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## Writing Readiness and children with Down Syndrome in an Irish Context

### Abstract

There is a dearth of studies investigating writing readiness in children with Down Syndrome (DS) and limited information on appropriate interventions. This article reports on a study conducted in the Republic of Ireland. An uncontrolled pretest–posttest design was implemented using writing readiness measures specifically adapted/developed from the literature to collect data on the writing readiness skills of 28 school–aged children with DS attending mainstream schools in the Republic of Ireland. Teacher/parent perspectives were also gathered during focus groups. The children presented with complex needs in relation to posture, pencil grasp, copying basic shapes, name/letter copying. Teacher and parent reports highlighted the need for collaborative intervention with occupational therapy. Findings from the study supports the need for targeted early collaborative syndrome–specific intervention to support the development of writing readiness in children with DS as an important part of school readiness. Intervention should include adopting a broader emergent literacy approach, teacher education regarding writing readiness and parental involvement in intervention.

Key words: writing readiness, children with Down Syndrome, collaboration, teachers, occupational therapy, parents.

### Introduction

Down Syndrome (DS) is the most common cause of intellectual disability (Vicari, 2006) and the number of children with DS attending mainstream education

is increasing (de Graaf et al., 2013; Doherty et al., 2009). Writing readiness, or being ready to begin to write, is a key issue in school readiness. The importance can be easily deduced from the estimates of 42% of a child's time spent on paper and pencil activities in kindergarten during a typical school day (Marr et al., 2003). One of the areas of greatest challenge for children with DS in a recent study of school functioning was in handwritten work (Daunhauer et al., 2014) and difficulties with handwriting continue into adulthood (Tsao et al., 2012). Yet the issue of writing readiness assessment and intervention remains largely unaddressed for this population. This is despite handwriting being an important functional life skill needed in everyday tasks and for participating in school activities.

Writing readiness requires prerequisite skills and the development of small muscles in the hand. The skills required include eye-hand coordination and being able to use writing tools, which can be considered to represent fine motor skills. There is much evidence indicating difficulties with fine motor skills in children with DS (e.g. Sacks and Buckley, 2003; Fidler et al., 2005), wide variability in the attainment of a mature pencil grasp and poor postural control in sitting (Novak Hoffman et al., 1990; Ziviani and Elkins, 1993).

These children also have difficulty with the additional prerequisite skills of being able to form basic strokes, such as circles and lines (visual-motor skills) and letter perception and orientation to printed language (linguistic skills), e.g. Abbeduto et al., 2007; Daunhauer and Fidler, 2011; Spano et al., 1999; Turner and Alborz, 2003. Most of the limited studies reporting on handwriting abilities in children with DS indicate wide variability. Teachers reported in a UK longitudinal study that 25% (n554) of children aged 8 years were reported to be able to write their first name independently. At follow-up, aged 10 years, 50% (n536) were able to

copy letters and 25% were able to write their first name and surname independently (Turner and Alborz, 2003). In another Australian study, approximately 46% (n556) of children aged 5 years 1 month to 9 years were reported by parents to write their own name and other familiar words. However, 37.5% fell into the 'does not write' category (Trenholm and Mirenda, 2006).

Little attention has been directed towards the teaching of handwriting as part of literacy in national curriculums (see for example, Australian Curriculum, Assessment and Reporting Authority, 2010; Department of Education and Skills (DES), 1999; Medwell and Wray, 2008). Recent policy, however, outlines the importance of direct explicit teaching of handwriting (Department of Education, 2013) in particular for children with special educational needs (SEN) (National Council for Curriculum and Assessment (NCCA), 2012). Additionally, contemporary authors advocate that assessment and intervention needs to account for the profile of strengths and weaknesses of individuals with DS (Daunhauer et al., 2014) and that collaborative syndrome-specific approaches need to be developed by educators and allied health professionals (All Party Parliamentary Group on Down Syndrome (APPGDS), 2012).

Within this context, the purpose of this article is to present pre- and post-intervention data relevant to the profile of writing readiness in children with DS from a larger doctoral study. The intervention involved collaboration between teachers, parents and an occupational therapist; relevant data regarding teacher/parent perspectives on the intervention are also included. Discussion will centre on how the data inform the issues surrounding writing readiness in children with DS and the nature of assessment and intervention required to address specific challenges.

## Methodological approach

Data were collected in 2006–2007. Forty-six children with DS attending mainstream schools in 3 counties in the Republic of Ireland, and their parents and teachers, were recruited using purposive sampling. A voluntary parent organization, Down Syndrome Ireland (DSI), distributed information to parents of children with DS on their database. Inclusion criteria included; the children had Down Syndrome, were aged between 5 to 10 years 11 months at the start of the study and had handwriting difficulties according to parent/teacher report. The findings presented here relate to 28 children at a prewriting stage or 61% (n546) of entire sample. Ethical approval for the study was obtained from Trinity College Dublin and DSI. Written consent was obtained from teachers and parents (who also completed consent on behalf of their child).

The context of the findings reported in this article involved the application of the Handwriting Without Tears (HWTVR , Olsen, 2003) method using a collaborative approach between children with DS, their teachers, parents and an occupational therapist. Refer to Table 1 for details.

As part of a larger mixed methods study, data were collected relevant to writing readiness using an uncontrolled pretest–posttest design. The following aspects of writing readiness were tested; writing posture including body posture and pencil grasp, letter formation, name writing and visual–motor integration (copying shapes). Teacher reports of reading abilities were collected. Teacher/parent perspectives relevant to writing readiness were gathered during focus groups.

A range of measures were thus assessed during the study. Pencil grasp levels were determined based on the descriptive categories developed by Schneck and Henderson (1990). A similar procedure was used to categorise body posture

using a purpose-designed descriptive scale. Three categories were used in this scale: poor whole body posture (slouched upper body posture and feet not consistently flat on ground; poor upper body posture (upper body slouched over desk) and no postural issues (upright posture with feet flat on the floor).

The Developmental Test of Visual Motor Integration (VMI; Beery and Beery, 2004) was used to measure visual-motor integration abilities. The VMI has been subjected to substantial psychometric testing and its validity has been demonstrated by a number of studies (Beery and Beery, 2004).

At the time of data collection there was no suitable comprehensive measure of handwriting readiness available, an issue recently reported to still be the case (van Hartingsveldt et al., 2011). A suitable measure was developed by engaging four experienced therapists (specialising in work with children with Intellectual disabilities including DS) in a focus group as well as ongoing literature review. The format used in the Scale of Children's Readiness in Printing (SCRIPT; Marr et al., 2001) was piloted and adapted with a total of 10 children from the sample, in a phased basis prior to pre-intervention testing. Both individual letters and names were scored using one criterion - whether the letter/name was legible or not. Intra-rater and inter-rater reliability was measured by calculating percentage agreement and kappa statistic for letter and name legibility. In the case of intra-rater reliability kappa values were 0.687 (rater 1) and 0.582 (rater 2) for letter legibility and above 0.8 (rater 1 and 2) for name legibility. In the case of inter-rater reliability a kappa value of 0.722 was reached for letter legibility and a value above 0.8 for name legibility.

Pre- and post-intervention teacher and post-intervention parent focus groups were also conducted. Semi-structured question formats were developed; questions relevant

to this discussion are summarised in Table 2 along with sampling methods.

The writing readiness measure was applied with all 28 children on three occasions – pre-intervention, post-group (6 months later) and post-intervention (at two month follow up) by the first author. Three teachers attended the pre-intervention, four teachers (six teachers invited) and six parents attended the post-intervention focus groups.

### Analysis and findings

Descriptive statistics were used to analyse all writing readiness data. Pencil grasps were categorised according to the three levels of grips devised by Schneck and Henderson (1990) as primitive (immature grasp patterns), transitional and mature grips. Categorisation was undertaken by video analysis of pre-intervention testing

footage separately by first author and another expert occupational therapist. The children's body postures were categorized using the descriptive scale developed. Two independent therapists scored each letter and name blindly on the criteria and joint agreement was needed to deem the letter/name legible. Focus group data were recorded verbatim and content analysis completed with review by a supervisor of summary of themes. Member checking was completed, with all participants in agreement with themes identified.

Twelve or 43% (n528) of parents reported that their child had some form of Occupational Therapy input in the past. This intervention consisted of one short block of weekly intervention (4–6 sessions) or assessments/advice only for all children with the exception of one child who had received a number of blocks of intervention. The remaining 16 children (57%) had received no previous occupational therapy intervention.

All children, with one exception, had postural difficulties. Eight of the children

(n=28) had poor whole body posture and 18 (64%) had poor upper body posture (typically body slouched over desk). Overall, only three children had a mature grasp and 11 children (39%) had transitional grasps. However, 14 children (50%) were at a primitive grasp level, which included such immature grasp patterns as palmar supinate grasp (typical developmental age 1 to 1½ years) and grasp with extended fingers (typical developmental age 2–3 years). Children with primitive grasps ranged in age from five years six months to ten years nine months. A number of children were unable to copy the first four shapes in the VMI pre and post intervention (eight months later). Refer to Table 4. Additionally, wide variability in reading ability was reported, including seven children with no reading ability. Refer to table 5.

Only two children were able to copy their name and 22 (78.57%, n=28) were unable to form any legible letters pre-intervention. Again, a wide variability in the age of children was apparent. Seven (25%) of the children aged over seven years and in the moderate range of intellectual disability had received educational intervention to develop handwriting for at least two years previously.

Given the complexities of difficulties that 14 children in this group presented with, such as very immature pencil grasps and no handwriting ability, functional goals were chosen in collaboration with teachers and parents. These goals included focusing on the letters in their name and/or letters in family names. At post intervention, 15 children could write their name, 12 children (43%) were able to form ten or more legible letters and 11 children (39%) were able to form one to nine letters. Five children (18%), within the age range of six years one month to nine years three months, were unable to form any letters pre and post intervention and had no reading ability.



Teachers reported that training received in handwriting instruction was minimal at an undergraduate level and there was no training at either pre- or post-graduation in teaching handwriting to children with special educational needs. Teachers were reluctant to adopt the developmental approach of the HWTVR (i.e. teaching capital letters first as they are developmentally easier to form) as that deviated from the standard curriculum (where lower case letters are taught first). A compromise was reached during collaborative goal-setting, with the exception of five children whose teachers continued to teach lower case letters. However, teachers and parents acknowledged the HWTVR hands-on materials and step-by-step approach to teaching letter formation as very useful for teaching children with DS.

The teachers identified the need for occupational therapy involvement in undergraduate teacher professional education and in continuing professional development (CPD) for resource teachers in relation to handwriting. Parents also advocated for teacher training in the use of HWTVR with children with DS. Parents requested that findings could be presented to the Department of Education and Skills (DES) for consideration in future curriculum developments, in particular, at a preschool level. Both teachers and parents identified continued practical guidance and support of occupational therapy expertise in a three-way collaborative approach between teachers, parents and occupational therapy as beneficial. Refer to Table 6 for supporting quotations.

## Discussion

Difficulties in a number of areas considered prerequisite skills to writing were evident, with ability not necessarily linked to chronological age. This supports reports from previous studies (Abbeduto et al., 2007; Novak Hoffmann et al., 1990; Spano et al., 1999; Trenholm and Mirenda, 2006; Turner and Alborz,

2003). Yet a conflict existed for teachers between the individual learning needs of the child with DS and their desire to follow the standard curriculum. Existing national primary school handwriting curricula assume a certain level of prerequisite skills for writing (Australian Curriculum, Assessment and Reporting Authority, 2010; Department of Education, 2013; Department of Education and Skills (DES), 1999). Given the complex needs of children with DS, with half of the children at the level of basic functional handwriting goals, the curriculum would appear inadequate. It is evident that writing readiness needs to be investigated from a broader emergent literacy perspective, which includes the child's understanding of writing as symbolic representation, language development, and cognitive skills, as well as an understanding of the impact of motor skills on the ability to physically reproduce letters. While this approach has been advocated for occupational therapy practice (Gerde et al., 2014), it requires inter-agency collaboration between educationalists, occupational therapists and other allied health professionals to enable joint goal planning and implementation.

As the preschool years are critical for developing literacy skills including prewriting skills, (Puranik and Lonigan, 2011) targeted syndrome-specific interagency early intervention should begin in preschool and writing readiness should be addressed as an important part of school readiness. The need to address writing readiness was highlighted by the findings of a recent study of school functioning which found that one of the challenges for children with DS in a recent study of school functioning was in handwritten work (Daunhauer et al., 2014).

There is also a need for accurate inter-agency collaborative assessment to inform functional goal setting and individual education plans during the preschool and school years. See further discussion in Patton (2011) and Patton, Hutton and MacCobb (2015).

Interestingly, teachers reported limited training in teaching handwriting to children

with SEN/DS. Both teachers and parents identified the provision of teacher training in handwriting and HWTVR approach as a priority outcome from the study. Both nationally and internationally, the need for an extension of teaching and learning approaches/methods by teachers to meet special educational needs and curriculum differentiation has been identified (European Agency for Development in Special Needs Education, 2011; National Council for Special Education (NCSE), 2013). Specifically, the national literacy strategy in Ireland identifies the need for teacher training to include education in promoting literacy skills for children with SEN (DES, 2011). Occupational therapists have unique skills in task analysis and adaptations and facilitating functional skills that could greatly inform pre- and post-graduation teacher education curricula to support children with DS in developing writing readiness and handwriting skills.

Both teachers and parents reported that the practical guidance and support of the occupational therapist and the three-way collaboration during assessment and intervention was beneficial. As early parental involvement is key to developing children's literacy including handwriting (Aram and Levin, 2004; Skibbe et al., 2013) collaborative early intervention with parents is advised. This approach to intervention could be incorporated as part of an extended schools/service model which has been used in many countries to address social disadvantage, including the United States, Australia and UK (Dyson, 2011). By using this approach, intervention, such as the parent-child groups, training sessions for staff and parents could occur within preschool/school facilities. Interestingly, Vaughan and Henderson (2016) report on a teacher training initiative which involved a parent organisation and school partnership and which addressed curriculum issues for children with DS and included occupational therapy input using face to-face workshops and online learning options. This suggests another possible avenue to facilitate teacher/parent education that could incorporate a focus on writing readiness.

All the above recommendations require increased face-to-face contact between educationalists, parents and occupational therapists. Yet parents reported limited to no access to previous occupational therapy services. The implementation of coordinated early intervention by allied health professionals and educators faces many systemic and fiscal barriers nationally and internationally (APPGDS, 2012; Marshall et al., 2014; NCSE, 2013).

It should be noted that the findings in this article are not generalisable, as they were context specific. The first author acted in a dual researcher-clinician role which may have introduced bias. The first author conducted the pre-intervention focus group. The post-intervention focus groups were conducted by academic staff members to reduce researcher bias. Additionally, scoring of measures was undertaken in conjunction with independent therapists. The measures used (with the exception of the VMI) were not standardised. However, every effort was made during the process of measurement adaptation/development to pilot new measures and to establish intra- and inter-rater reliability where appropriate. Cognitive and language skills related to writing readiness were not directly investigated.

#### Concluding remarks

The complexity of individual needs in relation to writing readiness that children with DS can present with highlights the need for further investigation of writing readiness in children with DS attending preschools and mainstream/special schools. Whilst the present study refers to an Irish context, the findings have relevance broadly to other national settings. Further research into development of writing readiness interventions as part of school readiness, involving interagency

collaborative practice, is also required.

Teacher training opportunities with occupational therapists and collaborative inter-agency goal setting and planning opportunities could ensure appropriate curriculum differentiation strategies for children with DS in relation to writing readiness. This would seem particularly pertinent given the complexity of individual needs with which children with DS present with in relation to writing readiness. Joint collaboration between occupational therapy and education university departments to investigate inter-professional training opportunities is recommended. The findings support the recommendation for properly resourced provision of support services, such as occupational therapy (NCSE, 2013) 'to ensure appropriate adaptation of teaching approaches and curriculum appropriate to the specific learning profile [of children with DS]' (p.11, APPGDS, 2012).

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