Handwriting difficulty among Basic school pupils in the Oforikrom Municipality in Ghana

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Abstract

Handwriting plays an important role in academic progression and personal development. Handwriting challenges among primary school children are widespread and well-documented. Handwriting instruction has become a relegated phase of the learning process in many Ghanaian basic schools. The study assesses the prevalence of handwriting difficulties among basic school pupils in selected public schools in the Oforikrom Municipality in the Ashanti Region. The study employed a cross-sectional design using a standardized handwriting assessment tool, the pupil's Handwriting Assessment Rubric. Pupils' handwriting was assessed based on eight handwriting descriptors: letter formation, placement, letter sizing, spacing of letters, legibility, speed, neatness, and spacing of words. Each descriptor was scored on a 5-point scale with 5 representing the highest score. The study found a high prevalence of handwriting difficulties among the pupils; scores indicated that 11 pupils, representing 2.2%, had Very Poor, 89 representing 18.9% had Poor, 242 representing 50.6% had Average, 112 representing 23.6% had Good and 22 pupils representing 4.6% had Very good handwriting. This implies that the pupils' handwriting scores are considered Average. The study also indicated a significant difference in letter formation, legibility, and speed, with girls scoring higher than boys. Considering the high prevalence of handwriting difficulties and their consequences, policymakers must integrate comprehensive handwriting instruction across the curriculum of basic schools. Teachers, parents, clinicians, and other stakeholders should also watch for early signs of difficulties and offer remediation to mitigate its long-term academic and social consequences.

Keywords: *Handwriting, difficulty, children, primary school, legibility.*

Introduction

Writing by hand requires the brain to coordinate mental and motor skills and goes beyond simply using a pen or pencil on a surface. Handwriting (HW) is an intricate undertaking that demands synchronising various cognitive, motoric, and neuromotor processes (Smiths-Engelman et al. 2001; Dinehart, 2014). It entails mentally coding and rehearsing visual representations of patterns and integrating them with motor patterns (Berninger, 1994, as cited in Medwell & Wray, 2007). Generally, handwriting occurs over time and can be improved through continuous writing practices (Harris, 1993; as cited by Thara & Wangchhuk, 2021). The subtle and accurately coordinated movements used in handwriting influence children's brain stimulation patterns associated with studying (Ose Askvik et al., 2020).

Teaching HW is a critical component of any literacy programme in the early years of preschool. Preschoolers who do not have these skills may struggle. In Ghana, where English is taught as a second language, these abilities can present a significant obstacle at the beginning of the literacy process. However, it is important to teach letter-writing techniques to children so that teaching becomes effective

and proficient. While HW is often overshadowed by phonics instruction, the teaching of reading and phonics increases with grade. The present manner in which HW is taught describes the factors and challenges that impact the way the task is approached. A synthesis of the literature shows that implicit approaches to teaching are common across many developing countries, and the actual instruction of HW has become a relegated phase of the learning process.

Between 30% and 60% of children's time in school revolves around fine motor activities, such as writing (Volman et al., 2006). Nonetheless, some struggle with handwriting, negatively impacting their academic achievement and self-esteem (Graham & Harris, 2000). In their study, Feder and Majnemer (2007) found a connection between poor HW in grade one and lower academic success in grade two, particularly in reading and mathematics. Similarly, Smiths-Engelsman et al. (2018) found a correlation between bad HW and poor spelling, writing, and arithmetic results.

Handwriting difficulties (HWD) are the obstacles pupils face while writing legibly and successfully. It can appear in various ways, such as trouble gripping a pencil or pen, difficulty forming letters or numbers, and difficulties with letter size, spacing, and alignment (Feder & Majnemer, 2007). Evaluation of HWD is essential for early diagnosis and intervention to prevent long-term academic and social consequences. To develop neuronal oscillation patterns that help study, children should be introduced to handwriting and drawing exercises in schools during their formative years (Ose Askvik et al., 2020). It is therefore important to sustain both activities in a conducive atmosphere for learning.

Studies confirm the incidence of HWD in children, albeit with varying reports of prevalence. HWD among primary school children is widespread and well-documented, with 10% to 30% of school-going children struggling with writing (Daly, Kelley, and Krauss, 2003; Feder and Majnemer, 2007; Geri et al., 2017). Similarly, Rosenblum et al. (2013) revealed that 17.6% of children in grades 1 to 3 had HWD, and Sharma and Khan (2020) found that 34% of students had handwriting deficiency, indicating a prevalence of HWD. Many developmental, neurological, and environmental factors contribute to these difficulties. Children may also suffer significant social and academic setbacks due to these problems,

emphasising the significance of timely detection and remediation. Children can overcome these obstacles and reach their full potential with early detection and focused treatment.

Graham et al. (2000) linked HWD to low academic achievement, diminished self-esteem, and reduced quality of life. Similarly, Peverly et al., (2013) stated that the problem could persist into adulthood, affecting children's career prospects. Handwriting has a low prominence and profile in literacy education and has attracted little attention in recent years from teachers, legislators, or researchers in educational practices (Medwell and Wray, 2007). This statement mirrors the situation in Ghana, where basic schools place less emphasis on HW in favour of reading, thereby impeding the formation of letters perfectly and legibly. Teaching HW has become the sole duty of English teachers in many schools; as a result, Thara and Wangchhuk (2021) contend that teaching HW should be an interdisciplinary concern, as students' HW quality impacts their performance across all subjects.

Researchers posit that focus on content delivery and syllabus coverage increases as pupils advance in grade, yet less time is allocated to teaching and improving HW. In elementary school education in some countries, typewriting on digital devices has replaced traditional handwriting (Kiefer et al., 2015; Ose Askvik et al., 2020). Also, reading and spelling competitions are common practice in primary schools with little attention given to HW. As students' progress, teachers become frustrated when reading their handwritten scripts at the tertiary level due to the pronounced HWD that persists at both basic and high school levels.

To address HWD among class two students in basic schools, especially public schools in Oforikrom, this research is important for policy and practice. Despite its influence on early learning, HWD in Ghana is severely understudied. By demonstrating the prevalence of HWD, the findings could equip educators and policymakers with evidence to allocate resources strategically, refine teaching methods, and intervene early enough to prevent long-term academic hurdles. Fundamentally, this study fills the gap of research in the national context, offering insights tailored to a region where such data has been scarce, even as HW remains a cornerstone of foundational education. This study also provides opportunities for further

investigations into developmental, neurological, teacher training, classroom dynamics, or socioeconomic barriers, while enhancing pupils' confidence through timely support. Its value lies not just in diagnosing a problem but also in generating discussions about equitable solutions, which ensures that every child, regardless of school or background, can thrive academically.

Literature

Causes and effects of handwriting difficulties.

Fine motor skill deficits are a common challenge among children, affecting their ability to perform daily tasks and academic activities, particularly handwriting (Goyen et al., 2009; Rosenblum et al., 2013). Challenges with fine motor skills can manifest as a lack of precision, control, speed, and accuracy in movements that require dexterity, such as manipulating small objects, using utensils, and buttoning clothes (Rosenblum et al. 2013). Also, children with developmental conditions such as Down syndrome, cerebral palsy, and ASD may struggle with fine motor activities due to muscular weakness, stiffness, and delayed sensory processing (Case-Smith & Weaver, 2014). However, fine motor skill deficits can also occur in developing children, and environmental factors and lifestyle habits may influence them.

Early childhood experiences like play activities can aid in developing fine motor skills, but sedentary behaviours like excessive screen time and limited physical activity can weaken these skills. Cadoret et al. (2018) recommend that early childhood communications, specifically play activities, can assist the progress of fine motor skills. Also, children with challenges of perception, especially in visual-spatial alignment, figure-ground judgment, and visual memory, can affect their ability to reproduce letters and shapes accurately (Berninger et al., 2008). Dysgraphia hurts HW's abilities. Berninger et al. (2010) describe dysgraphia as specific difficulties with written expressions, including difficulty with spelling, HW, and written composition. According to them, HWD is a prevalent symptom of dysgraphia, with affected children demonstrating poor letter formation, spacing, and legibility.

Environmental influences can also be detrimental to children's HW abilities. Classroom layouts and illumination, noise levels, and other factors can all affect how children can write correctly by hand. A noisy environment can hinder children's focus and attention, leading to poor HW. Socioeconomic status (SES) is an important influence on HW. Barnett et al. (2009) affirm that lack of access to high-quality writing materials and other educational supplies may cause handwriting difficulties, especially among children from SES backgrounds. Children in the lower SES bracket typically face greater stress and adversity, which ultimately leads to handwriting non-proficiency. Also, inadequate and inappropriate desk and chair dimensions in various schools can have adverse effects on HW skills. Engel-Yeger et al. (2010) assert that children without access to appropriate writing equipment, such as easy-grip pencils or paper with suitable spacing, could face HWD. According to Medwell & Wray, (2007), schools using structured programmes, where teachers model letter formation step-by-step, tend to produce more legible writing.

Children use the same muscles in writing, whether they are left-handed or right-handed, but may activate these muscles in different sequences. This difference, along with the fact that most writing progresses from left to right in Ghanaian schools, can create obstacles for left-handed children. These obstacles include smudging due to hand positioning, awkward instrument grip, using techniques designed for right-handed individuals, and writing at a slower pace. Until a few decades ago, many left-handed people learnt handwriting with their non-dominant right hand (Stetter et al., 2023). A left-handed child does not have an intellectual disability, but an inflexible educational system can turn a biological peculiarity such as left-handedness into a handicap (Heni & Mujahid, 2018).

In some schools in Ghana, it is common for preschool teachers to insist that left-handed children write with their right hand. Raymundo and Cermak (2023) noted that teaching HW results in improved legibility and fluency compared to non-handwriting instructional conditions. They assert that individualising HW training and using technology also improves legibility, writing quality, length, and fluency. These findings support the fact that text-copying skills are essential for HW development.

Interventions for handwriting difficulties

A comprehensive assessment of therapies for children with developmental coordination problems revealed, for instance, that programmes addressing fine-motor control components, such as finger dexterity and grip strength, may considerably enhance handwriting ability (Goyen et al., 2009). Occupational therapy (OT), which includes exercises, can improve fine motor skills, hand-eye coordination, grip strength, handwriting legibility, and speed (McMaster & Roberts, 2016). Also, using sandpaper letters and tracing letters in shaving cream has improved letter formation and handwriting speed (Berninger et al., 2018). Keyboarding has also been found to improve written communication and reduce the physical demands of writing (Graham et al., 2012). Further, they propose that cognitive-behavioural interventions, which tackle the emotional and behavioural aspects of handwriting difficulties, enhance children's writing skills and alleviate their handwriting-related anxiety (Graham et al., 2012).

Prevalence of handwriting difficulties

Feder and Majnemer (2007) state that HW challenges in children are the third most common reason for occupational therapy referrals, with estimates ranging from 1% to 50% depending on the population examined and the criteria for HW issues used. The prevalence of handwriting disorders may vary with the child's age, with younger children in kindergarten and first grade more likely than older children to display higher difficulty (Hammill et al., 1991; Rosenblum et al., 2006). These studies emphasise the variance in the prevalence of HW challenges across sections of children and emphasise the importance of considering the population studied. According to Kartsdottir and Stefansson (2002), girls perform better than boys in HW legibility and speed, corroborating Sharma & Khan’s (2020) study that found that 67% of boys and 33% of girls had HW. Similarly, Raghuram et al. (2024) found HWD more prevalent among male students than female students.

Hypotheses

This study examined the following hypothesis, in respect of the general prevalence, gender and school-based difference in the selected public schools in the Oforikrom Municipality:

H_1: Comparatively, boys and girls in class two in these schools exhibit significantly different rates of HD, pointing to a potential gender-based variation.

H_1: There are obvious significant variations in HWD between public schools in the Oforikrom Municipality.

Methods

This research employed a cross-sectional design, with participants consisting of primary two pupils (gender non-discriminatory and HWD non-discriminatory), chosen from fifteen out of twenty-five schools in the Oforikrom Municipality in Kumasi, Ghana. A total of 476 students participated in the study, 223 females and 253 males. The participants' age range was 5 to 14 years, with a majority falling within the age bracket of 7 to 9 years old. The researchers used the Children's Handwriting Assessment Rubric (The Handwriting Rubric), (Your Therapy Source Inc., 2015), a standardised handwriting assessment tool to evaluate the HWD among the pupils under study. This standardised assessment is reliable and critically assesses eight HW descriptors that determine good handwriting: *letter formation, placement, letter sizing, spacing of letters, legibility, speed, neatness,* and *spacing of words.* Each descriptor was scored on a 5-point scale with 5 representing the highest score. When all criteria were met, a total score of 40 points was awarded. Table 1 shows the interpretation of the scores.

Table 1: Interpretation of handwriting difficulties score.

Overall Handwriting	**Percentage Range**	**Status**	**Score Range**
Less than 25% of the letters are formed correctly	0 – 25	Very poor	0 – 10
Few of the letters are formed correctly (25-50%)	25 – 50	Poor	10 – 20
Some of the letters are formed correctly (50-75%)	50 -75	Average	20 – 30
Most of the letters are formed correctly (more than 75%)	75 – 90	Good	30 – 36
All of the letters are formed correctly	90 – 100	Very good	36 – 40

Adapted from Children's Handwriting Assessment Rubric (The Handwriting Rubric), (Your Therapy Source Inc., 2015).

The prevalence of HWD was determined using descriptive and inferential statistics. Permission was obtained from school authorities and class teachers through informed consent forms beforehand. The data was treated with confidentiality throughout the study, and all data was stored securely. Participants copied/rewrote the following sentences on ruled A4 landscape sheets:

"Juggling six spicy bones, Quicky the naughty fox teased

and jumped over Bulzy, the hungry brown dog."

This two-line sentence has eighty letters and consists of all the English alphabet. The sentence was set in 16 points *Sassoon Infant* font to enhance legibility. The following dimensions were employed: The space between the x-height and baseline was 7 mm, and between the ascender and x-height and the descender and baseline was 5 mm. Participants were asked to copy the sentences within five minutes. Each participant provided demographic information: name of school, age, gender, class, and the start and finish times of the exercise. For consistency in scoring, all completed handwriting copy sheets were meticulously scrutinised and accessed by a scorer to avoid discrepancies that might occur with multiple scorers. The HW quality was evaluated using Cronbach's alpha. As seen in Table 2. below, the average relationship between the variables demonstrates strong internal reliability and suggests a high level of internal consistency. Additionally, the strong Cronbach's alpha values show consistency in the response values for each participant throughout the test. This demonstrates the validity of the assessment and suggests that the items may measure the same trait.

Table 2: Internal reliability.

Cronbach's Alpha	Cronbach's Alpha based on Standardised Items	N of Items
.928	.908	9

Findings

The study included 476 participants from fifteen public schools in the Oforikrom Municipal Assembly. The gender distribution was relatively balanced; 53.2% (n = 253) were male and 46.8% (n = 223) were female. The mean age of the participants was 8.3 years, with most of them (83%) falling between 7-9 years old. An overwhelming majority (93.9%, n = 447) were right-handed. The demographic data are represented in Table 3.

Table 3: Demographic Characteristics.

Name of School		N	Percent (%)
	Kentikrono M/A Basic School	22	4.6%
	Ummul Qura Islamic Primary School	19	4.0%
	Ayigya M/A Primary School 'B'	17	3.6%
	Ayigya Nuriya Islamic Primary School	19	4.0%
	Ayigya M/A Primary School 'A'	23	4.8%
	Weweso M/A Primary School 'A'	53	11.1%
	Bomso M/A Primary School 'B'	35	7.4%
	Kokoben M/A Primary School	28	5.9%
	Oforikrom M/A Primary School 'B'	26	5.5%
	Bomso M/A Primary School 'A'	39	8.2%
	Weweso M/A Primary School 'B'	45	9.5%
	Boadi M/A Primary School	47	9.9%
	Ayeduase Roman Catholic Primary School	36	7.6%
	Kotei Roman Catholic Primary School	32	6.7%
	Appiadu Roman Catholic Primary School	35	7.4%
Gender	Male	253	53.2%
	Female	223	46.8%
Age	5 years	1	0.2%
	6 years	10	2.1%
	7 years	124	26.1%

	8 years	171	35.9%
	9 years	100	21.0%
	10 years	45	9.5%
	11 years	11	2.3%
	12 years	12	2.5%
	13 years	1	0.2%
	14 years	1	0.2%
Handedness	Right	447	93.9%
	Left	29	6.1%

In Table 4. below, the HW scores indicate that 11 pupils, representing 2.2%, had *very poor* handwriting; 89 representing 18.9% had *poor handwriting*; 242 representing 50.6%, had *average handwriting*, 112 representing 23.6%, had *good handwriting* and 22 pupils representing 4.6%, had *very good handwriting*. The mean HW score is 26.0420 (approximately 26) with a standard deviation of 6.867. This implies that the pupils' HW scores are considered *average*.

Table 4. The sum of pupils' handwriting scores.

Total scores	**N**	**%**	**Interpretation**
0-9	11	2.2%	Very Poor
10-19	89	18.9%	Poor
20-29	242	50.6%	Average
30-39	112	23.6%	Good
40	22	4.6%	Very Good

Table 5: Descriptive Statistics.

	N	**Mean**	**Std. Deviation**
Handwriting	476	26.0420	6.86856

	N	Mean	Std. Deviation
Valid N (listwise)	476		

The school with the highest mean score is Weweso M/A Primary School B (*M*=31.9556, *SD* = 3.57997) followed by Bomso M/A Primary 'A' (*M*=30.3590, *SD* = 7.12478). The school with the lowest mean score is Weweso M/A Primary School 'A' (*M*=20.6226, *SD* = 6.31002). Table 6. shows the mean scores of HWD among pupils in the schools.

Table 6: The mean scores of handwriting difficulties among schools.

Name of School	Mean	N	Std. Deviation
Kentikrono M/A Basic School	25.8636	22	3.66834
Ummul Qura Islamic Primary School	22.0000	19	5.84047
Ayigya M/A Primary School 'B'	21.2941	17	5.74200
Ayigya Nuriya Islamic Primary School	22.1053	19	6.31484
Ayigya M/A Primary School 'A'	25.1304	23	5.39616
Weweso M/A Primary School 'A'	20.6226	53	6.31002
Bomso M/A Primary School 'B'	27.7714	35	4.35948
Kokoben M/A Primary School	26.2857	28	5.55683
Oforikrom M/A Primary School 'B'	22.8462	26	5.48957
Bomso M/A Primary School 'A'	30.3590	39	7.12478
Weweso M/A Primary School 'B'	31.9556	45	3.57997
Boadi M/A Primary School	28.5319	47	6.82340
Ayeduase Roman Catholic Primary School	28.3333	36	5.14365
Kotei Roman Catholic Primary School	26.6250	32	6.62230
Appiadu Roman Catholic Primary School	23.4000	35	8.45472
Total	**26.0420**	**476**	**6.86856**

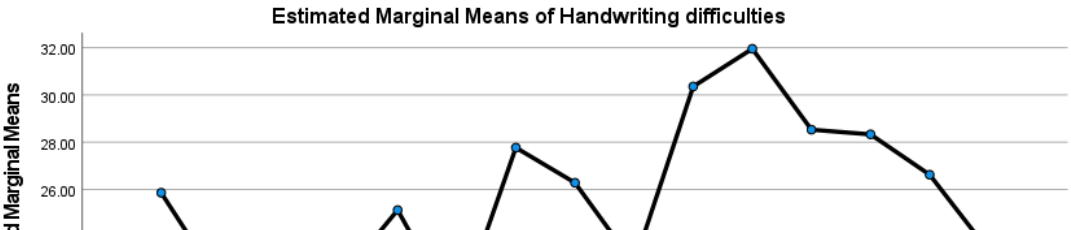

Figure 1: Estimated marginal means of handwriting difficulties among schools.

H1: There are obvious significant variations in HWD between public schools in the Oforikrom Municipality.

An ANOVA analysis was conducted to evaluate the significant effect of the difference in the mean scores between HWD based on the pupils' schools. Table 7 reveals a significant effect of HWD scores. The F-statistic ($F(14, 461) = 11.965$, $p < 0.001$). indicates a highly significant difference across the 15 schools in handwriting difficulties across the schools. We can reject the null hypothesis that all schools have equal means for handwriting difficulties. Between-group variance (differences between schools) accounts for approximately 26.7% of the total variance in handwriting difficulties (5972.430 ÷ 22409.160). This suggests that the school a student attend explains about a quarter of the variation in handwriting difficulties. The effect size, calculated as eta squared (η^2), was 0.267, indicating a large effect suggesting a substantial effect. The ratio of between-group to within-group variance (426.602 ÷ 35.655 = 11.965) indicates that the variation between schools is nearly 12 times larger than what would be expected by chance.

Table 7: ANOVA Analysis of handwriting difficulties, mean scores, and schools.

			Sum of Squares	df	Mean Square	F	Sig.
Handwriting difficulties * Name of School	Between Groups	(Combined)	5972.430	14	426.602	11.965	.000
	Within Groups		16436.729	461	35.655		
	Total		**22409.160**	**475**			

Independent t-test between gender and handwriting variables.

To ascertain the degree of data overlap between the two groups, an independent t-test was used to compare the mean scores of each group (male and female pupils) while accounting for the numbers that form the basis of the mean scores. As shown in Table 8. there is a significant difference between males (M = 3.29, SD = 1.039) and females (M = *3.48*, SD = *.944*; t (474) = *2.092, p = .037*) for letter formation. The magnitude of the differences in the mean scores (mean difference = .191, 95% *CI*: .012 to .371) is significant. There is also a significant difference between male (M = 3.06, SD = 1.115) and female (M = 3.29, SD = 1.090; t (474) = 2.286, p = .023) for handwriting legibility. The magnitude of the differences in the mean scores (mean difference = .232, 95% *CI*: .012 to .384) is significant. Again, concerning handwriting speed, there is a statistically significant difference between male (M = 3.65, SD = .979) and female pupils (M = 3.91, SD = .863; t (474) = 3.157, p = .002). The magnitude of the differences in the mean scores between males and males was (mean difference = .267, 95% *CI*: .099 to .434). However, there are no significant differences between male and female pupils with regard to HW *placement*, *letter sizing*, *spacing of letters*, *spacing of words,* and *neatness*.

Table 8: Independent t-test between gender and handwriting variables.

Variable	*Gender*	*N*	*M*	*SD*	*t*	*P*
Letter Formation	Male	253	3.29	1.039	2.092	**.037
	Female	223	3.48	.944		
Placement	Male	253	2.92	.981	.729	.467
	Female	223	2.99	.979		
Letter Sizing	Male	253	3.02	.943	1.838	.067

Variable	*Gender*	*N*	*M*	*SD*	*t*	*P*
	Female	223	3.18	.997		
Spacing of Letters	Male	253	3.15	1.029	1.874	.062
	Female	223	3.33	.980		
Spacing of words	Male	253	3.26	1.053	1.493	.136
	Female	223	3.41	1.035		
Legibility	Male	253	3.06	1.115	2.286	**.023
	Female	223	3.29	1.090		
Speed	Male	253	3.65	.979	3.157	**.002
	Female	223	3.91	.863		
Neatness	Male	253	3.04	1.013	1.628	.104
	Female	223	3.20	1.047		

H1: Comparatively, boys and girls in class two within these schools exhibit significantly different rates of HD, pointing to a potential gender-based variation.

Table 9: Independent sample t-test between boys and girls.

		F	Sig.	t	df	Sig. (2-tailed)	MD	95% CI Difference	
								Lower	Upper
Handwriting difficulties	Equal variances assumed	.743	.389	2.211	474	.028	1.38896	.15431	2.62362
	Equal variances not assumed			2.216	470.617	.027	1.38896	.15754	2.62039

Levene's test for equality of variances indicates equal variances between boys and girls (F (1,474) = 0.743, p = 0.389). Since $p > 0.05$, we fail to reject the null hypothesis of equal variances. This means we can assume equal variances between the two groups (boys and girls), and use the first row of results ("Equal variances assumed"). Also, the t-test for equality of means shows that (t = 2.211, df = 474, p = 0.028) the p-value (0.028) is less than 0.05, indicating a statistically significant difference between boys and girls. The mean difference (1.38896) with the standard error of 0.62833 indicates the magnitude of

the difference between the boys and girls. This positive value indicates that the girls had higher scores on the "Handwriting difficulties" measure than the boys. The 95% Confidence Interval ranges from 0.15431 to 2.62362. Since this interval does not contain zero, it confirms the statistical significance of the difference.

While the t-test showed a statistically significant difference ($p = 0.028$), the effect size measures help us understand the practical significance. Cohen's d of 0.203 indicates a small effect size (conventionally: small = 0.2, medium = 0.5, large = 0.8). In addition, all three effect size measures (Cohen's d, Hedges' correction, Glass's delta) show similar values (~0.2). This consistency strengthens confidence in the small effect interpretation. This suggests that although the difference is real (unlikely due to chance), the practical importance may be limited. In educational contexts, this small effect might not represent a meaningful difference that would warrant substantial intervention or policy changes.

Discussion

Prevalence of handwriting difficulties

The results of this study offer a significant contribution to the prevalence of HWD among basic school pupils, particularly within the Oforikrom Municipality. Based on the rubric, the findings show that HWD is prevalent, with 21.1% of the participants classified as having *poor* or *very poor* HW skills, while 50.6% fell into the *average* category (see Table 4). The prevalence of HWD observed in this study aligns with Feder and Majnemer (2007), who found that 10-30% of children struggle with HW, a range that resonates with the 21.1% of pupils in the current study who scored poorly. Also, Sharma and Khan (2020) reported a prevalence rate of 34%, which is slightly higher than what was observed in this study but still within a similar range. The results are similar to Rosenblum et al.'s (2013) finding that approximately 17.6% of children in grades 1-3 had HWD. This suggests that HW challenges begin at an early age and can persist throughout elementary education if not adequately addressed.

The fact that nearly half of the pupils, representing 50.6% with *average* scores, suggests that while many pupils did not have severe HWD, a significant proportion had not reached optimal proficiency. This

finding is critical because, as McHale and Cermak (1992) highlighted, HW occupies a significant portion of a child's school day, contributing directly to their academic success. The average scores could suggest that many pupils had basic HW skills but may lack the finesse and speed necessary for efficient writing tasks, which can have lasting academic consequences.

School-based differences in handwriting difficulties

The obvious variation between schools is statistically significant as confirmed by the ANOVA results ($F(1,14) = 11.965, p < 0.001$), with a large effect size ($\eta^2 = 0.267$). This suggests that school-based factors could considerably impact HW development. Such influences could include teaching approaches, curriculum emphasis on HW, resource availability, or teacher training. This is consistent with Medwell & Wray, (2007), who found that schools using structured programmes, where teachers use good pedagogy, tend to produce pupils who write more legibly. Notable in this study, the highest and lowest performing schools belong to the same community (Weweso M/A Primary 'A' and 'B'), suggesting that even within similar socio-geographical contexts, educational approaches can dramatically impact outcomes.

Gender Differences in handwriting difficulties

The results from the t-test in this study show a statistically significant difference in *letter formation*, *legibility*, and *speed*, with girls scoring higher in all three categories. This is consistent with Kartsdottir and Stefansson's (2002) and Sharma & Khan's (2020), research, which found that girls tend to perform better in HW tasks than boys. These findings could be attributed to developmental differences in fine motor control between boys and girls, as girls generally develop fine motor skills earlier than boys, which might explain their superior handwriting performance (Raghuram et al., 2024; Barnett & Prunty, 2021; Goyen & Lui, 2009). These differences in motor development could explain why girls tend to write better, as evident in our study. The fact that 2.2% scored *very poor*, 18.9% poor, and 50.6% *average* indicates that most pupils were at risk of low academic performance since it has been established that

there is a correlation between handwriting proficiency and overall academic performance (Graham et al., 2000; Peverly et al., 2013). Poor handwriting can detract from pupils' ability to express their knowledge, leading to lower performance in written tasks, particularly in subjects requiring written expression (Graham et al., 2012; Feder and Majnemer (2007) making early intervention critical.

Handedness in handwriting

The study reveals a strikingly low prevalence of left-handedness (6.1%) among pupils in Oforikrom Municipality, contrasting the global average of ~10%. This inconsistency probably stems from cultural stigmatisation and systemic biases, such as teachers coercing left-handed children to use their right hand, a tradition entrenched in outdated educational norms. The findings highlight how institutional inflexibility changes a natural trait into a handicap, aligning with Heni & Mujahid's (2018) argument that rigid systems create unnecessary barriers.

Interventions

There is a need for targeted interventions to improve HW proficiency, as HW challenges are prevalent and persistent, yet there is a lack of structured interventions in Ghanaian schools. The combined scores of *very poor*, *poor,* and *average* HW skills indicate a need for greater emphasis on HW instruction in early education. This is especially important, considering that HW remains a foundational skill for academic success. To identify good HW skills, these eight handwriting descriptors - *letter formation, placement, letter sizing, spacing of letters, legibility, speed, neatness,* and *spacing of words* must be taught from kindergarten. The benefits of interventions that focus on fine motor skill development and visual-motor integration for children with HWD, like incorporating multisensory techniques like tracing letters in sand or using tactile writing tools, can improve letter formation and overall handwriting legibility (Goyen et al., 2009; Berninger et al., 2018). Similarly, Graham and Harris (2005) suggest that to improve letter formation and spacing, pupils use a variety of paper, like raised-line paper, to provide tactile clues to assist in constructing correct letters. Also, teachers should be trained on and resourced to identify and support pupils with HWD and left-handedness, by incorporating handwriting adaptive

techniques into daily classroom activities and providing pupils with the tools needed to practice HW regularly. Policy changes to prohibit forced hand-switching among pupils by teachers should be enforced to encourage, rather than suppress, natural diversity.

This study focused solely on class two pupils in selected public schools within the Oforikrom Municipality, which means the findings do not fully represent the experiences of pupils in other classes or those attending private schools. The study also excluded other important factors like teacher pedagogies and resources influences, parental contributions, identified learning difficulties like dyslexia and dysgraphia, cultural and socioeconomic background, or school environmental settings that may also contribute to HWD. It should be noted that, while the study offers valuable awareness of the prevalence of HWD in a specific group, caution should be exercised in generalising the results beyond this context.

Conclusion

Handwriting is a critical yet often overlooked skill in education. This study highlights the widespread HWD among basic school pupils in the Oforikrom Municipality and underscores the need for early diagnosis and intervention. The results align with previous research on the prevalence of HWD, establish gender differences in HW abilities, and suggest a guide for identifying HWD and the need for targeted interventions. Considering the high prevalence of HWD and its consequences, teachers, parents, and other stakeholders must watch for early signs to mitigate its long-term academic and social consequences. Handwriting instruction should be integrated comprehensively across the curriculum, with interdisciplinary involvement from teachers in various subjects (Thara & Wangchhuk, 2021). Given the critical role that HW plays in a child's academic journey, addressing these challenges will be vital to ensuring that all students can achieve their full potential in school.

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