DATADRIVE 2030

PRESCHOOLERS' MOTOR, COGNITIVE, AND SOCIAL-EMOTIONAL FUNCTIONING IN SOUTH AFRICA

An Exploration of Differences Between Boys and Girls

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ACRONYMS

CEF	Cognition and Executive Functioning
CI	confidence interval
ELOM	Early Learning Outcomes Measure
ENM	Emergent Numeracy and Mathematics
ELL	Emergent Literacy and Language
ELP	Early Learning Programme
FMC-VMI	Fine Motor Coordination and Visual Motor Integration
GMD	Gross Motor Development
n	number
SD	standard deviation
SEF	Social-Emotional Functioning
SES	socioeconomic status
WHO	World Health Organization

SUMMARY OF FINDINGS

1. Socioeconomic proxy

As was found in the 2021 Thrive by Five study, **socioeconomic status is strongly related to ELOM scores and this relationship is slightly stronger for girls.** Children in the lowest quintile schools do significantly worse than those in the highest. In quintile 2, girls perform slightly better than boys when it comes to Fine Motor Coordination and Visual Motor Integration. In quintiles 4 and 5, girls outperform boys when it comes to Emergent Numeracy and Mathematics, and Emergent Literacy and Language.

2. Programme exposure

In the current sample, boys tend to have less programme exposure than girls. **In girls, increased programme exposure was significantly related to increased performance in all domains except Fine Motor Coordination and Visual Motor Integration. Whereas for boys, this was only significant for the Emergent Literacy and Language domain.** However, these findings must be interpreted with caution due to the variety of programme types included in this sample

3. Stunted growth

The data suggest slightly higher rates of stunting among boys than girls (7% versus 6.1%). **The effect of stunted growth on ELOM scores is negative and statistically significant across all domains for girls. The effect is similar for boys,** with the exception of Emergent Numeracy and Mathematics, for which no significant effect was found. On average, the effect is stronger for girls, but no significant effect differences are evident.

4. Assessor rating score

This score measures overall attentiveness, concentration, diligence, and interest of the child during the assessments. **Girls have a higher average assessor rating score than boys. The association between the assessor rating score and ELOM scores is strong, positive, and significant in all domains for both girls and boys.**

5. Social functioning

Girls are more likely than boys to meet the social functioning standard. However, social functioning is not associated with any domain scores for girls. However, boys who met the social functioning standard had statistically significantly higher scores for Fine Motor Coordination and Visual Motor Integration, and Cognition and Executive Functioning compared with boys who did not meet the standard.

6. Emotional functioning

Girls are more likely to meet this standard than boys. Positive and statistically significant coefficients suggest that meeting the emotional functioning standard plays an important role in ELOM scores across all domains for both boys and girls. There are no substantial differences in the effect of emotional functioning on domain scores between boys and girls.

1. INTRODUCTION

Education researchers and practitioners have long been interested in understanding the differences between boys and girls in terms of their early learning and development. Historically, studies found that girls tended to excel in language and verbal abilities while boys excelled in gross motor skills and spatial tasks (Bornstein et al., 2004; Etchell et al., 2018; Halpern et al., 2007; Kokštejn et al., 2017). However, recent research has provided a more nuanced understanding of these differences, suggesting that they may be more prominent in certain age ranges (Etchell et al., 2018), and that a combination of factors such as early experience, biological factors, cultural context, socioeconomic status, and educational policies may be driving these differences (Barbu et al., 2015; Miller & Halpern, 2014). The current study used the term sex to differentiate between boys and girls. However, we acknowledge that by definition, sex refers to a set of biological attributes associated with physical and physiological features, whereas gender refers to socially constructed roles, behaviours, and identities (Heidari et al., 2016). We acknowledge too that the mechanisms behind the differences between boys and girls in early learning and development have been attributed to factors associated with both gender and sex.

It is well known that a child's brain development in the early years is influenced by experience (Fox et al., 2010). This means that even small differences in experiences between boys and girls can have long-lasting consequences (Baker & Milligan, 2016; Barcellos et al., 2014). A recent publication investigated gender similarities and differences in 3- and 4-year-olds across 71 low- and middle-income countries (Rey-Guerra et al., 2023). They found that in half of the countries included, girls were more likely to be developmentally on track, and in the other half of the countries, there were no significant differences between boys and girls. Very few studies investigating these differences have been conducted in South Africa. One study that looked into these differences in a 24-month-old cohort found that boys performed universally poorly compared with girls and that risk and protective factors differed for girls and boys (Donald et al., 2019).

The Thrive by Five Index conducted with children aged 50-59 months in South Africa in 2021 measured early learning outcomes and also found favourable results for girls (Tredoux et al., 2024). More specifically, girls were found to perform better than boys: nearly half of them were 'On Track' and 25.9% were 'Falling Far Behind', while only 40% of boys were 'On Track' and 30.9% were 'Falling Far Behind'. This paper builds on these findings by incorporating data from other studies that have utilised the ELOM instruments. The objective is a) to further investigate sex differences across the five ELOM domains and b) to identify whether certain factors that predict performance on these ELOM domains differ for boys and girls.

1.1 The ELOM 4&5 Tool

The ELOM 4&5 Years Assessment Tool is an age-normed assessment tool for use with children in two age groups (50-59 months and 60-69 months). It involves a direct assessment of children's performance in five developmental domains, as well as an observed assessment of the child's task orientation. It is often administered alongside the ELOM Social-Emotional Rating Scale, which is completed by the child's teacher. The ELOM 4&5 Tool consists of 23 items measuring indicators of the child's early development in the following five domains:

- Gross Motor Development (GMD);
- Fine Motor Coordination and Visual Motor Integration (FMC-VMI);
- Emergent Numeracy and Mathematics (ENM);
- Cognition and Executive Functioning (CEF);
- Emergent Literacy and Language (ELL).

The teacher rating scale is used by teachers who are familiar with the child and have been able to observe them over the course of their attendance in an Early Learning Programme (ELP). It provides the teacher's subjective rating of aspects of social-emotional functioning (SEF) relevant to readiness to learn in the early grades, and it includes assessing behavioural aspects such as the children's social relations (adults and peers) and emotional readiness for school. The teacher rating on these aspects may be used to complement the ELOM direct assessment of the child.

2. RESULTS

2.1 Sample description

The dataset consists of 12,243 children who have valid ELOM 4&5 Assessments, as well as data on teacher-rated child SEF. The factors explored with respect to their relationship with ELOM scores by sex and domain are presented in Table 1 together with their definitions and number of missing values in the sample. A number of facility and educator characteristics are also available in the DataDrive2030 dataset and may be used to add nuance and further explore the sex differences in future analyses. However, these variables are limited to a much smaller subsample of children and are not explored presently.

TABLE 1: VARIABLE DEFINITIONS

Variable	Values and definition	Number of missing values
ELOM domains		
GMD score	Numeric variable with values 0-20 obtained by adding up the item scores.	0
FMC-VMI score	Numeric variable with values 0-20 obtained by adding up the item scores.	0
ENM score	Numeric variable with values 0-20 obtained by adding up the item scores.	0
CEF score	Numeric variable with values 0-20 obtained by adding up the item scores.	0
ELL score	Numeric variable with values 0-20 obtained by adding up the item scores.	0
Factors associated with ELOM domain scores		
Age group	2 categories: 50-59 and 60-69 months	0
Socioeconomic proxy	5 categories. This proxy variable is created using monthly ELP fee levels where available, and Department of Basic Education quintiles where children are enrolled in primary school or where ELP fee information is missing.	87
Stunting	3 categories: normal growth, moderately stunted growth, and severely stunted growth. It is created using the height-for-age z-score as per World Health Organization (WHO) criteria (z-score between 2 and 3 SDs below the WHO Child Growth Standards median is considered moderate stunting and z-score >3 SDs below the WHO Child Growth Standards median is considered severe stunting).	2,206
Programme exposure in years	3 categories: 1, 2 and 3 years in the programme.	1,050
Assessor rating score	Numeric variable. It is the total score of 4 items measuring attentiveness, concentration, diligence, and interest. It is based on assessor ratings from observing the child during assessments.	0
Met social functioning standard	Yes/No. 'Yes' describes that the child met the expected standard for social relations with peers and adults by scoring at least 18 out of 24 in the total score out of 6 questions.	0
Met emotional functioning standard	Yes/No. 'Yes' describes that the child met the expected standard for emotional readiness for school by scoring at least 9 out of 12 in the total score out of 6 questions.	0

[1]Presenting the CI allows multiple comparisons between categories and by sex without having to perform an excessive number of statistical tests.

The final dataset used in this analysis includes 5,930 boys (48.5%) and 6,307 girls (51.5%). Table 2 presents a summary of the variables of interest by sex to provide an overview of the sample. All variables are categorical apart from age, programme exposure in years, and the assessor rating score, which are numerical. The descriptive statistic (either percentage or mean) for each variable and its confidence interval (CI)[1] is presented by sex. Statistically significant albeit small differences are found between girls and boys in: age in months, programme exposure, assessor rating score, meeting social functioning standard, and meeting emotional functioning standard.

More specifically, the average age of sampled girls is slightly higher than that of boys and girls also have a higher programme exposure on average. Girls have a higher assessor rating score and are more likely to meet the social and emotional requirements for school.

The socioeconomic status (SES) proxy variable is distributed between girls and boys alike. However, the higher SES groups are under-represented in this dataset. The rate of stunted growth does not differ statistically significantly[2] between boys and girls, although boys are more likely to be moderately or severely stunted than girls (7% versus 6.1%).

TABLE 2: VARIABLE DESCRIPTIVES BY SEX

Variable	Boys			Girls		
	Statistic	**CI**	**n**	**Statistic**	**CI**	**n**
Age in months (mean)	58	(57.9, 58.2)	5,930	57.7	(57.6, 57.8)	6,307
SES proxy (%)						
SES 1	33.6	(32.4, 34.8)	1,977	32.7	(31.5, 33.9)	2,046
SES 2	30.7	(29.5, 31.9)	1,807	30	(28.9, 31.1)	1,877
SES 3	24.4	(23.3, 25.5)	1,435	24.9	(23.8, 26)	1,556
SES 4	7.9	(7.3, 8.6)	467	8.7	(8, 9.4)	543
SES 5	3.5	(3.1, 4)	206	3.8	(3.3, 4.3)	236
Stunting (%)						
Normal growth	93	(92.3, 93.7)	4,561	93.9	(93.2, 94.5)	4,816
Moderate/ severe stunting	7	(6.3, 7.7)	341	6.1	(5.5, 6.8)	313
Programme exposure in years (mean)	1.63	(1.61, 1.65)	5,431	1.67	(1.65, 1.69)	5,756
Total assessor rating score (mean)	6.9	(6.84, 7.01)	5,930	7.5	(7.38, 7.54)	6,307
Met social functioning (%)	49.4	(48.2, 50.7)	2,932	54.4	(53.1, 55.6)	3,429
Met emotional functioning (%)	45.5	(44.2, 46.8)	2,698	50.7	(49.4, 51.9)	3,195

Note: Statistically significant differences at 5% level of significance between girls and boys are highlighted.

[3]Cohen's d statistic relates the mean difference to variability and assesses magnitude in differences.

Figure 1 shows the average ELOM scores and CIs by domain and sex. Girls perform better than boys in all domains except GMD, where boys outperform girls. All differences in the average domain score between girls and boys are statistically significant. However, the differences appear to be small, ranging from 0.2 (GMD) to 0.8 (ELL). Further exploring these differences by obtaining the Cohen's d[3] statistics confirms that the magnitude is small (Cohen's d<0.2 for all domains). In order to identify which of the aforementioned child characteristics are linked to the ELOM score by domain and explore whether there are differences in the key factors by sex, multiple regression analysis is performed next.

FIGURE 1: Average scores and confidence intervals by domain and sex

2.2 Multiple regression analysis

In this section, multiple linear regressions[4] are run by domain and sex. Multiple regression allows the identification of several associations while at the same time controlling for the confounding effects of the other variables included. Regressions are run to determine whether the factors presented in Table 2 are associated with (or predict) each domain score and whether the associations differ between boys and girls while also controlling for province and language. The regression results are visualised and discussed by predictor[5] in the following sections and the regression tables can be found in the appendix (Table A1 in the appendix).

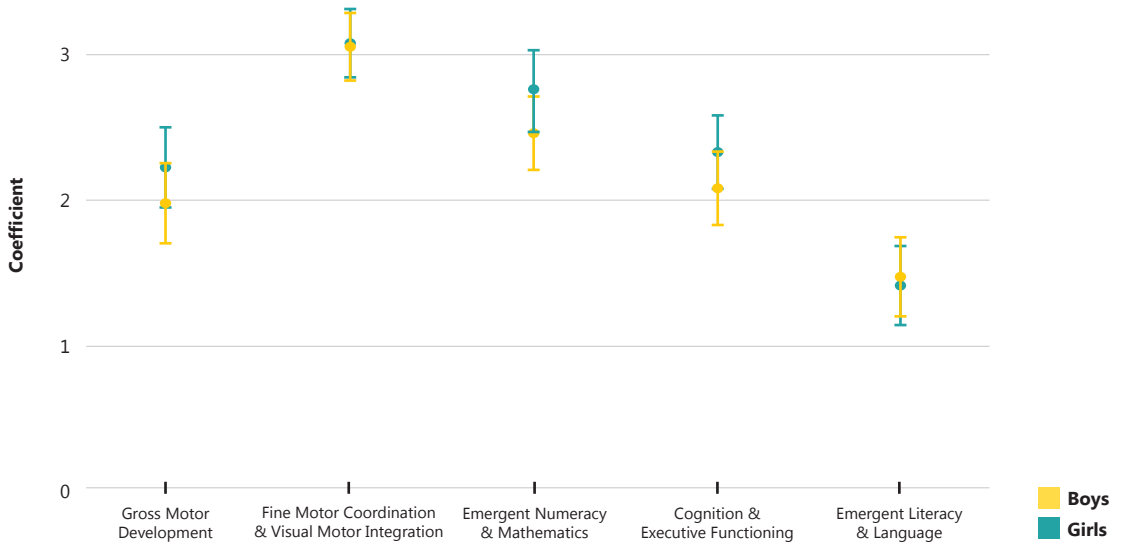
2.3 Relationship between age and domain scores by sex

Age appears to be an important predictor for ELOM scores for both boys and girls across all domains (Figure 2). As expected, the coefficients for age are positive and statistically significant in

[4]The regressions are fit including province and language fixed effects. Diagnostic tests show no violation of linear regression assumptions.
[5]The regression coefficients may be found in Table A1 in the appendix.

all regressions (also see Table A1 in the appendix). This means that children perform better as they get older. However, the maturation effect differs across domains. The strongest association between age and ELOM score is observed for FMC-VMI (coefficient=3.08) and the weakest for ELL (coefficient=1.41) for both girls and boys. Regarding sex differences, similar effects are observed for both boys and girls.

FIGURE 2: Relationship between age and domain scores by sex



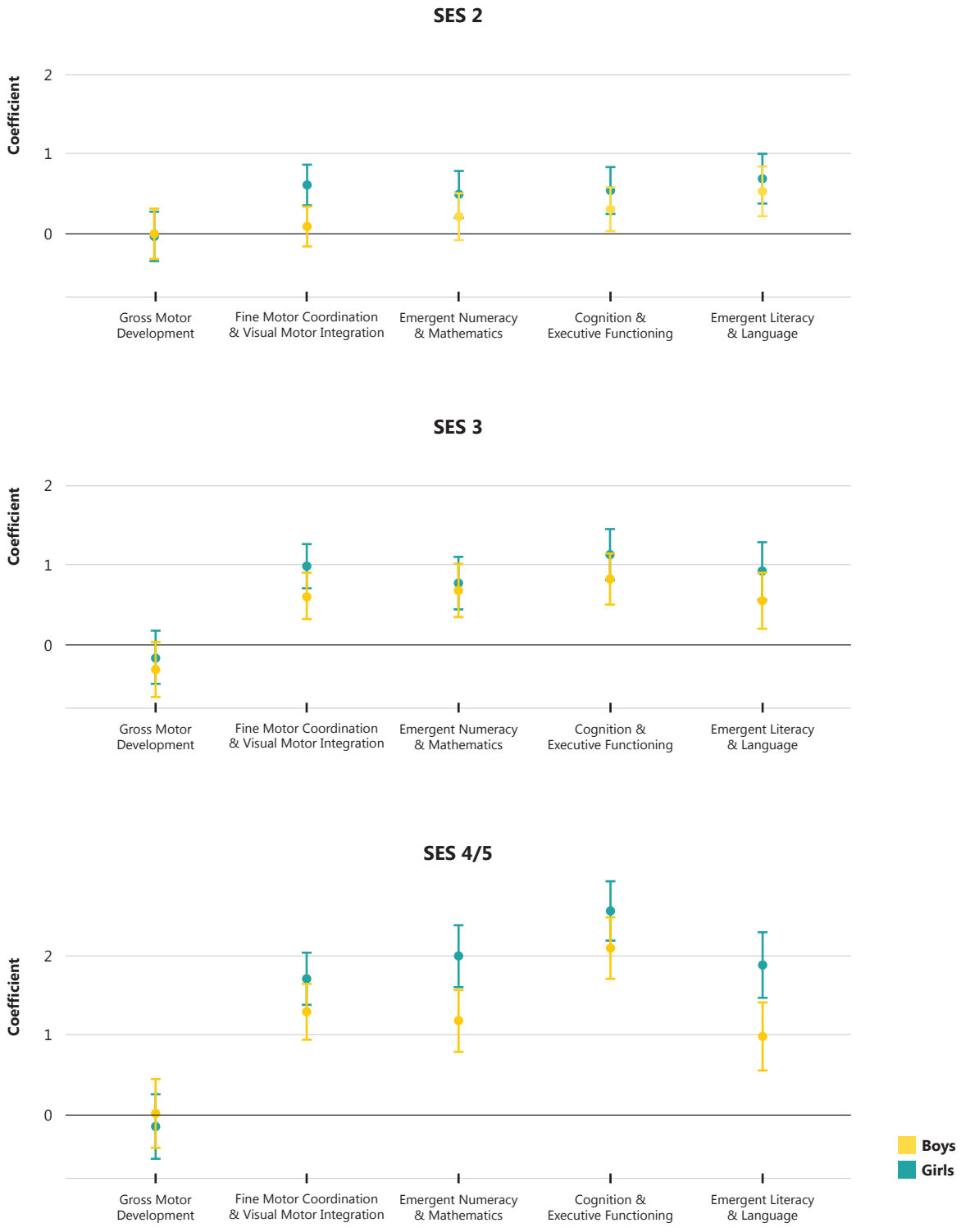
Reading the graph: *The graph shows how age is linked to ELOM scores for girls and boys for each domain. The dots represent the average change in ELOM score for one unit[6] increase in child's age. The lines around the dots show a range that is likely to contain the true effect of age (95% CI). When a dot falls above/below zero, it means there's a positive/negative connection between age and ELOM score, and this connection is considered statistically significant if its CI does not contain zero. If the lines overlap, it suggests the effect of age on ELOM scores is similar for boys and girls.*

2.4 Relationship between socioeconomic status proxy and domain scores by sex

Figure 3 presents the SES proxy (school quintile or ELP fee level) coefficients by sex and domain. No statistically significant associations are found between SES proxy and GMD. In all remaining domains, a positive association is observed, showing that children from a higher SES proxy perform better than children from the lowest SES proxy. Regarding sex differences, it appears that girls benefit more from being in a higher SES compared with boys. This is particularly evident in FMC-VMI, ENM, and ELL scores; however, the differences between girls and boys are not statistically significant. Figure A1 in the appendix displays the predicted score for ELL across all socioeconomic proxy categories and shows how the gap between boys and girls increases as the SES increases. Additionally, the effect of each socioeconomic category is not always the same across domains and the most striking differences are observed among children in the highest socioeconomic category. For example, girls in SES 4/5 have an average gain of 2.55 score points versus girls in SES 1 for CEF, while the same gain is 1.7 points for FMC-VMI.

[6]Note that one unit represents one standard deviation, as the numeric variables were standardised to enable comparisons between coefficients.

FIGURE 3: Relationship between socioeconomic proxy and domain scores by sex

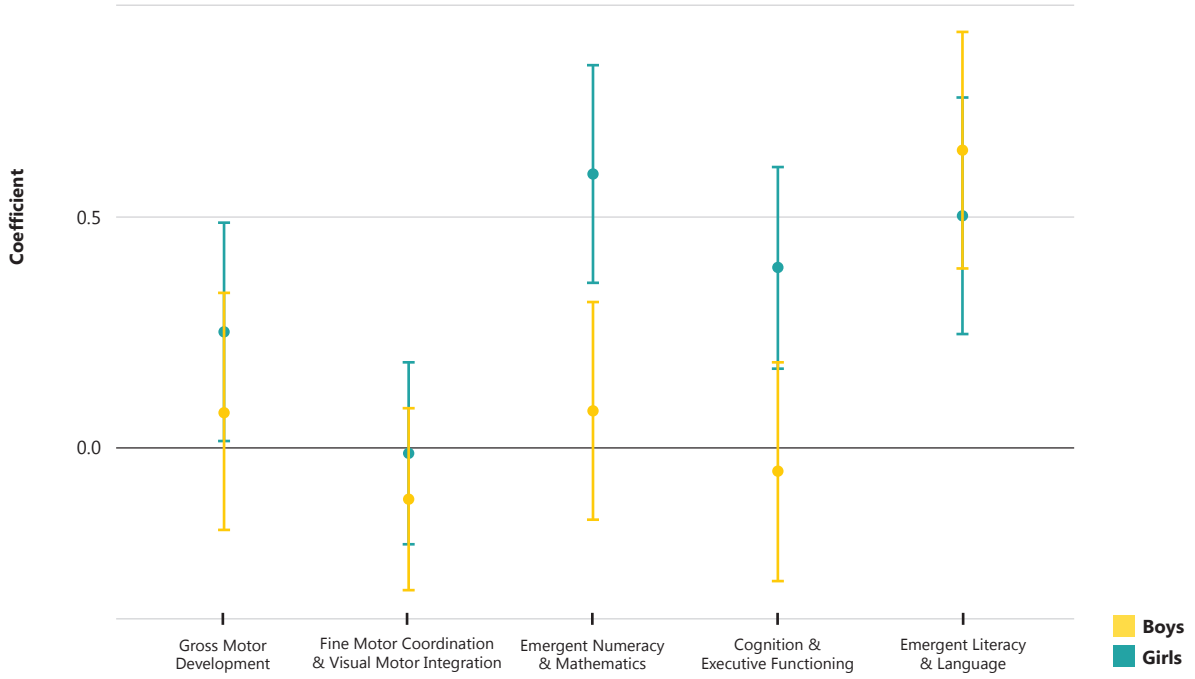


Reading the graph: *The graph shows how SES proxy is linked to ELOM scores for girls and boys for each domain. The dots represent the average change in ELOM score when the SES proxy changes from the lowest SES to the one reflected in the figure subtitle. The lines around the dots show a range that is likely to contain the true effect of SES proxy (95% CI). When a dot falls above/below zero, it means there's a positive/negative connection between SES proxy and ELOM score, and this connection is considered statistically significant if its CI does not contain zero. If the lines overlap, it suggests the effect of SES on ELOM scores is similar for boys and girls.*

2.5 Relationship between programme exposure in years and ELOM scores by sex

The association between programme exposure and ELOM scores is more evident for girls than for boys, as pictured in Figure 4, where programme exposure is significantly associated with four domains for girls (GMD, ENM, ELL, and CEF), but only one domain (ELL) for boys. In other words, programme exposure seems to impact a wider range of early learning outcomes in girls compared with boys. While this might suggest that girls benefit more from programme exposure than boys, interpreting this finding is difficult for several reasons. First, the dosage data are incomplete and more detail on programme exposure rates is necessary, and second, it might be the case that the maturation effect is greater for girls than for boys.

FIGURE 4: Relationship of programme exposure in years and domain scores by sex



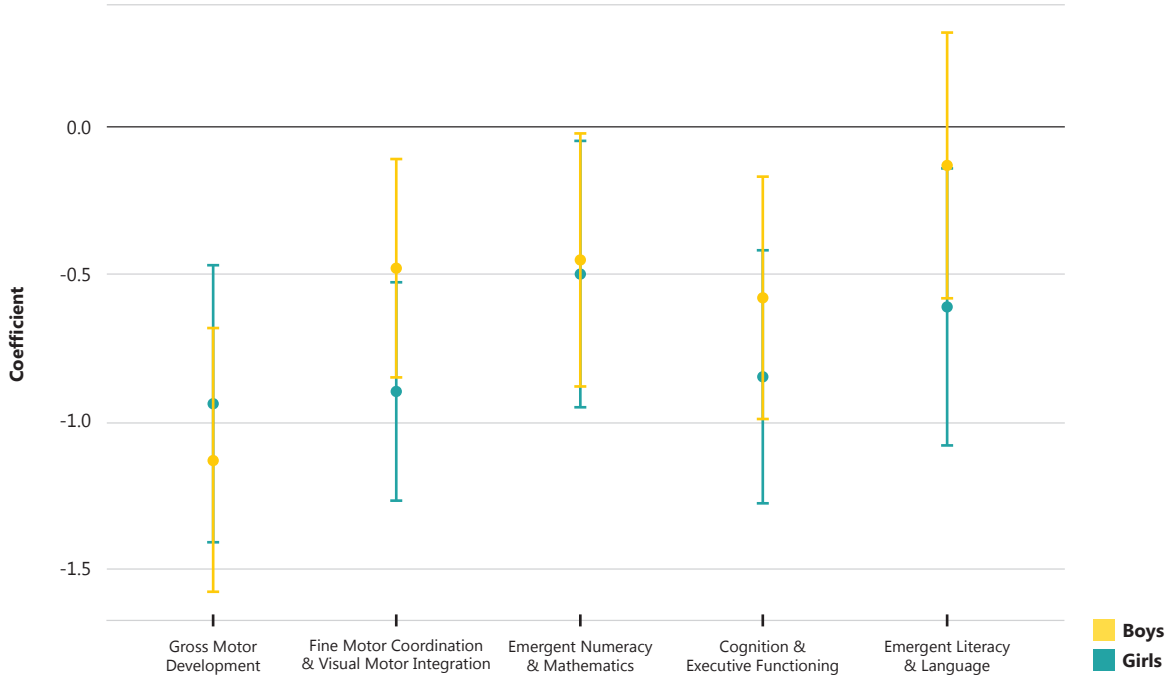
Reading the graph: *The graph shows how programme exposure is linked to ELOM scores for girls and boys, and by domain. The dots represent the average change in ELOM score for one unit[7] increase in programme exposure. The lines around the dots show a range that is likely to contain the true effect of programme exposure (95% CI). When a dot falls above/below zero, it means there's a positive/negative connection between programme exposure and ELOM score, and this connection is considered statistically significant if its CI does not contain zero. If the lines overlap, it suggests the effect of programme exposure on ELOM scores is similar for boys and girls.*

[7]Note that one unit represents one standard deviation, as the numeric variables were standardised to enable comparisons between coefficients.

2.6 Relationship between stunted growth and ELOM scores by sex

Similar to what was reported in the Thrive by Five Index[8], this analysis found that stunted growth is negatively associated with ELOM scores for girls and boys (Figure 5), meaning that a child who is stunted is more likely to score poorly on ELOM domains than children who are not stunted. On average, this effect is slightly stronger for girls than for boys (-0.76 versus -0.55) and we see that while stunted growth is a significant predictor of ELL for girls, it is not a predictor for boys.

FIGURE 5: Relationship of stunted growth and domain scores by sex



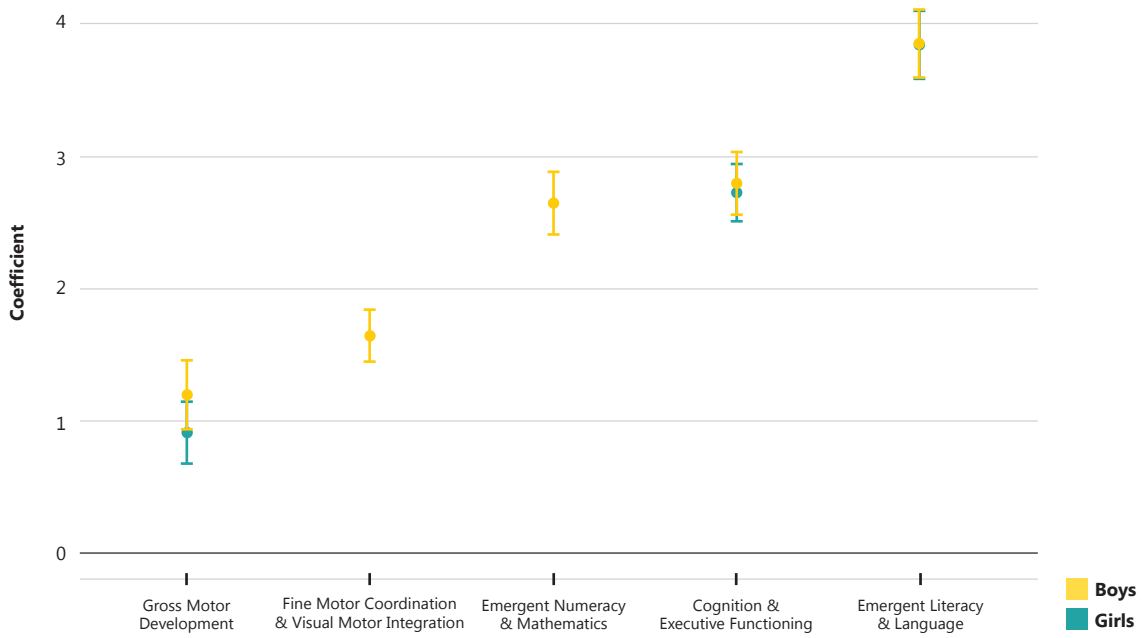
Reading the graph: *The graph shows how stunting is linked to ELOM scores for girls and boys, and by domain. The dots represent the average change in ELOM score when the child is moderately or severely stunted. The lines around the dots show a range that is likely to contain the true effect of stunting (95% CI). When a dot falls above/below zero, it means there's a positive/negative connection between stunting and ELOM score, and this connection is considered statistically significant if its CI does not contain zero. If the lines overlap, it suggests the effect of stunting on ELOM scores is similar for boys and girls.*

[7]www.thrivebyfive.co.za

2.7 Relationship between assessor rating score and ELOM score by sex

The assessor rating score is aimed at measuring the child's attentiveness, concentration, diligence, and interest during ELOM assessments. Therefore, it is not surprising that both girls and boys who were observed to be more attentive, concentrated, diligent, and interested were more likely to perform better in the ELOM direct assessments. However, this factor was not statistically significantly associated with higher scores in domain fine motor and emergent numeracy for girls. As you can see in Figure 6, the pattern of association is similar for boys and girls, in other words, no substantial sex differences are evident in the association between assessor rating score and ELOM domain scores. However, we do see differences in the strength of the association between domains, with the strongest association being between assessor rating score and ELL, and the weakest (but still significant) with GMD.

FIGURE 6: Relationship between assessor rating score and domain scores by sex

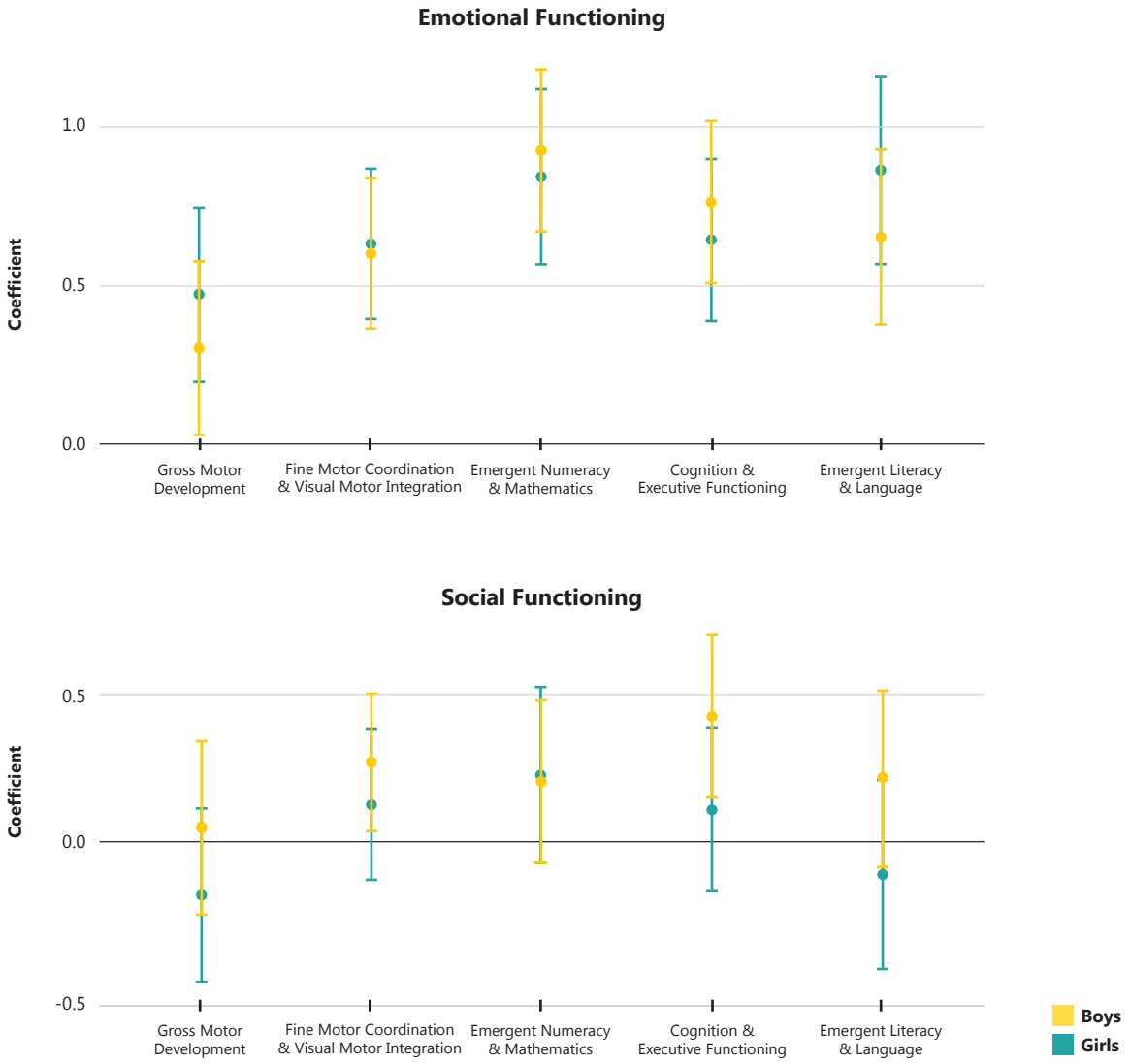


Reading the graph: *The graph shows how the assessor rating score is linked to ELOM scores for girls and boys, and by domain. The dots represent the average change in ELOM score for one unit increase in the assessor rating score. The lines around the dots show a range that is likely to contain the true effect of the assessor rating score (95% CI). When a dot falls above/below zero, it means there's a positive/negative connection between the assessor rating score and ELOM score, and this connection is considered statistically significant if its CI does not contain zero. If the lines overlap, it suggests the effect of the assessor rating score on ELOM scores is similar for boys and girls.*

2.8 Relationship between social-emotional functioning and ELOM scores by sex

Meeting the social functioning standard is not found to be a statistically significant predictor for girls in any domain but is a significant predictor in boys. More specifically, boys assessed to have better social relations with peers and educators are more likely to perform better in FMC-VMI, as well as CEF (Table A1 in the appendix). For emotional functioning, both boys and girls who meet the emotional readiness standard for school score higher across all domains, with the effect being strongest on the ELL score for girls and on ENM for boys. As shown in Figure 7, the relationship between emotional functioning and ELOM scores (i.e., meeting emotional readiness for school standard) does not differ statistically significantly, as the patterns are similar across sex and domain.

FIGURE 7: Relationship between emotional/social functioning and domain scores by sex



Reading the graph: *The graph shows how emotional and social functioning are linked to ELOM scores for girls and boys, and by domain. The dots represent the average change in ELOM score when the emotional or social functioning standard is met. The lines around the dots show a range that is likely to contain the true effect of these factors (95% CI). When a dot falls above/below zero, it means there's a positive/negative connection between these factors and ELOM score, and this connection is considered statistically significant if its CI does not contain zero. If the lines overlap, it suggests the effect of emotional or social functioning on ELOM scores is similar for boys and girls.*

3. DISCUSSION

This analysis provides a foundational exploration of the DataDrive2030 composite dataset, consisting of several studies over time. We investigated the differences in domain scores between boys and girls, and found that girls outperformed boys in all domains except GMD. However, these differences are of small magnitude, ranging between 0.2 and 0.8 score points. This finding is mostly in line with previous research that has found girls outperforming boys on aspects of early learning, specifically ELL, FMC-VMI, and SEF (Donald et al., 2019; Weber et al., 2017). While these findings highlight that boys may be at a higher risk for Falling Behind developmentally, some longitudinal research has suggested that these differences may only be present during certain age ranges and that boys tend to catch up to girls later on (Etchell et al., 2018). A better understanding of the reasons behind these differences in South African settings is needed.

In order to explore potential differences between boys and girls even further, the current study also looked at factors that influence children's early learning outcomes, often referred to as predictors, and whether the effect of each predictor differed between boys and girls. This was explored using multiple linear regressions. The predictors included in the analyses are child age, sex, SES proxy, height for age (stunting), programme exposure, assessor rating of the child's approaches to learning, and teacher-rated SEF. Overall, age and assessor rating of the child's approaches to learning had the highest positive association with ELOM scores. This means that children who are older or children who had a higher assessor rating score are more likely to have higher scores for the ELOM domains. On the other hand, stunted growth was significant, but negatively associated with ELOM domain scores, meaning that children with stunted growth perform worse on the ELOM than those with normal growth.

We found the largest differences between boys and girls when looking at the predictors' programme exposure and social functioning. For boys, higher programme exposure was only associated with higher ELL scores, whereas for girls, higher programme exposure was associated with higher scores in four domains, namely ELL, GMD, ENM, and CEF. This suggests that girls may be benefiting more from programme exposure than boys. However, these findings should be interpreted with caution due to the limitations of the programme exposure variable noting that the dosage data are incomplete and that more detail on programme exposure rates would be needed to draw conclusions. Yet, these findings are of interest and highlight the need for further investigation.

When it comes to differences in social functioning, girls were more likely to meet the social functioning standard compared with boys. This has been highlighted in previous research, where girls are commonly found to develop social and emotional skills more rapidly and display less externalising (problematic) behaviours compared with boys (Maguire et al., 2016; McTaggart et al., 2022; Romer et al., 2011). However, notable in the current study is that social functioning is only a significant predictor of ELOM scores (FMC-VMI, and CEF) in boys and not girls. This is interesting, as it could mean that having good social skills could have a protective or promotive effect on certain aspects of early learning for boys. Alternatively, this finding might also be as a result of the baseline social functioning being higher in girls and so they are less likely to gain from additional improvements.

This highlights the need to further investigate the differences in social functioning between boys and girls, and the mechanisms behind these differences. In line with the evidence mentioned earlier, girls in this sample are also more likely to meet the emotional readiness standard for school compared with boys. Interestingly though, emotional functioning as a predictor does not differ between boys and girls, and is significantly positively associated with all ELOM domains. This means that for both girls and boys, meeting the emotional readiness standard can lead to higher scores across all domains.

The finding that SES proxy is predictive of ELOM outcomes is not surprising and further emphasises the need for investment in early learning in the lower SES groups. What is surprising, though, is that for ELL, the gap between boys and girls increases as the SES increases. (See Figure A1 in the appendix.) In other words, there are bigger differences between boys and girls in terms of literacy and language skills in higher SES groups. This is in contrast to previous research that found no significant differences in language performance between boys and girls in the higher SES groups, but significant differences between boys and girls (favouring girls) in the lower SES groups (Barbu et al., 2015). This could suggest that factors not impacted by SES may be the driver of these differences in literacy and language skills, such as biological factors or gender stereotypes that are common across all SES groups, but are perhaps more pronounced in higher SES groups. However, given that higher SES groups are under-represented in the current study, this warrants further investigation.

It is clear from this analysis that there are indeed differences between boys and girls in terms of their performance when it comes to early learning outcomes. Most notably, girls are outperforming boys in all domains except GMD. However, the pattern of predictors of ELOM domain scores is fairly similar for both boys and girls, apart from the domains that are teacher- or assessor-rated (social functioning and assessor rating score). This prompts the need to consider the impact of gender stereotypes or bias within the community, classroom, or broader culture, and highlights the need to measure these biases specifically when assessments rely on subjective ratings.

4. LIMITATIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH

The composite dataset is not fully representative of the South African children attending ELPs. Some population groups are under-represented (for example, children with a higher SES, but this is also observed in national studies) and others have very small sample sizes that hinder statistical inference. However, this investigation helps to identify potential areas for further study. Further data collection and analyses would be helpful to better understand some of the sex differences we observed in this study. Below are some examples of research questions and areas for further research:

- Are boys on average enrolling later in ELPs? And are they on average enrolled for shorter periods of time than girls prior to starting school?
- Are maturation and programme effects on ELOM scores different for boys and girls?
- The relationship between ELP fee/quintile levels (SES proxy) and learning outcomes (for some domains) appears to be different for boys and girls. Is this consistent across studies and if so, what is driving this?
- Boys' poorer performance when it comes to SEF and assessor rating score (attentiveness, concentration, diligence, and interest) requires further investigation. It is important to understand the extent to which boys' poorer performance in these areas (relative to girls) is contributing to their poorer performance in key learning domains and to explore the impact of assessor or practitioner bias in subjective ratings of boys versus girls.
- ELOM outcomes could be examined as categorical variables using the 'On Track', 'Falling Behind', and 'Falling Far Behind' categories in order to identify particular factors linked to each category, especially since the score cut-off points are designed to account for a portion of the maturation effect.
- Spatial variation/correlation that is not captured by province may be affecting the scores and should be taken into account by including district or ward random effects or fit a spatial model using the geographic information system coordinates of the facility.
- The effect of facility and practitioner characteristics is not explored in this analysis but it could have a potentially strong impact on children's performance. Other analyses have been undertaken to explore the impact of the facility and practitioner characteristics on child early learning outcomes. See the **DataDrive2030 website** for links to these papers.

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APPENDIX

TABLE A1: Standardised regression coefficients by domain and sex

	Girls			Boys		
	Coefficient	**Standard Error**	**P-value**	**Coefficient**	**Standard Error**	**P-value**
GMD						
Age	2.23	0.14	0.00	1.98	0.14	0.00
SES 2	-0.05	0.16	0.73	-0.02	0.16	0.89
SES 3	-0.15	0.17	0.38	-0.30	0.18	0.09
SES 4/5	-0.16	0.21	0.42	0.00	0.22	0.99
Programme exposure in years	0.25	0.12	0.04	0.08	0.13	0.52
Moderately/severely stunted	-0.94	0.24	0.00	-1.13	0.23	0.00
Assessor rating score	0.91	0.12	0.00	1.20	0.13	0.00
Social functioning standard met	-0.16	0.14	0.26	0.04	0.14	0.79
Emotional functioning standard met	0.47	0.14	0.00	0.30	0.14	0.04
FMC-VMI						
Age	3.08	0.12	0.00	3.06	0.12	0.00
SES 2	0.60	0.13	0.00	0.08	0.13	0.54
SES 3	1.00	0.14	0.00	0.62	0.15	0.00
SES 4/5	1.70	0.17	0.00	1.28	0.18	0.00
Programme exposure in years	-0.01	0.10	0.89	-0.11	0.10	0.31
Moderately/severely stunted	-0.90	0.19	0.00	-0.48	0.19	0.01
Assessor rating score	1.64	0.10	0.00	1.64	0.10	0.00
Social functioning standard met	0.12	0.12	0.29	0.25	0.11	0.03
Emotional functioning standard met	0.63	0.12	0.00	0.60	0.12	0.00
ENM						
Age	2.76	0.14	0.00	2.46	0.13	0.00
SES 2	0.48	0.15	0.00	0.20	0.15	0.19
SES 3	0.78	0.17	0.00	0.69	0.17	0.00
SES 4/5	1.98	0.20	0.00	1.17	0.20	0.00
Programme exposure in years	0.59	0.12	0.00	0.08	0.12	0.52
Moderately/severely stunted	-0.50	0.23	0.03	-0.45	0.22	0.04
Assessor rating score	2.64	0.12	0.00	2.64	0.12	0.00
Social functioning standard met	0.21	0.14	0.13	0.19	0.13	0.14
Emotional functioning standard met	0.84	0.14	0.00	0.92	0.13	0.00

	Girls			Boys		
	Coefficient	Standard Error	P-value	Coefficient	Standard Error	P-value
CEF						
Age	2.33	0.13	0.00	2.08	0.13	0.00
SES 2	0.53	0.15	0.00	0.29	0.14	0.05
SES 3	1.15	0.16	0.00	0.84	0.16	0.00
SES 4/5	2.55	0.19	0.00	2.08	0.20	0.00
Programme exposure in years	0.39	0.11	0.00	-0.05	0.12	0.67
Moderately/severely stunted	-0.85	0.22	0.00	-0.58	0.21	0.01
Assessor rating score	2.72	0.11	0.00	2.79	0.12	0.00
Social functioning standard met	0.10	0.13	0.47	0.39	0.13	0.00
Emotional functioning standard met	0.64	0.13	0.00	0.76	0.13	0.00
ELL						
Age	1.41	0.14	0.00	1.47	0.14	0.00
SES 2	0.68	0.16	0.00	0.52	0.16	0.00
SES 3	0.94	0.18	0.00	0.56	0.18	0.00
SES 4/5	1.87	0.21	0.00	0.97	0.22	0.00
Programme exposure in years	0.50	0.13	0.00	0.64	0.13	0.00
Moderately/severely stunted	-0.61	0.24	0.01	-0.13	0.23	0.59
Assessor rating score	3.83	0.13	0.00	3.84	0.13	0.00
Social functioning standard met	-0.10	0.15	0.52	0.20	0.14	0.17
Emotional functioning standard met	0.86	0.15	0.00	0.65	0.14	0.00

FIGURE A1: Emergent Literacy and Language predicted scores by socioeconomic proxy