almost identical to findings from the DP models. Notably, the returns of early arts participation were more pronounced for female and especially White female children. A maximum effect size of a 32% reduction in BMI (−1.22/3.83) was observed for white females participating in two arts activities, controlling for pre-trends. These results differ from the moderators in the DP models because the DID specification better captures the contribution of arts participation from kindergarten among females.

4. Discussion

Based on prior works on arts engagement and cultural capital, we argued that early arts activity may be an important contributing ecological factor reducing the risk of being overweight. While previous arts and cultural capital studies have mainly focused on educational and mental health outcomes, this study focused on the possible link between early arts experience and BMI as an alternative explanation for increased health and social inequalities. To test our claim, we applied dynamic panel models and a difference-in-differences approach employing the newly released ECLS-K. To our knowledge, this study is the first that provides empirical evidence on this relationship, longitudinally, and with large scale data.

Our findings from dynamic panel models showed that arts participation in elementary schooling reduces the risk of being overweight; the effect size was between 12% and 23% of a SD of BMI for all children (from M1 to M3 in Table 1), and the influence of arts participation became stronger in later grades. Reinforcing this finding with DID models, we also observed that arts participation at kindergarten has a significant relationship with changes in BMI in elementary schooling. Further, the returns of early arts participation were more pronounced for female and White female students. Evidence suggests that females (Barry and Grilo, 2002) and White females in particular (Wang et al., 2009) are more vulnerable to weight-related stigma than those in other demographic categories. Early arts participation may be most beneficial for these students, potentially relieving stress or even serving as a positive source of identity and belonging. Arts participation may thereby promote psychological well-being and reduce negative internalizations and coping mechanisms especially well among some types of students (Crosnoe, 2007), although more research is needed to examine the observed differences here.

4.1. Strengths and limitations

In this study we provided nationally-representative, longitudinal evidence on an often-overlooked ecological factor affecting weight gain in early childhood—artistic activities. To date, most research on the health-related aspects of arts engagement have been cross-sectional correlational analyses and relied on self-reported BMI and demographic characteristics. Gosse (2014) argued that as self-reported BMI tends to be underestimated, such measures have major limitations for use in public health research and policy-making. In addition to robust in-person measures, the applied DP and DID models used here effectively address unobserved confounding that may introduce spurious relationships.

However, while we provide several theoretical explanations for the possible link between arts and health, the mechanisms of arts participation effects on BMI were more difficult to test in these data. Additionally, some of the observed effect may be spurious and/or due to cultural capital more broadly. Yet, the literature also suggests that more direct mechanisms may operate as arts participation promotes psychological well-being, belonging, and self-regulation (Fancourt et al., 2020; Mak and Fancourt, 2019; Stickley, 2010; Bone et al., 2022). Considering potential confounding causes, while this study applied advanced panel data methods with several sensitivity analyses, we could not fully address unobserved time-varying confounding. On the other hand, Guo and VanWey (1999) argued that over short intervals of schooling (such as the periods in our DP models), the most important familial and environmental influences on children tend to remain largely unchanged. Nevertheless, future studies might employ longitudinal models that can, with available data, even more effectively address time-varying confounding (e.g., see e.g., Daniel et al. (2013)).

4.2. Implications, future studies, and conclusions

Previous studies showed that being overweight not only leads to serious health problems, but also affects student academic performance due to associated negative stigma (Shaw et al., 2015) and impaired neurocognitive functioning (Liang et al., 2014). Thus, given the very large socio-demographic gaps in arts participation reported here, high-SES children may benefit comparatively in varied ways from early artistic experiences and consequent maintenance of a healthy weight. Beyond BMI, we suggest future studies of arts participation, and cultural capital more broadly, consider diverse health outcomes and different social groups/contexts to better understand the growing inequalities in educational achievement between high- and low-income students (Reardon and Portilla, 2016). Investigation of the link between arts engagement and health in childhood will help inform ecological models of health and social inequalities.

Unfortunately, in the US, it is now common for schools to provide little or no arts education in the early grades, especially in the wake of No Child Left Behind and test-based accountability focusing on the core academic subjects. Further, non-participation in the arts is most common for children from low-SES families (Gara et al., 2018). A declining trend in arts/cultural education has also been observed in other nations (Aróstegui, 2016). Early arts participation is an important predictor of adult arts participation (Dumais, 2019), and it also has significant relationships with early childhood development (Kisida et al., 2018). As schools provide less and less arts education, however, participation in artistic activities will be largely determined by family SES and parental involvement, with ever greater exclusivity. Our findings thus suggest the possibility of social reproduction via a pathway that might be easily overlooked, the accumulation of arts experience, a central component of cultural capital, linked to health inequalities in childhood.

Ethical approval statement

The ECLS-K is a secondary data set collected by the National Center for Education Statistics and the Department of Education. All students and parents gave their informed consent prior to their participation in the study. We have access to the restricted-use ECLS-K data through an NCES secure data license.

CRediT authorship contribution statement

Baeksan Yu: Writing – original draft, Conceptualization, Methodology, Formal analysis, Writing – review & editing. **Sean Kelly:** Conceptualization, Writing – review & editing.

Declaration of Competing Interest

The authors received no funding for this study and declare that they have no conflict of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ypmed.2022.107120.

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