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Translating evidence-based practice into an autism specific special school: Model, evaluation and outcomes

Lee, Katy

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**Translating evidence-based practice into an autism specific special school:
Model, evaluation and outcomes**

Katy Lee

Thesis submitted to the School of Psychology, Bangor University, in partial fulfilment
for the degree of Doctor of Philosophy

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Summary

Autism Spectrum Disorder (ASD) has been identified as the most prevalent primary need amongst school aged children in the United Kingdom (UK) requiring specific special educational provision. However, despite this prevalence, adult outcomes for those on the autism spectrum remain troublesomely bleak. Researchers have acknowledged the translational gap between research and practice within autism education and have cited the lack of practice-based research in school settings as a contributory factor. The purpose of this thesis was to begin to address the existing research-practice gap by evaluating the impact of a whole-school, evidence-informed behavioural model of practice for children and young people with autism and an intellectual disability. Research chapters begin with a rare description of a school-wide behavioural model of educational practice implemented within an autism specific special school in addition to reporting some preliminary outcomes for the children and young people attending the school (Chapter 2). Chapter 3 presents and evaluates an assessment framework used for the monitoring and evaluation of pupil progress in a special school setting. This framework is then utilised in Chapter 4 to evaluate the impact of the school-wide behavioural education model after one year of access for a group of pupils new to the school. The question then explored in Chapter 5 turns to the longer-term sustainability of outcomes for pupils from a whole-school behavioural educational model of practice. Results from these studies provide preliminary evidence that it is feasibly possible to implement an evidence-informed model of practice into a UK special school and produce positive and sustainable outcomes for pupils with autism and an intellectual disability. The findings from these studies are brought together in Chapter 6 and discussed in relation to their

contributions to the evidence-base, methodological strengths and weaknesses, avenues for future research and implications for practice.

Chapter 1: Introduction to Thesis

This introductory chapter will initially guide the reader through an overview of Autism Spectrum Disorder (ASD). Autism will then be considered within the context of wider models of disability and how such models may have influenced the context of special education, within which children and young people with ASD access their educational entitlements. A summary of the current special educational needs (SEN) context within the UK is then presented which highlights some troublesome statistics in relation to school-based experiences and adult outcomes for those on the autism spectrum. I then consider what the literature reveals about evidence-based practices within autism education and, if and how such approaches have been embedded and evaluated within every-day school practice. Finally, a persistent research-practice gap in the autism education field is highlighted before closing the chapter with an overview of the content of this thesis.

Autism Spectrum Disorder

Autism Spectrum Disorder (ASD) is life-long neurodevelopmental condition, exemplified by difficulties with social communication and interaction along with unusually repetitive behaviours and restricted interests (DSM-IV). The prevalence of ASD has steadily increased since the first reported population studies in the mid-1960s (Elsabbagh et al, 2012) with more recent statistics reporting ASD to impact one percent of children in the United Kingdom (UK) (National Institute of Health and Clinical Excellence, 2013). This increase is thought to be attributed to a number of factors such as improved autism awareness and recognition in society, changes to diagnostic criteria and children being diagnosed at a younger age than has previously

been the case (Elsabbagh et al, 2012; Keyes, Susser, Fountain, Liu & Bearman, 2012). However, an increase in risk factors associated with an autism diagnosis may also be a contributory variable (Lai, Lombardo & Baron-Cohen, 2014).

More males are affected by autism than females with large-scale population studies reporting a male/female ratio of 4:1 respectively (Fombonne, Quirke & Hagen, 2011). Co-morbidity is common with over 70% of the ASD population being diagnosed with an additional psychiatric, medical or developmental condition (Lai et al, 2014) and approximately half of all children with ASD reported to have an intellectual disability (ID) (Totsika, Hastings, Emerson, Lancaster & Berridge, 2011). Autism is described as a spectrum condition, meaning that although those with ASD will share difficulties in certain areas, the impact on each individual can vary greatly, with some leading relatively independent lives with minimal support, whilst others require a high level of support across their lifetime to ensure that their basic needs are met (Howlin, Goode, Hutton & Rutter, 2004). To date, there is no single known cause for ASD and as such, no corresponding cure. Thankfully, research has both moved past and discredited the possible causes proposed in the 1950s linking childhood autism to poor parenting skills devoid of affection (Bettelheim, 1967), with contemporary research acknowledging autism to be underpinned by a combination of complex interactions between aetiological, genetic and non-genetic factors (Lai et al, 2014).

Despite an exponential growth in research attention over the past twenty years into possible interventions to support children and young people on the autism spectrum (Wong et al, 2015), adult outcomes for this population remain a concern, with 58-78% of adults with autism reported to have poor outcomes in relation to quality of life, independent living, educational attainment, occupational achievement

and peer relationships (Billstedt, Gillberg & Gillberg, 2005; Howlin et al, 2004; Howlin, Moss, Savage & Rutter, 2013). In order to amend such trajectories for individuals with autism and their families, a research focus on the identification and implementation of what constitutes effective support for children and young people with autism during their school-aged years should be considered a priority (Pelicano, Dinsmore & Charman, 2014). Although rooted in physiological factors, research suggests the most effective interventions for autism to be educational and behavioural, with drug treatments playing only a minor role to date (Lai et al, 2014). As such the translation of evidence-based practices identified by research into day-to-day educational settings has been acknowledged as a gap in the literature that needs to be addressed (Bond, Symes, Hebron, Humphrey & Morewood, 2016).

Autism and models of disability within the context of special education

In order to consider the place and relevance of evidence-based practices within autism education, it is helpful to firstly consider the wider models of disability prevalent within the field of special educational needs and how these may have influenced current educational practices and contexts for children and young people with autism, ID and complex learning needs.

The medical model of disability and its influence within special education.

The medical model focuses on disability as a result of within-child impairments and thus atypical or reduced function is viewed as a direct outcome of biological defects within the individual (Rees, 2017). The medical model has influenced many areas of pedagogical and teaching practices for a variety of possible reasons. For example, the influence of the medical model is evident in an infant's life from the moment of conception through valuable initiatives such as national screening programmes for

pregnant women, post birth screenings to identify possible congenital disorders, health visitor check-ups until a child reaches school age and then school-based screenings for possible medical problems such vision and hearing impairments. Given this context, the identification of possible special educational needs (SEN) may be first questioned by, or reported to, health rather than education professionals when children fail to meet typical developmental milestones. Health professionals then refer children on for diagnostic assessments and, if a diagnosis of autism is warranted, then it is given by a medical professional.

Carrying labels weighted with medical context into education settings may lead to a number of difficulties in practice. For example, with the medical model assuming that any special educational needs a child experiences stem directly from an identified impairment within the child, it has been criticised for reducing the accountability of teaching staff to conduct wider enquiry into why a child may behave in a particular way or experience developmental challenges or other barriers to their learning. That is, the model overlooks the impact of environmental and social conditions on the developmental learning journey of children and young people with identified SEN (Bottcher & Dammeyer, 2016). Furthermore, if autism or any other SEN is primarily understood as a biological factor then failure to learn and progress lies within the child's diagnosis thus minimising the need to establish adapted teaching and learning approaches and establish adequate support to enhance a child's progression (Reid & Valle, 2004).

The social model of disability and its influence within special education.

The social approach to disability focuses on cultural, environmental and social factors proposing that disability is constructed by barriers in society that limit the meaningful involvement of particular groups of people (Reindal, 2008). The social model has had

a salient influence within the field of special education and was instrumental in establishing the right to education for children with SEN in the 1970s (Warnock, 1978). However, with a focus solely on a child's learning environment, as opposed to any physiological factors, the concept of special education in itself is problematic, with children's rights viewed as compromised if separated from mainstream pupils or practices (Rees, 2017). This is reported to have led to a focus on mainstream inclusive practice, referring to *where* education takes place, driven by principled rather than evidence-based decisions (Bottcher & Dammeyer, 2016). The current cultural view of inclusive practice within the mainstream school sector may disadvantage pupils with severe and complex learning needs. By aligning with a model of differentiation of mainstream practices within mainstream settings, teachers may not support the learning of children with SEN in a manner accessible for them (Rees, 2017). In addition, the literature surrounding the development of children and young people with complex learning needs provides considerable support for differences in pedagogy (Imray & Hincliffe, 2014).

A biopsychosocial understanding of disability and its influence within special education. The medical and social models of disability both hold important places in our understanding and support for children and young people with SEN, however, both can be problematic philosophically and practically when considered in isolation. Bottcher and Dammeyer (2016) argue for a more interactional model of disability understanding inclusive of biological, psychological and social factors that emphasise both the importance of societal understanding of disability in childhood *and* the bearing of disability on child development. Such a dialectical approach emphasises the influence of both genetics and environmental factors in a child's development. The term 'developmental incongruence' is used to highlight a potential

mismatch between a child's biological and psychological development and the cultural practices in society (Bottcher & Dammeyer, 2016). Translated into the special education field, this understanding may arise both at a broad level (e.g. a common curricular) and an individual pupil level (e.g. specific approaches to teaching and learning). Working within this model in a special education context promotes the organisation of children's learning based both on knowledge of commonalities experienced by children with similar needs (e.g. children with autism) alongside knowledge and understanding of individual pupils needs. Put into the context of autism specific education; without an understanding of both the common learning needs and barriers faced by children with autism *and* the individual needs, strengths and weaknesses of each and every child with autism, teaching and learning approaches may not be adequately designed to support their progress and development.

The context of this thesis lies firmly within this dialectical framework. The view of autism is twofold; Autism is a neurodevelopmental condition, however, regardless of its biological roots, children and young people with autism are able to learn and progress meaningfully given appropriate educational support. This dichotomy is matched in the view of special education within this thesis; Children and young people with autism should be supported to access their full educational entitlement which consists of an appropriate education enabling them to achieve their best possible outcomes (DfE, 2015). For those children with complex learning needs associated with their autism and intellectual disability, specialist teaching approaches may be required in order to support their learning. Teaching and learning may thus, take place in specialist school settings in order to meet the learning and support needs of this vulnerable group of children and young people.

Special Educational Needs: UK Context

The purpose of universal education in the UK is to prepare children and young people for adult life, equipping them with the skills and knowledge required to thrive and participate in society (Hodkinson, 2015). Children with special educational needs are entitled to an education that enables them to reach their best possible outcomes (DfE, 2015), although, what constitutes a good outcome will vary considerably based on pupils' individual needs. The number of pupils with special educational needs in the UK has increased year on year to a figure of 14.6% in 2018 (DfE, 2018). Pupils' with particularly complex learning needs who have been unable to make adequate progress via typical provision will often be in receipt of an Education, Health and Care Plan (EHCP). An EHCP is a legally binding document that sets out the identified needs of the child, along with the necessary provision and educational placement required to meet those needs (DfE, 2015). The number of children requiring EHCPs has also risen over recent years, totalling 2.9% of the population at the time of writing, with autism cited as the most prevalent primary need accounting for 28.2% of all EHCPs issued for children by local authorities (DfE, 2018). As children with SEN vary widely in terms of intellectual disability and support needs, it is recognised that a range of educational placements is required in order to meet the needs of this population (Parsons et al., 2009, Parsons & Kasari, 2013), with 45% of children with an EHCP attending special school placements (All Party Parliamentary Group on Autism, 2017).

Despite special needs schools supporting some of the most vulnerable children in our population, there is very little published about the recommended practice for such settings nor the outcomes achieved by the pupils attending them (Wittmeyer et

al., 2011). With specific regard to children and young people with autism, we are faced with some difficult statistics in relation to their school experiences. For example, children with autism are six times more likely to be excluded from school than typically developing children (DfE, 2014) and over 60% of teachers in England have not received adequate training to teach children on the autism spectrum (NASUWT, 2013). Such troublesome statistics alongside the acknowledged poor outcomes for adults on the autism spectrum (Dingfelder & Mandell, 2011; Shattuck et al, 2012), prompts the question of whether we are doing enough to support the education and outcomes for some of the most vulnerable children and young people in our society. It is helpful therefore, to now turn to the academic literature to establish what may be considered as best available evidence-based practice for children and young people with autism and, if or how this is currently incorporated within education settings.

Autism Education and Evidence-Based Practice

Rising statistics in autism prevalence over the past two decades (Lai et al, 2014) have led to an increased focus from researchers on the evaluation of interventions to support children and young people with ASD (Kasari & Smith, 2013). Recent systematic reviews have been helpful in identifying empirically tested interventions. Wong et al (2013) evaluated the quality of autism intervention studies for children and young people aged from birth to twenty-two over a twelve-year period from 1990 to 2011. This review identified twenty-seven interventions considered to be evidence-based with authors reporting that the majority of these practices consisted of techniques derived from the field of behaviour analysis either as isolated techniques (such as the use of reinforcement, prompting and extinction), or in

combinations to produce replicable procedures (such as functional communication training and discrete trial teaching). A further review by Bond, Symes, Hebron, Humphrey & Morewood (2016) extended this work by including more recent literature. Results reported 22 practices considered to be evidence-based with most of the interventions echoing those identified by Wong et al (2013). The National standards Project (2015) aimed to provide comprehensive information for parents, caregivers, educators, and policy makers who are required to make important decisions regarding approaches to education and intervention for children with ASD. Outcomes from this review listed 14 interventions that were considered ‘established’ for children and young people under the age of 22. The largest body of evidence was found in support of behaviourally-based interventions, with a further five of the focused interventions listed being derived from the science of behaviour analysis. Comprehensive early intervention programmes for young children with autism underpinned by behaviour analysis have also been widely acknowledged as well-established evidence-based practices for some time (Eldevik et al, 2010).

The growing evidence-base for the use of behavioural interventions within autism education has been acknowledged within national policy in some parts of the world. For example, in the USA behavioural approaches are provided as the intervention of choice for young children with autism in a number of States (Dillenberger, 2015). Similarly, in Canada, most provinces provide recently diagnosed young children with autism access to Early Intensive Behavioural Intervention (EIBI) (Norris, Pare, & Starky, 2006). However, the UK is somewhat further behind, with the only reference to behaviourally-based interventions in national policy and guidance, referring to the recommended use of functional

assessment methods for challenging behaviours in children and young people with autism under the age of 19 (National Institute of Health and Care Excellence, 2013).

The evidence base for behavioural approaches in the school-based education of children and young people with autism. There is an established and growing evidence-base reporting the positive outcomes from comprehensive EIBI for young children with autism (Eldevik et al, 2012; Smith & Ladarola, 2015). However, as children will be of school age for many more years than those considered optimal for early intervention, it is imperative to consider if and how behaviourally-based interventions can support children's school-based education (Anderson, Smith, & Wilczynski, 2018). There are limited examples in the literature demonstrating the use of behaviourally-based education models within school settings, however, those that do exist show promising preliminary results. Grindle et al (2012) described how evidence-based behavioural teaching and learning methods were introduced into an autism specific classroom for key stage 1 children in a UK-based mainstream primary school. Participants were a group of 11 children aged between 4-7 years. Encouraging results were demonstrated for children accessing the provision after both one and two years with children making significant improvements in IQ and adaptive behaviour scores indicating that they had learned skills more rapidly than expected given their baseline assessment results. Foran et al (2015) evaluated the inclusion of behavioural approaches to teaching, learning and behaviour support for a group of seven children aged between 5-7 years old in a UK special needs school. School staff were trained in behaviour analysis and Board Certified Behavior Analysts (BCBAs) worked with teaching staff to design individualized teaching and behaviour support plans for the pupils in the study. After one year, significant gains were observed across measures of academic skills, language, adaptive skills, social skills and challenging behaviour.

Pitts, Gent & Hoerger (2019) extended this research with a slightly larger sample of 16 pupils aged 4-13 years across three class groups in another UK-based special school. These studies are methodologically similar, with the authors also training school staff in behaviour analysis and a BCBA working alongside teaching staff to design and implement individualized programmes of support for learning and challenging behaviours. Results were in line with Foran et al (2015) with pupils making significant gains with language, social and academic skills, adaptive skills and challenging behaviour. Although such studies provide preliminary positive outcomes, authors acknowledge the small sample sizes and therefore, caution the generalizability of these outcomes.

Evidence has also accumulated for the use of behaviourally-based approaches in the teaching of specific skills for children and young people with ASD. For example, teaching verbal behaviours to support communication skills (Landa, Hansen & Shillingsburg, 2017); increasing fluency skills via the use of precision teaching (Kerr, Smyth & McDowell, 2003); supporting the development of academic skills such as mathematics (Tzanakaki et al., 2014) and reading (Grindle et al., 2012) along with the development of precise technologies such as the Picture Exchange Communication system (PECS) (Frost & Bondy, 2002) and the use of functional analysis and function-based behaviour support plans in school settings (Rispoli, Ninci, Neely & Zaini, 2014).

Although studies demonstrating both the inclusion of behaviourally-based approaches within schools and the use of such approaches for the teaching of specific skills have yielded positive outcomes, we could find no publications at the time of writing, on how such approaches could be embedded into a school-wide model of provision other than the studies derived from this thesis (see Chapters 2, 4 & 5). As

schools in the UK are accountable for the education and progress of *all* children in their cohort (DfE 2014), it appears imperative that researchers begin to evaluate school-wide models of practice within the special school sector which is supporting those children on the autism spectrum with the most complex of learning needs.

The research-practice gap in autism education and evidence-based practice

Evidence-based practice within schools in the UK is increasingly advocated (Goldacre, 2013) and schools are under pressure to use ‘what works’ with regard to teaching and learning practices in order to maximise pupil outcomes (Hattie, 2008). Research indicates that individual practitioners seldom draw on the research literature to alter their practice (Lather, 2004), with many schools therefore utilising teaching and learning approaches unsupported by such research (Carter, Stephenson, & Strnadova, 2011). However, both policy makers and researchers have identified the need for further work in order to translate research outcomes into everyday school practice (DfE, 2014; Guldberg, 2017). This problem should not be interpreted as top down in nature. The view that practices should flow straight from efficacy studies in respected journals to everyday classroom practice is problematic as school settings are unable to provide the highly controlled conditions under which research has often taken place (Guldberg, 2017). For example, how successful an intervention may be in a school setting may depend on a number of other variables in addition to the intervention itself; teacher skills and understanding, different starting points for pupils, the quality of learning objectives, the school curriculum, and the school context in general (Biesta, Allan, & Edwards, 2014). Although the research literature has been pivotal in identifying empirically tested interventions to support children and young people with autism, their relevance to educators has not been clear, with only

32% of the evidence-based interventions reported from robust systematic reviews having been evaluated within school settings (Anderson, Smith & Wilczynski, 2018). It is therefore difficult to assess their educational utility.

Assessment and evaluation of progress for children and young people with autism accessing educational support is a further criticism of both the research literature (Guldborg, 2017) (regarding how the impact of approaches is measured) and of day to day school practice in the UK (Parsons et al, 2011; Wittemeyer et al., 2011). In a recent review of measurement tools for children with autism, McConachie et al (2015) acknowledge that a limited range of outcomes measures are often used within autism intervention research making it difficult to assess the impact of potential interventions on more than a narrow range of skills. In addition, it is widely acknowledged that many of the measures used by schools in the UK for assessing progress are ill-suited for the planning and monitoring of progress for pupils with ASD (Wittemeyer et al, 2011), and that simply adapting mainstream approaches to assessment will not suffice (Cumming, 2008). Given the diverse educational needs of pupils on the autism spectrum, it appears prudent that both researchers and schools use multiple measures of progress to capture gains and development across all areas of life (Charman et al, 2001; Charman et al, 2011; Charman & Howlin, 2003; Magiati & Howlin, 2001; Wittemeyer et al, 2011).

Given the continued poor outcomes of adults on the autism spectrum in the UK (Dingfelder & Mandell, 2011; Shattuck et al, 2012), there has been a clear call for researchers to collaborate with schools both in the implementation and evaluation of evidence-based practices. Research evaluations should be conducted within the day to day school settings in which models, interventions and practices will be embedded; with the pupils whom will be supported by such models of practice and with the

school staff who will be implementing them (Anderson, Smith & Wilczynski, 2018; Kasari & Smith, 2012; Robson & Bond, 2017). This is the focus of this thesis.

Structure of the thesis

The remainder of this thesis consists of five chapters: four research chapters based on independent studies, and a discussion chapter. Each of the research chapters have been written as manuscripts that either have been, or will be, submitted for publication. They are therefore, written as stand-alone pieces of work.

At the time of writing, there is a paucity of research into school-wide models of practice that support children and young people with autism and an intellectual disability to access their statutory right to an effective education. This is despite the widely accepted poor outcomes for adults on the autism spectrum. Researchers have acknowledged the translational gap between research and practice, citing the lack of practice-based research as a contributory factor and calling for researchers to collaborate with schools to evaluate practices within the context in which they occur. The intention of this thesis was therefore to: (1) describe a comprehensive school-wide model of practice informed by evidence-based behavioural approaches and implemented within an autism specific special school in the UK, (2) evaluate an assessment framework upon which, school-wide practices can be evaluated, (3) use this framework to evaluate the impact of a school-wide behavioural model of practice and, (4) explore whether such a model may lead to ongoing, sustainable progress for pupils with autism and an intellectual disability at a whole school level.

Chapter 2 provides what we believe to be the first description of a school-wide behavioural model of educational practice implemented within an autism specific special school in the UK. The chapter goes on to present some pilot data examining

change over a typical 12-month period for pupils attending the school. Results revealed statistically significant improvement across measures of learning skills and adaptive behaviours providing some preliminary evidence that a school-wide behavioural model of practice can be integrated within a special school setting and produce positive outcomes for children and young people with autism and an intellectual disability.

Given the positive preliminary outcomes revealed in Chapter 2, a more robust evaluation of the behavioural education model described was warranted. However, one of the widely acknowledged barriers in practice-based research within school settings and one of the salient criticisms of special school practice, is that of measurement. That is, what should be assessed and how, in order to evaluate pupil progress and the impact or quality of provision in place at a school? Chapter 3 presents an assessment framework designed to capture progress across multiple areas of life and explores the properties of the measures concerned based on their current status within the literature. Preliminary convergent validity is established for two previously unvalidated measures of learning skills, barriers to learning and developmental milestones. The established internal consistency of two measures focused on autism characteristics and challenging behaviour is shown to be maintained when the measures are completed by school staff in the context of a school setting. In addition, the feasibility of using such measures as part of day-to-day school practice was of interest with results indicating that over 92% of assessments scheduled were achieved over the course of the school year. Findings provide positive preliminary indication that a whole-school assessment framework can be implemented into a special school setting to evaluate pupil progress and school performance.

The research undertaken for Chapter 4 utilises the assessment framework described in Chapter 3 to evaluate the impact of the behavioural education model described in Chapter 1, whilst addressing some of the methodological weaknesses of the same study. That is, the impact of the model was evaluated for a group of children new to the school over the course of their first year of provision (access to the model described), therefore, controlling for variance in the length of time accessing the provision. In addition, a wider range of assessment measures was utilised as described in Chapter 3. Children were assessed upon admission to the school and the assessment framework was repeated 12 months later. Significant improvements were found across all outcome measures (learning skills across the curriculum, adaptive skills, autism characteristics and challenging behaviour) in comparison to baseline scores. In addition to group data, the use of the reliable change index allowed for analysis at the individual level which also revealed encouraging results.

Chapter 5 turns to the question of sustainable progress; an important accountability for schools but a neglected area of research. That is, does the model described lead to ongoing positive outcomes at a whole-school and individual level across a typical school year? The entire school cohort ($n=78$) were assessed using the assessment framework described in Chapter 3, at two distinct timepoints with 12 months in between assessments. We found statistically significant gains across all measures for the school cohort over a typical year and individual analysis revealed encouraging positive change for the pupils in the sample. The study provides positive preliminary evidence that the implementation of a behavioural education model at a school-wide level as part of day-to-day school practice, can lead to positive outcomes and sustainable progress for the school population.

The final chapter provides a general discussion of the research included in this thesis. Discussion of how findings contribute to the current literature, methodological challenges and limitations along with suggestions for future research are presented. Practical implications for special school settings and the real-world impact of evaluating school-wide models of practice within the school context are also discussed.

Research Context

It is important for the reader to note that throughout the duration of the research studies reported in this thesis, I was employed full time as Deputy Head of the school concerned. The data collection involved in the studies reported formed part of my day-to-day role within the school and as such I had management authority and responsibility for directing the work of other school staff contributing to the collection of data for this research. This dual researcher-practitioner status brought both many privileges and challenges to the process of applied research which are fully discussed within Chapter 6 of this thesis.

Ethical Review Process

The process of obtaining ethical approval consisted of three stages. Firstly, permission was sought from the families or care givers of each individual pupil attending the school. This was achieved by amending the school's existing home-school agreement issued to families at the start of each academic year. The home-school contract contained information about a number of the school's activities and the various permissions requested from families such as whether pupil images can be used on the school website and whether the pupil concerned had parental permission

to access the local community as part of the school's curriculum offer. Information was provided regarding the school's research and evaluation projects and permission was sought for pupil data to be anonymously analysed and reported as part of ongoing research. Parents were able to opt in or out with 100% giving permission for their child's data to be included in the studies. Permission was also obtained from the from the school Headteacher and Chair of the Governing body to access and analyse the school's cohort data anonymously. The research reported within this thesis formed part of both the school development plan and the strategic development plan focusing on improving pupil outcomes. Ethical approval was then granted by the Bangor University School of Psychology Ethics Committee.

Chapter 2: Translating evidence-based practice into a comprehensive education model within an autism specific special school¹

As the first study in this thesis, chapter 2 presents a rare description of a school-wide behavioural model of educational practice implemented within an autism specific special school in the UK. Some preliminary outcomes achieved for a group of children and young people attending the school over a 12-month period are also reported. This chapter therefore, addresses the first intention of this thesis; to describe a comprehensive school-wide model of practice informed by evidence-based behavioural approaches and implemented within an autism specific special school in the UK. The reader should note that this paper was published in 2015 (refer to footnote). Since this time, two additional studies have been published that would have featured in the introductory section of this paper (Foran et al, 2015; Pitts, Gent & Hoerger, 2018). However, both studies cited, have been described and referenced within Chapter 1 and the introductory sections of Chapters 4 and 5 in this thesis. The data reported in this study was collected in the 2011-2012 academic year.

¹¹ A version of this chapter has been published as: Lambert-Lee, K.A., Jones, B., O'Sullivan, J., Hastings, R.P., Douglas-Cobane, E., Thomas, E., Hughes, J.C., & Griffith, G.M. (2015). Translating evidence-based practice into a comprehensive education model within an autism specific special school. *British Journal of Special Education*, 42, (1) 69-86.

Abstract

Research evaluations of Applied Behaviour Analysis (ABA)-based interventions for children with autism demonstrate positive outcomes. However, little research has focused on the translation of these evidence-based interventions into service delivery models within existing education systems. In the present paper, we provide a description of the comprehensive behavioural educational model used within TreeHouse School, London, UK. In addition, we analyse progress data over 12 months for a group of pupils attending the school. Fifty-three pupils with autism were tested and then re-tested with the Assessment of Basic Language and Learning Skills-Revised (ABLLS-R), and for 23 students a repeated Vineland Adaptive Behavior Scales (VABS) assessment was available. Repeated measures t tests revealed statistically significant improvements over time on all ABLLS domains and for all VABS scores. These data provide preliminary evidence that a school-wide behavioural education model can be integrated into the UK special school system and produce positive outcomes for pupils.

Key words: Autism; Applied Behavior Analysis; School-based intervention; Intellectual disability; Autism Education

Introduction

There is a growing evidence base for positive outcomes from Early Intensive Behavioural Intervention (EIBI) based on the principles of Applied Behaviour Analysis (ABA) for young children with autism (e.g., Eikeseth, 2009; Eldevik et al., 2009; Eldevik et al., 2010; Reichow & Wolery, 2009; Rogers & Vismara, 2008; Virués-Ortega, 2010). Demonstrating improved outcomes in cognitive ability, adaptive functioning, language and core ASD symptoms, EIBI is considered a ‘well established’ intervention by commonly used criteria for evaluating evidence-based practices (Rogers & Vismara, 2008). EIBI has also been recommended as the intervention of choice for children with autism by expert consensus panels (e.g., New York State Department of Health, 1999). Most studies included in systematic reviews to date focus on home or clinic based programmes that are intensive in nature (at least 20-30 weekly hours throughout the year), begin early in a child’s life (2-4 years of age) and train the child’s parents as co-therapists to conduct teaching sessions and to generalise skills into typical family routines such as bath and mealtimes (Green, Brennan & Fein, 2002).

Although ABA-based intervention has been shown to be effective in rigorous research (e.g. Sallows & Graupner, 2005), few studies have focused on the translation of these evidence-based interventions into service delivery models within existing systems such as schools or state/province wide community practice. Those studies that have been conducted do, however, show encouraging outcomes. For example, Perry et al. (2008) conducted a large community-based behavioural intervention study (n=332) examining the progress of children accessing services through the Ontario Preschool Autism Initiative (Perry, 2002a), a province wide programme in Canada that began in 2000. Results demonstrated significant reductions in autism severity and

improvements in standard test scores for cognitive skills and adaptive functioning. In a sample of 89 children accessing one of the regional programmes under the Ontario Behavioural Intervention initiative, Freeman and Perry (2010) also found significant reduction in symptoms of autism severity along with significant improvements in cognitive skills.

In another large-scale Canadian study, Smith et al. (2010) examined outcomes of 45 children accessing the Nova Scotia early intensive behavioural intervention model (Bryson et al., 2007) with results demonstrating significant progress within the domains of language and communication, autism symptoms, adaptive functioning, cognitive skills and behaviours described as challenging.

Given that children and young people with autism and intellectual disability in the UK will be within statutory education between the ages of 5-19 years, thus many more years than those considered optimal for early intervention, it is somewhat disappointing that the application of behavioural education models within school settings has received such little attention from researchers. Grindle et al (2009) published a rare description of how evidence-based behavioural teaching methods were integrated into an autism specific class within a mainstream primary school setting in the UK and demonstrated that a behaviourally based education model was able to complement the statutory education frameworks in place within the school. Grindle et al (2012) went on to publish some encouraging results for children who accessed this provision. Moderate to large effect sizes were demonstrated for gains made in IQ and adaptive behaviour over one and two years indicating that children had learned skills more rapidly than expected given their baseline assessment results.

Eikeseth, Smith, Jahr and Eldevik (2002) also demonstrated superior outcomes for a group of children who received 28 hours per week of behavioural intervention in

comparison to children who received the same number of hours of eclectic special education. Both interventions took place in mainstream nursery and primary schools in Norway. The same group of children assessed at follow up continued to show larger gains for the behavioural intervention group in comparison to the eclectic special education group (Eikeseth, Smith, Jahr & Eldevik, 2007). Similar research in Norway has compared the effects of eclectic special education and behavioural intervention in mainstream pre-school settings, again showing significant advantages for children in the behavioural education group (Eldevik, Hastings, Jahr & Hughes, 2012).

Many children and young people on the more severe end of the autism spectrum with associated intellectual disability within the UK attend special school provisions deemed necessary to meet their complex educational needs. Such schools often use a variety of approaches and interventions to meet the diverse needs of their pupils. A small number of autism-specific school provisions in the UK include evidence-based practices underpinned by behaviour analysis as part of their whole school model (Griffith, Fletcher & Hastings, 2012). However, there are only a small number of evaluation studies to date evaluating the outcomes of children and young people receiving their education in similar settings (McGarrell, Healy, Leader, O'Connor, & Kenny, 2009; Waddington & Reed, 2009) and, to our knowledge, no study describing the specific characteristics of an autism specific special school in which a behavioural education model is delivered.

A number of significant differences exist between the traditional EIBI models referenced above and the use of behaviourally-based approaches within special school settings in the UK. Firstly, children may enter school provisions at any time within their school career. For example, due to previous placement breakdowns or lack of

progress in other settings, a pupil may enter a special school setting at any point between the ages of 5 and 18 years. Therefore, the age at intake and previous intervention history varies considerably from that seen in early intervention research. Secondly, whereas many previous researchers have screened out children with high levels of intellectual disability, autism specific school provisions have no such exclusion criteria. Thirdly, a school-based provision will likely be less intensive in nature given timings of the typical school day and school holiday periods for children attending such provisions. Such differences between school-based behavioural models and traditional EIBI research were also identified in a nationwide census of schools in the UK where behavioural approaches were being utilised (Griffith et al., 2012). Therefore, it is clear that children and young people attending such schools differ from samples used in previous EIBI research and attend school primarily to receive their statutory right to an education rather than to access behaviourally-based services.

As children and young people with autism and an intellectual disability (ID) in the UK will be within statutory education for the majority of their childhood and adolescent years, it is important to investigate the educational models available to them and to evaluate outcomes based on these educational models to shape services for young people with autism across the UK. The aims of the current paper were: (1) To provide a brief description of the comprehensive educational model underpinned by the principles of behaviour analysis implemented within an autism specific special school in the UK, (2) To present some pilot data examining change over a typical 12 month period for children and young people attending the school, and (3) To explore any correlates of change within the available data.

TreeHouse School Behavioural Education Model

TreeHouse School is a non-maintained autism-specific special school in London, UK. The school is registered for children and young people aged between 3 and 19 years old and, at the time of writing had 83 pupils on roll between 5 and 19 years of age. The school caters for children and young people on the autism spectrum with additional intellectual disability and behaviours described as challenging. All pupils attending the school were in receipt of an Education, Health and Care Plan (EHCP) issued by their home local authority, naming the school as responsible for meeting their special educational needs. An EHCP refers to a legal document which describes a young person's special educational needs, the support required to meet those needs, and the setting responsible for provision (DfE 2015).

The school is housed in purpose built accommodation equipped with classrooms, quiet spaces, shared work areas, playgrounds, a sports hall, and outside spaces along with specialist teaching areas such as teaching kitchens, ICT suites, a pupil-run shop, laundry room, family bathroom, training toilets, a dentist room, an art room, and a digital media suite.

Curriculum content. All pupils receive a broad, balanced, relevant and functional curriculum personalised around each pupil's individual needs (please refer to case study examples in Table 1). The school curriculum is planned to build the skills, knowledge and understanding that will enable all pupils to: (1) be successful learners who enjoy learning, make progress and achieve; (2) be confident individuals who are able to lead safe, healthy and fulfilling lives with appropriate autonomy and independence, and (3) be responsible citizens who meaningfully participate in their communities. The school curriculum is designed to be relevant (socially significant) and challenging to prepare pupils for life as a young adult and beyond whilst ensuring

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that they enjoy and achieve whilst at school. What is 'relevant' learning alters with age and developmental stage, and the school curriculum reflects this educational journey.

Table 1: *Example pupil case studies*

	Raheen	Abigail	Stefan
Learner profile	Raheen is 7 years old and has been attending TreeHouse School for one year. He uses the Picture Exchange Communication System (PECS) to communicate his basic needs through one-word requests and understands language at the two key word level when supported with visuals or signs. He finds small group contexts particularly difficult although is able to learn new skills well when broken down and taught through one to one tuition. Raheen exhibits behaviour that challenges in the form of property destruction and some aggression which assessments indicate is linked to escape from demands and access to attention.	Abigail is 14 years old and has been attending TreeHouse School for 5 years. She communicates verbally in short sentences and understands language at the 4 key word level. She is now able to learn new skills within a small group context. She exhibits behaviour that challenges through being highly passive and non-responsive in certain contexts. Assessments indicate that this behaviour is linked to avoidance contingencies (avoidance of perceived failure) but leads to a concern around whether her choices are truly made clear or acknowledged by others.	Stefan is 17 years old and has been attending TreeHouse School for 2 years. He communicates using Makaton Signs and verbal approximations at the one-two key word level. He understands language at the 3 key word level when supported with signs and visuals. He has learnt to participate within small group contexts and is able to generalise the skills he has acquired into this context, however, he is not yet able to learn new skills in a group setting. He exhibits behaviour that challenges in the form of frequent aggression, which assessments indicate is linked to contexts he finds demanding.
Personalised curriculum content	In addition to personalised targets set for Raheen from all areas of the school curriculum, Raheen's individual targets include	At 14 years of age Abigail is now accessing vocational and leisure pathways within her personalized curriculum. All pathways are	With only one academic year of school left, the focus for Stefan currently lies within his vocational, leisure and life skills

	<p>attending Prayer at the Mosque with his family, toilet training, participating in paired and small group contexts and communicating when he would like attention versus when he would like to be alone.</p>	<p>sampled in order for Abigail to choose which areas to focus on through her final years at school. Abigail is currently participating in catering and hospitality, horticulture and community sport and leisure. These sessions occur throughout the week and involve regular community trips. Abigail's individual targets are currently focusing on developing her self-esteem and assertiveness skills along with her ability to communicate a clearly expressed choice.</p>	<p>specialisms. After sampling all pathways on offer to him, Stefan now specialises in retail and enterprise, office skills, digital media and community sports and leisure. Therefore, a large portion of his week involves doing shifts in the school shop and office pod (for example, preparing the school news letter to go out to parents), attending classes at his local gym and working on digital media projects such as photographing the school play. Therefore, most personalised core curriculum targets are focused on within these contexts. Stefan has an established work experience placement in a local charity shop which he attends for two afternoons per week where he uses skills developed within in a real world setting. Stefan is also working on how to communicate when a context or environment is too demanding for him in order to decrease his aggression and increase the likelihood of community inclusion.</p>
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Personalised curriculum delivery	New skills are currently targeted in a one to one teaching context using discrete trial teaching, natural environment teaching, shaping and chaining techniques. Raheen has planned access to paired and small group contexts throughout each day in order to further develop his group skills and teaching also occurs across all areas of the school and in the local community. A 6-week block of home visits is currently in place to support Raheen's inclusion at the Mosque with his family.	Abigail spends most of her school day within small teaching groups and is taught using direct instruction and precision teaching methods. Short daily sessions of one to one teaching sessions are timetabled for Abigail to work on her individual targets described above. Teaching often occurs within the vocational teaching spaces within the school and in the local community.	Stefan is predominantly taught using chaining and natural environment teaching within a vocational or leisure context. He receives individual bursts of teaching for establishing new skills that he finds challenging and then uses these skills within group contexts with his peers e.g. within a group-based lesson. Individual sessions are also timetabled to prepare or follow up from Stefan's work experience placement e.g. to target any skills that need developing to maintain his placement.
Team around the child or young person	In addition to the core team of a qualified teacher, a behaviour analyst, a speech and language therapist and learning support assistants, Raheen has access to a specialist music and PE teacher and weekly sessions with the school occupational therapist targeting fine and gross motor skills development.	In addition to the core team of a qualified teacher, a behaviour analyst, a speech and language therapist and learning support assistants, Abigail has access to a specialist PE teacher and a team of vocational specialists for each pathway that she accesses.	In addition to the core team described in previous examples, Stefan has weekly input from the occupational therapist focusing on life skills required within the work place and access to vocational specialists for retail and enterprise, office skills, digital media and community sports and leisure. Stefan and his family also fall under the caseload of the school Transition

			liaison officer who is supporting the family through a person centred planning process to secure a desirable adult service provision for Stefan.
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The Early Years and Primary curriculum includes opportunities for pupils to develop communication skills; play and social skills; personal care skills such as dressing, eating and toileting; and learning ‘readiness’ skills; in addition to a differentiated National Curriculum² that includes literacy, numeracy and cross-curricular topics.

The Secondary school curriculum continues to build on pupils’ English and maths skills and the functional application of these within relevant environments, as well as increasing the breadth of their curriculum and increasing opportunities to learn beyond the classroom including overnight residential educational visits. Vocational and Leisure Pathways are an important part of the school curriculum for pupils aged 14-19 years of age. From 14-16 years of age all pupils have an opportunity to develop skills across a wide range of Vocational and Leisure Pathways. These include Catering and Hospitality; Community Sport and Leisure, Creative Arts; Digital Media, Horticulture; Landscaping; Office Skills; Performing Arts and Retail and Enterprise. As part of a person-centred transition planning process, pupils are supported to identify and express their preference for the vocational and leisure pathways they would like to specialise in. Their curriculum is then personalised accordingly, and community-based work experience is introduced to include ‘real work’ related to the vocational options they have chosen. In addition, the National Curriculum sets out an entitlement that is an important part of the school curriculum for all pupils at a highly differentiated level, meaningful and functional to each individual.

Curriculum decisions are made through a person-centred planning process and are driven by the school curriculum, individual assessment outcomes, and what is important to the family and the young person concerned. All curriculum decisions are also developmentally informed.

² The National Curriculum is a set of subjects and standards used by primary and secondary schools in England. It sets out the curriculum framework and entitlement of children in all required subject areas (DfE, 2013).

Curriculum delivery (teaching): Teaching within the school is underpinned by evidence-based behavioural approaches and, therefore, pupils are taught using a variety of behaviourally-based techniques depending on the profile of the pupil(s) involved and the skill being taught. Methods include, but are not limited to, task analysis, shaping, chaining, discrete trial teaching, direct instruction, natural environment teaching, and precision teaching. ABA-based teaching plans are devised for individual pupils and for groups of pupils working together. These teaching plans set out important information such as particular teaching techniques, prompt levels, reinforcement schedules, materials and generalisation requirements.

Teaching is delivered in a variety of contexts depending on the needs of the pupil (e.g. 1:1 teaching, paired and small group instruction, along with community-based learning). Home visits are offered to families of all pupils depending on individual needs, however, parents/carers uptake of such visits varies greatly. Home visits might focus on supporting the family with their child's behaviour within the home or facilitating skills generalisation between home and school. The school ethos is that all pupils should be enabled to participate within small group settings as their learning skills develop and, therefore, the acquisition of group skills forms a part of each pupil's personalised curriculum. The school uses functional analytic methodology in understanding behaviours that challenge, with each pupil receiving a full functional assessment and corresponding positive behaviour support plan to help individuals learn to manage behaviours that form a barrier to learning or participation.

Staffing model: Pupils are grouped into classes of 6, based on a combination of age and suitable peer match. Classes are staffed with a qualified teacher and learning support assistants all of whom participate in an ongoing in-house professional development programme based on the UK ABA Autism Competencies Framework (Denne, Hastings, Hughes, Bovell & Redford, 2011). Of those staff employed as learning support assistants,

71% joined the school with an undergraduate degree and all had some prior experience of supporting or interacting with children or young people as an essential criteria for the position explored at interview. The class teacher manages the staff team within the classes, monitoring the curriculum delivery and progress of pupils along with identifying any staff training issues. A multi-disciplinary team around the child supports the classes. This team consists of qualified and experienced teachers, Board Certified Behaviour Analysts (BCBA) (Masters level Behaviour Analyst via accreditation with the Behavior Analyst Certification Board) (Hughes & Shook, 2007) and, speech and language therapists with access to an occupational therapist, subject specialist teachers, and vocational specialists as appropriate. All staff in the school are trained in the behavioural approaches utilised in practice and BCBAs work collaboratively with class teachers and allied health professionals to personalise teaching, learning and behaviour support plans for all pupils. At the time of writing, the school team included eight Board Certified Behaviour Analysts.

All staff participate in the school's continuing professional development programme of regular in-house training which includes elements of behaviour analysis, education, autism and professional practice. This helps to ensure that all staff working with pupils use a consistent approach within their teaching and have similar expectations of the pupils concerned.

Assessment for Learning and Evaluation of progress: Data are collected on learning opportunities for the pupils across the school day and are analysed daily to make immediate data-driven decisions with regard to teaching and learning. Bi-weekly team meetings are also scheduled to discuss the progress of individual pupils and scheduled parent and professionals' meetings occur each term. Data are formally assessed and reported on a termly basis using progress against the targets set out in each pupil's individual education plan, and other more formal summative assessments are conducted annually. Parental

participation is encouraged with daily communications sent home to parents along with more detailed bi-weekly reports on progress within specific target areas. Parents attend termly meetings and are welcome to observe their child within school.

In summary, evidence-based behavioural approaches underpin all teaching, learning and behaviour support within the school as standard school-wide practice, supporting all pupils to access a meaningful, functional and challenging curriculum. Behaviourally based teaching techniques are consistently utilised along with the use of functional analytic methodology for behaviours described as challenging. Rigorous data are taken on progress within learning opportunities for all pupils and therefore, data driven decisions are made on a minute-by-minute basis in addition to a more summative measure of progress. All staff, regardless of professional background are trained in the behaviour analytic approaches used within the school, therefore, ensuring that a consistent teaching approach is utilised in all contexts across the school day.

Pilot Evaluation Study: Method

Sample

Pilot data were available for 53 pupils at the time of analysis. Pupils were aged between 6 and 18 years (mean= 12 years, 6 months) and included 5 females and 48 males. Pupils had been attending their current school placement for an average of 5 years (range= 1-13 years) and had all received an independent diagnosis of Autism prior to intake at the school. All but one pupil had an additional intellectual disability usually described in EHCPs issued by local authorities as 'global developmental delay' or 'severe learning difficulties'. All pupils lived within a one-hour commuting distance of the school and resided with family members. Pupils had an EHCP provided by their home local authorities, which named TreeHouse School as responsible for their educational provision and fully funded each

educational placement. Pupils attending TreeHouse School have typically experienced previous placement breakdowns due to behaviours described as challenging or due to lack of progress in other settings. Pupils attended school between the hours of 9.00-3.30pm Monday to Friday during term time only.

Measures

Data were available for analysis from two measures at two distinct points in time with approximately 12 months in between assessments. Pupils' adaptive skills were assessed using the Vineland Adaptive Behavior Scales II (VABS: Sparrow, Cicchetti, & Balla, 2005). The VABS consists of a semi-structured caregiver interview focusing on how individuals are able to function in their everyday lives. Standard scores and age equivalents are generated across four domains: Socialisation, Communication, Daily Living Skills, and Motor Skills (motor skills standard scores are only generated for children under 7 years of age). An overall adaptive behaviour composite standard score is also generated. Data were available for 23 pupils on this measure over a 12 month period.

Pupils were also assessed using the Assessment of Basic Language and Learning Skills- Revised (the ABLLS-R: Partington, 2008). The ABLLS-R is an assessment, curriculum guide and skills tracking system based on a criterion-referenced set of skills. The ABLLS-R demonstrates each learner's current skills repertoire and provides tracking of progress over time between assessments. The measure is divided into 25 domains covering skills identified as being critical for pupils to learn to communicate successfully and to learn from their everyday experiences (Partington, 2006).

The ABLLS-R is completed via a combination of observation and direct testing. Each of the 25 domains consists of 6 to 52 skill descriptors and pupils are rated on a 0-4 scale to determine whether each skill is an absent, emerging or mastered part of their repertoire. To

derive a smaller number of scores for analysis, the 25 domains were grouped into 6 meta-domains as described by Grindle et al (2009). The 6 domains consisted of learning skills, language, social skills and play, academic, self-help, and motor skills. Therefore, data obtained from the ABLLS-R reflects pupil's skills levels across a number of areas of the school curriculum. Scores were calculated using methods described by Grindle et al (2009). Firstly, raw scores were obtained for each of the 25 ABLLS-R domains and converted to proportion scores (i.e., the percentage of the total items mastered in each domain). Proportion scores for each domain within a meta-domain were then summed and divided by the total number of domains within the meta-domain. This process yielded, meta-domain proportion/percentage scores. Total ABLLS-R proportion scores were then calculated by summing the six meta-domain proportion scores and dividing the total by six.

Procedure

The VABS was conducted with a parent or caregiver over the telephone or in some cases, as a face-to-face interview (for example, with parents for whom English was not their first language). The VABS was conducted by the senior team at the school and all assessors exercised every caution to obtain reliable and valid data. For example, staff did not interview parents of children and young people with whom they directly worked with.

The ABLLS-R was administered annually for each pupil to coincide with the child or young person's annual school review. This process allowed for the tracking of progress in addition to the use of assessment data for target setting within the annual review process. The teaching teams (teacher and behaviour analyst) within the school administered the ABLLS-R for the pupils within their classes.

Results

Paired samples t tests were conducted to analyse any change in mean scores between time one and time two data sets (approximately 12 months apart) for the VABS and ABLLS-R scores. Results of this analysis are presented in Table 2 showing the mean scores and p values generated from the t tests. Prior to carrying out statistical analysis, data related to outcome variables were found to be reasonably normally distributed using one sample Kolmogorov Smirnov tests.

Table 2: Changes over 12 months for children and young people with autism and intellectual disability attending an autism specific special school.

Measure	N	Time 1		12 mo. later		p	d
		Mean	SD	Mean	SD		
VABS	23	49.92	9.00	55.63	9.49	.002	.62
Composite							
VABS	23	50.61	9.58	55.74	10.86	.001	.49
Communication							
VABS Daily	23	53.61	9.10	60.13	11.02	.001	.63
Living Skills							
VABS	23	46.22	8.10	54.04	9.48	<.001	.88
Socialization							
ABLLS ³ Total	53	46.67	24.09	51.40	23.18	<.001	.19
ABLLS	53	50.99	25.39	57.16	22.71	<.001	.23
Learning skills							
ABLLS	53	34.35	26.51	37.97	27.00	<.001	.13
Language							
ABLLS Social	53	27.83	20.09	32.11	19.84	<.001	.21

³ Scores are proportion of total items mastered. Sub-groupings of ABLLS domains based on: Grindle, C., Hastings, R. P., Saville, M., Hughes, J. C., Kovshoff, H., & Huxley, K. (2009). Integrating evidence-based behavioural teaching methods into education for children with autism. *Educational and Child Psychology*, **26**(4), 65-81.

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ABLBS	53	34.30	31.66	38.25	32.63	<.001	.12
Academics							
ABLBS Self-	53	61.76	24.77	67.75	23.36	<.001	.24
Help							
ABLBS Motor	53	70.70	27.75	75.18	25.06	<.001	.01

VABS = Vineland Adaptive Behaviour Scales, ABLBS = Assessment of Basic Language and Learning Skills - Revised

Statistically significant change in mean standard scores was revealed across all domains within the VABS data. Effect sizes were calculated using Cohen's *d* formulations, adjusted to account for the repeated measures design (Dunlap, Cortina, Vaslow & Burke, 1996). Cohen's *d* values are presented in Table 2 and demonstrate medium to large effect sizes across the four VABS domains with Cohen's *d* values ranging from .49 to .88. These data suggest that pupils exceeded normative expectations with regard to progress over a 12 month period in relation to their previous assessment results. Statistically significant change was also found across all ABLBS-R domains with smaller effect sizes (see Table 2) suggesting that pupils were learning a variety of key skills across the curriculum during their time at school.

An exploratory analysis of correlates of change was also carried out with regard to typical demographic variables such as age, gender, ethnicity, time attending TreeHouse School, and neighbourhood deprivation rating level (based on the pupil's home postal code) using Spearman's rho calculations. Statistically significant correlations are presented in Tables 3. Age was found to be negatively correlated with the ABLBS total change score and the ABLBS learning skills domain suggesting that the younger pupils made more progress on this measure which would be somewhat expected given the particular domains within the ABLBS-R. However, age was also found to be positively correlated with change on three out of the four Vineland domains (daily living skills, communication and the adaptive behaviour composite score) indicating that the older pupils showed greater change over 12 months on

this measure. The second variable found to be positively correlated with changes in VABS scores was how long the pupils had been attending the school. Pupils who had been at the school for longer periods of time showed greater change on this measure over a 12-month period.

Table 3: *Statistically significant correlations with pupil age and length of time attending School (Spearman's rho)*

Measure	Significant correlation with student age (<i>r</i>)	Significant correlation with time at School (<i>r</i>)
ABLIS Total change	-.349**	-
ABLIS Learning skills change	-.364**	-
VABS Daily Living Skills change	.470**	-
VABS Communication change	.498**	.422**
VABS Adaptive Behaviour Composite change	.554**	.427**
VABS Socialisation change	-	.424**

***p* < .001

Conclusions

We have provided a rare description of a behavioural education model used within a UK-based autism specific special school and presented some preliminary data on outcomes across a typical academic year for a group of pupils attending the school. The school has demonstrated how it is practically possible to deliver school-based special education through a behavioural approach for children and young people with autism and an intellectual disability within the UK statutory education framework.

Preliminary data indicate some positive outcomes with moderate to large effect sizes found in standardised assessments over a typical 12-month period. These results are in line with those obtained from EIBI studies for young children with autism (Eldevik et al., 2009). However, the context in which these results were obtained differs significantly from a typical EIBI programme. Firstly, intervention was conducted within a UK based autism specific special school working within the UK statutory education framework. The pupil's ages varied considerably from the typical EIBI age range with data analysed from pupils aged between 6 and 18 years who had been attending the school for different periods of time (1-13 years). Most pupils also demonstrated comorbid intellectual disability. Educational intervention was also less intensive than home or clinic-based programmes, with varying parental involvement within the educational process for all pupils.

The statistically significant change across all VABS standard scored domains is particularly encouraging as it suggests that pupils exceeded normative expectations of progress given their previous assessment scores. The VABS is well established as an outcomes measure and is arguably more clinically relevant than some other forms of assessments given that parents or caregivers act as informants and the assessment, therefore, focuses on how individuals are generally functioning within their day-to-day lives rather than under prescribed testing conditions. In fact, a recent Cochrane review (Reichow, Barton, Boyd & Hume, 2012) recommends adaptive behaviour as a more suitable measure of outcome than IQ. The fact that older pupils within the sample showed larger gains within the VABS assessment may be explained by a number of factors. For example, the VABS can be used over time and is standardised up to the age of 99. Therefore, pupils were unlikely to reach a ceiling imposed by this assessment. This measure also focuses on how key skills are being used within functional life settings which are much more likely to be the focus of the curriculum for older children and adolescents than for younger children. It is positive to see

such results over such a wide age range, as a common misconception about behavioural approaches to education for individuals with autism is that they only ‘work’ for younger children.

The fact that all domains within the ABLLS-R demonstrated a statistically significant increase in percentage scores indicates that pupils were learning and making progress over a variety of key areas across the curriculum, rather than progress being focused on smaller areas of development.

It is also worth noting that the length of time students had been attending the school was positively correlated with change within the VABS outcomes. This may indicate that the use of a behavioural education model for children and young people with autism throughout their educational career continues to bear fruit and may indeed have a larger impact over time. Significantly, students who had been in the school longer were also older. Therefore, it is difficult to separate the putative effects of age and time in the school.

Although achieving such preliminary outcomes in a real-world practice setting is a strength of this study, there are also a number of limitations, particularly with regard to research design, which should be addressed through future research. For example, our pilot evaluation involved no pre-intervention baseline data as all pupils involved in the sample had already been attending the school for different periods of time. We also did not measure other outcomes such as cognitive ability, core ASD symptoms or behaviour problems, which would be necessary to achieve a rounded picture of progress for a young person on the autism spectrum with an intellectual disability. A third limitation is that the behavioural education model used throughout the school involves multiple components. Therefore, it is not possible to isolate any particular aspects of the educational package as having had the most impact on progress. Mindful of these limitations, future research should look to expand the use of assessment measures to cover other outcomes of interest, to include pre-intervention baseline

Chapter 2

data and measure progress for pupils who have been accessing school-based models of provision for the same periods of time.

Chapter 3: Assessment of educational progress for children and young people with autism and an intellectual disability

Chapter 2 provided a description of a whole-school behavioural model of practice and reported some encouraging preliminary outcomes over a 12-month period for children and young people with autism and an intellectual disability attending the school. Given these positive outcomes, a more robust evaluation of the model described was justified. However, a widely acknowledged barrier both in practice-based research and in school settings on a day-to-day basis is that of measurement. That is, when considering the complex learning needs of pupils with autism and intellectual disability, what should be measured in terms of progress and how can this be achieved? The focus of Chapter 3 therefore, centres around assessment. The study presents and evaluates an assessment framework implemented at a school-wide level for the monitoring of pupil progress and school performance. This chapter therefore, addresses the second intention of this thesis; to evaluate an assessment framework upon which, school-wide practices can be evaluated. The data reported within this study was collected during the 2013-2014 academic year.

Abstract

Autism Spectrum Disorder (ASD) has been identified as the most prevalent primary special educational need amongst the school aged population in the UK. A requirement of all schools is to be accountable for their pupils' progress via a robust framework of assessment, however, measures used by schools for assessing progression may be ill suited for pupils with ASD. The aim of the current study was to evaluate a school-wide assessment framework to monitor the progression of pupils with autism and an intellectual disability in a special school setting by: (1) establishing the convergent validity of two unvalidated measures; the Assessment of Basic Language and Learning Skills-Revised (ABLLS-R), and the Verbal Behaviour Milestones Assessment and Placement Program (VB-MAPP), (2) exploring whether internal consistency of the Behaviour Problems Inventory-Short Form (BPI-S) and the Social Communication Questionnaire (SCQ) is maintained when completed by school staff, and (3) to assess the feasibility of utilising all measures at a school-wide level. Results revealed preliminary support for the convergent validity of the ABLLS-R and the VB-MAPP. Internal consistency was maintained for both the BPI-S and the SCQ, and over 92% of assessments scheduled during day-to-day school practice were completed. The study provides preliminary evidence that a whole-school assessment framework can be feasibly implemented in a special school setting to evaluate pupil progress and school performance.

Key words: Autism; School-based assessment; Intellectual disability; Autism Education;

Introduction

Prevalence rates for Autism Spectrum Disorder (ASD) have increased over the past three decades, with statistics indicating one in every hundred young people and approximately 450,000 adults meet (at the time of writing) the diagnostic criteria for ASD in the United Kingdom (UK) (Lai, Lombardo & Baron-Cohen, 2014). Amongst the school aged population in the UK, ASD has been identified as the most prevalent primary need for all children and young people requiring specific Special Educational Needs and/or disability (SEND) provision (DfE, 2018). Such statistics provide significant challenges to schools in ensuring that their provision is able to meet the diverse educational needs of pupils on the autism spectrum (Charman, Howlin, Berry & Prince, 2004).

Assessment and SEND: UK Policy Background

One requirement of all schools in the UK is to be accountable for their pupil's progress via a robust framework of assessment. The purpose of such assessment is clearly set out by the Department for Education (DfE, 2014) as: (1) to give reliable information to parents and other stakeholders about their child's progress and about the effectiveness of the school, (2) to help drive improvement for pupils and teachers via analysis of the school's data, and (3) to ensure that the school is keeping up with external best practice and innovation. With such high numbers of SEND pupils in UK schools, research into how progress, achievement, and need is monitored and evaluated has been identified as a priority (Wittemeyer et al, 2011). Schools have been asked to look beyond what is measured via National Curriculum judgements and are encouraged to develop in-house assessment practices that extend to the measurement and progress of priority skills for adulthood that children with SEND may not develop easily (e.g. social-communication and independent living skills) (Wittemeyer et al, 2011). This message is supported in legislation changes for

pupils with SEND. For example, the SEND Code of Practice (DfE, 2015) highlights a clear focus on wider long-term outcomes for pupils such as further education, employment, and independent living. Similarly, the Office for Standards in Education, Children's Services and Skills (Ofsted) has noted that most schools closely monitor the progress of SEND pupils against academic subjects, but that less attention is paid to the progress of personal and social skills and in becoming more independent (Ofsted, 2014). Therefore, in 2016, the DfE asked schools to consider ways of measuring all aspects of progress for pupils with SEND including communication, social skills and independence (DfE, 2016).

Assessment practices in schools

It is widely acknowledged that many of the measures used by schools for assessing progress are ill-suited for the planning and monitoring of progress for pupils with ASD (Wittemeyer et al, 2011) and that simply adapting existing assessments will not suffice (Cumming, 2008). Given the diverse educational needs of pupils with ASD, it appears prudent to ensure that progress is captured across all areas of life (Charman et al, 2001) and the use of multiple measures is generally seen as the gold standard (Charman & Howlin, 2003, Charman et al, 2011; Magiati & Howlin, 2001; Wittemeyer et al, 2011).

In 2011, the Autism Education Trust (AET) commissioned a report into good practice within autism education led by an academic research team from the University of London (Charman et al, 2011). One aim of this research was to identify and record existing practice in schools perceived as providing excellent care and education for children and young people with ASD. Researchers found that schools did indeed see measuring progress against behavioural and social outcomes as part of their role and as such, some schools had developed their own formal and informal assessment and recording procedures. This was particularly true for special schools, supporting pupils with the most severe and complex

needs. Findings also indicated that some schools in the sample had started using measures to assess adaptive skills, such as the Vineland Adaptive Behaviour Scales (Sparrow, Cicchetti & Balla, 2005); learning skills, such as the Assessment of Basic Language and Learning Skills - Revised (ABLLS-R) (Partington, 2006); and progress against a social curriculum, such as the Social Communication, Emotional Regulation and Transactional Support framework (SCERTS) (Prizant, Wetherby, Ruben, Laurent & Rydell, 2006). However, although encouraging, it was not the remit of the report to assess the suitability of these tools in measuring progress for pupils with ASD either individually or at a school-wide level. A systematic review of tools to measure outcomes for children and young people with ASD up to the age of six years old concluded that the evidence for possible measures is unbalanced and as such the authors were unable to recommend the use of particular assessment tools (McConachie et al, 2015). Therefore, schools remain in a challenging position, in that they are required to, and are accountable for, evidencing the progress of their pupils with ASD. Schools understand that multiple measurements are recommended but are not in receipt of any guidance as to how that measurement of progress can take place.

Assessment within autism education research: Academic literature

The academic research literature concerned with measuring the impact of interventions for children and young people with ASD, appears to have much to offer the education sector with a number of assessment tools having been utilised to measure outcomes in this context for some time. Outcomes studies generally use multiple assessment tools to ensure that progress or impact of an intervention is measured across different areas of a person's repertoire to provide a more accurate picture (Gould et al, 2011; Kazdin, 2005). For example, Perry et al (2008) utilised measures of ASD symptomatology (Childhood Autism Rating Scale – CARS, Schopler, Reichler & Renner, 1988), adaptive skills (Vineland

Adaptive Behaviour Scales – VABS, Sparrow et al, 2005) and IQ (Mullen Scales of Early Learning – MSEL, Mullen, 1995) to evaluate the effectiveness of a large community-based early intervention programme for young children with ASD. Data from all measures showed significant gains for the intervention group, therefore, providing evidence of learning and development for the children in the sample. Dawson et al (2010) used four assessment tools to measure the impact of the Early Start Denver Model (ESDM), an intervention for very young children with ASD. The Autism Diagnostic Interview – Revised (ADI) (Lord, Rutter & Le Couteur, 1994), Autism Diagnostic Observation Schedule (ADOS) (Lord, Rutter, DiLavore & Risi, 1999), Mullen Scales of Early Learning (MSEL) (Mullen 1995), and the Repetitive Behaviour Scale (RBS) (Bodfish, Symons & Lewis, 1998). This combination of assessments allowed measurement of autism symptom severity, developmental skills, adaptive skills and repetitive behaviour. Interestingly, change on the standardised measure of adaptive skills (VABS) was not present at one-year follow-up but was evident at two years, emphasising the importance of using assessment measures that can be repeated over time (Fletcher-Watson & McConachie, 2015; McConachie et al, 2015).

Although the use of such assessment tools has been established in ASD intervention studies for some time, published examples of their application within UK school settings is limited. Grindle et al (2012) utilised the ABLLS-R (Partington, 2006) in addition to IQ and adaptive skill measures in evaluating the outcomes of 11 key stage 1 children attending an intervention classroom within a mainstream primary school. The ABLLS-R assessment is a criterion-based measurement of critical skills, such as social and communicative functioning, imitation and cooperation, which have been identified as crucial skills for children to learn from their everyday experiences (Partington & Sundberg, 1998). It is most frequently used for children with autism and other developmental disabilities (Grindle, et al, 2012). On close examination, although ABLLS domains have likely overlap with other assessments utilised

(e.g. communication, daily living skills, socialisation skills), it appears to measure the development of such skills in much smaller increments which may be aptly suited for children on the severe end of the autism spectrum with complex learning needs. The significant change demonstrated on the ABLLS-R for the sample in the Grindle et al (2012) study allowed the authors to conclude that children were learning a variety of key skills during their time at school outside of the National Curriculum Measures, which is a key requirement of schools in the UK (DfE, 2014). The authors, do however, caution the interpretation of these results, given that the ABLLS-R is not currently a validated tool (Grindle et al, 2012).

The ABLLS-R (Partington 2006) has also been utilised in a small number of studies conducted in UK special schools. For example, Walker-Jones and Hoerger (2009) used the ABLLS-R as a progress measure in case studies of intervention for pupils within a Welsh special school. Foran et al (2015) also utilised this measure in a special school to evaluate the progress made by a group of seven key stage 1 children who had been in receipt of intervention support over an academic year. In addition, we utilised the ABLLS-R as part of a pilot evaluation study of a special school education model. This study involved data from a bigger sample group (n=53) and a wider age range (5-18 years) than previous studies involving the ABLLS-R (Lambert-Lee et al, 2015, Chapter 2 reported in this thesis), and is therefore, more reflective of a whole school approach to the assessment of progress.

Another assessment tool that is commonly used in intervention and curriculum design for children with ASD is the Verbal Behavior Milestones Assessment & Placement Program (VB-MAPP, Sundberg, 2008). The VB-MAPP assesses the presence, absence or emergence of early language and learning skills, along with barriers to learning. The VB-MAPP has been utilised in several studies to provide a relative measure of an individual's language and learning skills repertoire (Charania et al, 2010; Grannan & Rehfeldt, 2012; Gunby et al,

2010). However, no published data exist that we know of on the validity or reliability of this tool.

Despite being used in intervention outcome studies for many years, and in some studies, showing good evidence of change across time (Perry et al, 2008), there appears to be only one UK education-based example of the measurement of ASD specific symptoms. Charman, Howlin, Berry & Prince (2004) used the Social Communication Questionnaire (SCQ) (Rutter, Bailey & Lord, 2003) amongst other measures in a study that investigated the feasibility of collecting data on the developmental progress of children with ASD entering school. The SCQ is a widely used tool that enquires about the presence or absence of behaviours and difficulties associated with ASD. Such a tool may be helpful in the measurement of progress for children with ASD, especially in light of the DfE's request of schools to measure progress for children with SEND more broadly and to include evidence of progress within areas of priority for them (DfE, 2016). Schools educating children with ASD will naturally prioritise learning goals in line with this diagnosis to support pupils to develop key skills for adult life. For example, functional communication and socialisation goals would likely be a priority in such school settings, along with clear support for pupil's barriers to learning. As each of these areas are defining features of ASD, they are directly measured within autism symptomatology tools such as the SCQ. This type of measure, may therefore, have a valid place in evaluating progress for pupils with ASD; not for the purpose of measuring any change in their autism severity, but to measure progress towards long term goals that are important for them, such as the development of communication skills and the ability to interact with other people.

With as many as 82% of individuals with autism displaying some behaviours that challenge (Murphy, Healy & Leader, 2009), support for which would be prioritised within their education plans in special school settings, a measure of such behaviours seems an

essential contribution to a wider picture of progress over time for children with ASD. The Behavior Problems Inventory – Short Form (Rojahn et al, 2012a) is an informant-based scale that measures the frequency and severity of behaviours across three domains (self-injurious behaviour, aggression/destruction and stereotypy) and has demonstrated good reliability and validity in the literature (Mascitelli et al, 2015; Rojahn et al, 2012b). However, to our knowledge there are no published examples to date of the use of this measure in a school-based setting for children with ASD.

In line with good practice and legislative guidelines and in collaboration with the setting concerned, we piloted the use of an assessment framework at a school-wide level to capture and evaluate progress across all areas of life for their pupils, all of whom had a diagnosis of ASD. The assessment framework consisted of the VABS (Sparrow et al, 2005), ABLLS-R (Partington, 2006), VB-MAPP (Sundberg, 2008), SCQ (Rutter et al, 2003) and BPI-S (Rojahn et al, 2012a). The goals of the current study were: (1) to establish the convergent validity of the two unvalidated measures (ABLLS-R and VB-MAPP) via correlations with the widely used valid and reliable VABS, (2) to establish whether the internal consistency of the SCQ and BPI-S is maintained when data are collected by typical school staff, and (3) to assess the feasibility of utilising all five measures at a school-wide level as part of the school's assessment model.

Method

Sample

The sample formed the total population of children and young people attending TreeHouse School, a specialist autism-specific day school in London, UK. At the time of data collection, the entire sample was functioning within the Performance Scales, which refers to performance attainment targets and descriptors for children and young people working below

the standard of the UK national curriculum assessments (DFE, 2014). All pupils within the sample met criteria for a risk assessment of challenging behaviour, that is, their behaviour was putting themselves or others at risk. All pupils lived within a one-hour commuting distance from the school, resided with family members, and attended school between the hours of 9.00am and 3.30pm Monday to Friday during term time only.

The study was conducted using data from a sample of 89 children and young people aged 5 to 18 years (mean = 12.8, SD = 3.12). All pupils had an independent diagnosis of ASD, and 91% of the sample (81 out of 89 pupils) had an additional diagnosis described as global developmental delay or severe learning difficulties. All diagnoses were given by community paediatricians or multi-disciplinary teams prior to school admission. All pupils had an Education, Health & Care Plan (EHCP) maintained by their home local authority indicating a specialist autism specific educational provision to be necessary and placements for all pupils were local authority funded. An EHCP refers to a legal document which describes a young person's special educational needs, the support they require to meet those needs, the outcomes they would like to achieve and the setting responsible for provision (DfE 2015). Eighty-one of the pupils (91%) were male and eight (9%) were female.

Measures

Vineland Adaptive Behaviour Scales II (VABS). The VABS (Sparrow et al, 2005) is a semi-structured caregiver interview using open ended questions concerning how individuals are able to function in their everyday lives. Standard scores and age equivalents are generated across four domains: communication, socialization, daily living skills and motor skills. An overall adaptive behaviour composite score (ABC) is also generated. The motor skills domain was not assessed during this study as the chronological age equivalent for behaviours measured in this domain has a cut off of seven years of age (this would have applied to a small minority of the sample). The ABC score calculated from the VABS has

demonstrated both concurrent validity and reliability (Sparrow, Cicchetti & Balla, 2005) and is a widely used measure in the research literature as a global index of adaptive behaviour.

The VABS has also demonstrated reliability within the intellectual disability population (Bilt, Kraijer, Sytema & Minderaa, 2005). The current study utilised the VABS data within a validity analysis of other measures. (Example provided in Appendix D).

Behavior Problems Inventory-Short form (BPI-S). The BPI-S (Rojahn et al, 2012a) is an informant-based rating scale designed to measure specific behaviour problems in individuals with developmental and intellectual disabilities. The instrument consists of 30 items divided into three subscales: (1) Self-injurious behaviour (SIB) (8 items), (2) Aggressive/Destructive behaviour (10 items), and (3) Stereotyped behaviour (12 items). Each item is rated on two scales measuring frequency of occurrence (0 = never, through to 4 = hourly) and severity (1 = mild, 2 = moderate and 3 = severe), with each subscale prefaced by a general definition of the behavioural construct being measured (SIB, aggressive/destructive behaviour, and stereotyped behaviour). The BPI-S has demonstrated good reliability and validity as a measurement instrument (Rojahn et al, 2012b, Mascitelli et al, 2015). (Example provided in Appendix E).

Social Communication Questionnaire (SCQ). The SCQ (Rutter, Bailey & Lord, 2003) is a 40-item informant-report questionnaire based on the Autism Diagnostic Interview Revised (ADI-R, Lord, Rutter & Lecouteur, 1994). Items focus on the characteristics and behaviours associated with autism in three hidden domains (social interaction, communication and restricted, repetitive and stereotyped behaviours) and are presented in a dichotomous yes/no format for informants to circle. There are two versions of the SCQ: the SCQ *lifetime form* (SCQ-Lifetime) designed to be completed by a person with knowledge of the individual's developmental history, and the SCQ *current form* (SCQ-current form), which focuses on present behaviour, specifically over the past three months. The SCQ has three

main uses: to act as a screening tool for ‘at risk’ children who may require further autism diagnostic assessments, to compare overall severity of autism symptomatology across a group sample, and, to indicate severity of autism symptomatology with respect to changes over time. Given that in the context of an autism specific special school, all pupils will be supported to develop skills within the three domains assessed by the SCQ as part of their education, in the current study, the SCQ-current form was used to gather data on the items covered in this measure and to analyse change on these items over time. We did not use the scores to question children’s autism diagnoses. The SCQ has established validity as a measurement of severity of autism symptomatology (Berument, Rutter, Lord, Pickles & Bailey, 1999; Norris & Lecavalier, 2010). However, as much reliability data has been collected via parental report (Norris & Lecavalier, 2010), the current study was interested in assessing whether the internal consistency of the measure was maintained when data was collected by school staff. (Example provided in Appendix F).

Assessment of Basic Language and Learning Skills – Revised (ABLLS-R). The ABLLS-R (Partington, 2006) is an assessment, curriculum guide and skills tracking system based on a criterion-referenced set of skills. The ABLLS-R demonstrates each pupil’s current skills repertoire and provides tracking of progress over time between assessments. The measure consists of 25 domains focusing on skills identified as being critical for individuals to learn to communicate successfully and to learn from their everyday experiences (Partington & Sundberg, 1998). The ABLLS-R is completed via a combination of observation and direct testing. Each of the 25 domains consists of six to 52 skill descriptors and pupils are rated on a 0-4 scale to determine whether each skill is an absent, emerging or mastered part of their repertoire. Previous researchers have grouped these domains into six related meta-domains to derive a smaller number of scores for analysis (Grindle et al, 2009, 2012; Lambert-Lee et al, 2015, Chapter 2) and this procedure was utilized within the present

study. The six domains consisted of; learning skills, language, social and play skills, academics, self-help, and motor skills. The ABLLS-R is typically used to measure progress at an individual level and to inform target setting (Partington, 2006) but was used successfully as a cohort progress measure by Lambert-Lee et al (2015) (Chapter 2). To our knowledge, there are no published studies demonstrating reliability or validity of the ABLLS as an outcome measure. (Example provided in appendix C).

Verbal Behaviour Milestones Assessment and Placement Program (VB-MAPP).

The VB-MAPP (Sundberg 2008) is a criterion-referenced assessment tool, curriculum guide, and skill tracking system designed for individuals with autism, developmental disabilities or language delay. The tool consists of three assessment domains (milestones, barriers and transition), a task analysis and skills tracking resource and a procedure for determining Individualized Educational Plan (IEP) goals. The VB-MAPP is typically used to provide a relative measure of an individual's skills at fixed points in time. Several studies have used the VB-MAPP for this purpose (Charania et al, 2010; Grannan & Rehfeldt, 2012). However, no published data exist to our knowledge on the relative validity or reliability of the measure. All domains within the VB-MAPP are conducted via a combination of observation and direct testing. The milestones and barriers assessments were used within the present study. The milestones assessment contains 16 measurable learning and language milestones balanced and sequenced across three developmental levels. Each milestone is individually assessed and scored as to whether the skill is present, absent or emerging in the individuals' repertoire. One total score is generated from the milestones assessment. The barriers assessment consists of 24 common learning and language acquisition barriers faced by individuals with autism and related disorders and is scored in the same way as the milestones assessment, yielding one total score. (Examples provided in Appendix A and B).

Procedure

Data on all measures were collected at the same point in time as part of the school's annual assessment cycle.

The VABS was conducted by senior school staff with a parent or caregiver over the telephone, or, in some cases, as a face-to-face interview (for example, with parents for whom English was not their first language). All assessors exercised every caution to obtain reliable and valid data. For example, staff did not interview parents of pupils they were teaching that academic year.

Class teachers were identified as informants to complete both the BPI-S and SCQ assessments for the pupils within their class group (typically 6 pupils in each group). Each teacher had known and worked closely with the individual they were rating for 6 months or more. An initial training session was conducted by the first author to clarify understanding of the written directions on the assessment forms and to establish a shared understanding of the behavioural descriptors to be answered. Teachers then completed the rating scale and questionnaire with the first author present to address any questions or concerns.

Teachers and Behaviour Analysts, whose role it is within the school to personalise each pupil's curriculum and teaching strategies, completed the ABLLS-R and the VB-MAPP for pupils under their caseload (12-14 pupils per caseload). Through observation, direct testing and discussion with learning support staff, each area within the assessments was scored to determine whether each skill was an absent, emerging or mastered part of the individual learner's repertoire.

Data Analysis

Behaviour Problems Inventory-Short Form (BPI-S) and the Social Communication Questionnaire (SCQ). As both of these measures, have established reliability and validity in the existing literature for populations with an intellectual disability, the goal of the current study was to investigate whether good levels of internal consistency were maintained across both instruments, when data were collected by school staff with limited assessment experience. To estimate the internal consistency of both measures, Cronbach's alpha coefficients were calculated.

Assessment of Basic Language and Learning Skills – Revised (ABLLS-R) and the Verbal Behaviour Milestones Assessment and Placement Program (VB-MAPP). As no published data currently exist on the reliability and validity of these measures, the goal of the current study was to assess how well these tools measure the behavioural constructs that they were designed to measure. Construct validity was therefore assessed for each domain within the assessments via a correlation analysis with the VABS domains (as an established, reliable and valid measure of adaptive skills). Pearson correlation coefficients were calculated. The VB-MAPP milestones score along with each ABLLS-R domain was included in this analysis along with age equivalent scores from each VABS sub-domain. In addition, a correlation analysis was conducted between the VB-MAPP barriers assessment with each domain on the BPI-S.

As the VABS is a reliable, valid and well-established assessment tool, no reliability or validity data were analysed for this measure. A further goal of the current study was to assess feasibility for special schools to utilise such assessment tools to support the measurement of progress for children and young people with autism and complex learning needs at a whole school level. Therefore, feasibility data was collected based on the number of assessments

intended to be conducted by the school versus the number actually completed during the assessment period. All data were analysed using SPSS software version 24.

Results

BPI-S and SCQ scale reliability. Internal consistency coefficients (Cronbach's α) were calculated for the overall frequency and severity scales of the BPI-S in addition to each subscale. These results are presented in table 1. The internal consistency alpha coefficients for the BPI-S overall frequency and severity scales were .876 and .861 respectively. The aggression/destruction and stereotypy subscales demonstrated similarly high reliability scores, with Cronbach's α above .8. However, the SIB subscale showed a lower reliability score of $\alpha = .529$ (frequency) and $\alpha = .587$ (severity). Cronbach's alpha coefficients for the three subscales on the SCQ are presented in table 2. All domains demonstrated a good level of scale reliability with coefficients of 0.81 (Social interaction), 0.80 (Communication) and 0.86 (restricted, repetitive and stereotyped behaviours).

Table 1: *BPI-S Internal consistency alpha coefficients*

Items	α Frequency	α Severity
BPI-S overall scale	.867	.861
Self-Injury	.529	.587
Aggression/Destruction	.839	.864
Stereotypy frequency scale	.800	

BPI-S = Behaviour Problems Inventory – Short Form

Table 2: *SCQ Internal consistency alpha coefficients*

Items	α Frequency
Social Interaction	.81
Communication	.80
Restricted, repetitive & stereotyped behaviour	.86

SCQ = Social communication Questionnaire

Table 3 presents Pearson's correlation coefficient results estimating the association between the VB-MAPP milestones assessment score and each sub-domain score of the VABS. The strongest correlation being between the milestones score and the receptive language domain on the VABS $r=.961$ ($p < 0.01$). Similar significant associations were also found when the same exercise was repeated to assess the association between the VABS sub-domains and the ABLLS-R domains. These results are presented in Table 4. All possible combinations demonstrated statistical significance, with the strongest relationship being demonstrated between the ABLLS language domain and the VABS receptive ($r = .891, p < 0.01$) and expressive ($r = .892, p < 0.01$) language domains. As a sensitivity analysis to examine whether data distributions were skewing associations found Spearman's correlations were also conducted. A very similar pattern of results was found.

Table 3: *Associations (Pearson's correlation coefficient) between VB-MAPP milestones assessment and VABS sub-domains*

VABS Sub-domain	Correlation with VB-MAPP Milestones (<i>r</i>)
VABS Receptive	.961**
VABS Expressive	.950**
VABS Written	.717**
VABS Personal	.951**
VABS Domestic	.485**
VABS Community	.932**
VABS Interaction	.959**
VABS Play	.930**
VABS Coping	.665**

** $P < 0.01$, VABS = Vineland Adaptive Behaviour Scales

Table 4: *Associations (Pearson's correlation coefficient) between ABLLS-R domains and VABS sub-domains*

Domain	A Learning	A Language	A Social	A Academic	A Self Help	A Motor Skills	A Total
VABS Receptive	.797**	.891**	.749**	.852**	.715**	.691**	.877**
VABS Expressive	.797**	.892**	.782**	.861**	.690**	.674**	.876**
VABS Written	.654**	.646**	.489**	.555**	.681**	.723**	.694**
VABS Personal	.823**	.890**	.710**	.854**	.762**	.761**	.896**
VABS Domestic	.387**	.434**	.288**	.485**	.433**	.424**	.462**
VABS Community	.815**	.851**	.698**	.865**	.766**	.750**	.887**
VABS Interpersonal	.818**	.885**	.885**	.854**	.726**	.739**	.889**
VABS Play/Leisure	.817**	.866**	.866**	.792**	.781**	.789**	.882**
VABS Coping	.519**	.563**	.563**	.519**	.541**	.515**	.581**

** $p < 0.01$, A = ABLLS-R, VABS = Vineland Adaptive Behaviour Scales

Table 5 shows the correlation coefficients between the VB-MAPP Barriers assessment and the three BPI-S domains (self-injury, aggression/destruction, stereotypy). Significant associations were found with all three domains, the strongest being with aggression/destruction domain ($r = .826, p < 0.01$).

Table 5: *Associations (Pearson's correlation coefficient) between VB-MAPP barriers assessment and BPI-S frequency domains*

BPI-S Domain	Correlation with VB-MAPP Barriers (r)
BPI-S Self Injury	.784**
BPI-S Aggression/Destruction	.826**
BPI-S Stereotypy	.824**

** $p < 0.01$, BPI = Behaviour Problems Inventory-Short Form

On a practical level, we were interested in how feasible the measures were to complete within the day-to-day running of a school and therefore, the target number of assessments to complete versus the actual number completed are presented in table 6. Above 92% completion was achieved for all of the measures, with the highest completion being for the BPI-S and the SCQ (98.8%).

Table 6: *Raw data and percentages showing the target number of assessments to complete versus the number completed*

Measure	Target number	Actual number	Percentage
VABS	90	83	92.2%
BPI-S	90	89	98.8%
SCQ	90	89	98.8%

VB-MAPP	90	88	97.7%
ABLRS-R	90	88	97.7%

VABS = Vineland Adaptive Behaviour Scales, BPI-S = Behaviour Problems Inventory – Short Form, SCQ = Social Communication Questionnaire, VB-MAPP = Verbal Behaviour Milestones Assessment and Placement Program, ABLRS-R = Assessment of Basic Language and Learning Skills.

Discussion

This paper has explored the implementation and properties of tools used in a school-wide assessment system to monitor and evaluate progress for pupils with ASD and complex learning needs, in line with the DfE's requirement for schools to measure areas of progress outside of the National curriculum (DfE, 2015).

The VABS (Sparrow et al, 2005) was used as a 'gold standard' comparison measure to assess the convergent validity of two widely used, but unvalidated measures within autism intervention, the ABLRS-R (Partington 2006) and the VB-MAPP (Sundberg, 2008). Results showed that all VABS domains were significantly correlated with the ABLRS-R total score. That is, pupils with higher scores on the ABLRS-R also achieved higher scores on the VABS, providing some preliminary support that the ABLRS-R is measuring developmental skills. Encouragingly, the strongest correlations were within pairings where we would expect to see some overlap. For example, the ABLRS-R language domain was strongly correlated with both the receptive and expressive communication sub-domains on the VABS, and the social domain on the ABLRS-R showed a strong association with the VABS interpersonal relationships sub-domain. In addition, the weakest correlations were linked to both the domestic and coping skills VABS domains. The types of items measured in these sub-domains are not measured directly within the ABLRS-R. For example, the VABS domestic domain refers to skills such as helping with household chores, tidying up personal items and helping to prepare snacks. These types of skills

are not directly assessed within the ABLLS-R; however, a number of the pre-requisite skills are. For example, a child who is able to imitate an adult and to follow simple instructions (assessed through the ABLLS-R) is far more likely to be able to follow parental requests to put toys away, or to learn how to prepare a snack by watching their parents. This explanation may account for the overall positive correlations; however, it is very encouraging to see the strongest correlations in areas where clear overlap would be expected.

A very similar pattern was found in analysis of the VB-MAPP milestones assessment. The milestones assessment provides one score based on the number of developmental language and learning skills scored as present at the time of assessment. This total score showed a strong correlation with all VABS sub-domains. The weakest correlations, like the ABLLS-R analysis, were with the domestic and coping skills sub-domains on the VABS. Again, this makes good sense in that items from these sub-domains are not directly assessed in the milestones assessments. However, early learning skills that make the presence or absence of community and domestic skills more likely *are* assessed. The barriers assessment in the VB-MAPP also showed a strong correlation with all three domains on the BPI-S. This indicates that children scoring high on the barriers assessment (demonstrating difficult behaviours that impact their ability to access their learning) also scored high on a reliable and valid measure of behaviour problems. Overall, this provides some support for the use of the VB-MAPP milestones and barriers assessment in the monitoring and evaluation of progress for pupil's with ASD.

Although reliability and validity of both the BPI-S (Rojahn et al, 2012b) and SCQ (Berument et al, 1999; Norris & Lecavalier, 2010) have been demonstrated in the literature, to our knowledge there are no exiting published examples of their use as

a progress measure within a special school setting. As such, the current study assessed whether the internal consistency of these measures would be maintained when the data were collected by typical school staff within the everyday practice setting of a special school. Internal consistency of the BPI-S was assessed using Cronbach's alpha. The aggression/destruction and stereotypy subscales showed good to excellent internal consistency, and the self-injury subscale showed lower consistency. Similar findings have been reported in previous research (Gonzales et al, 2008, Rojahn et al, 2001, Van Ingen, Moore, Zaja & Rojahn, 2010). All three sub scales on the SCQ showed a good level of internal consistency, again supporting previous findings (Berument, Rutter, Lord, Pickles & Bailey, 1999; Norris & Lecavalier, 2010). It therefore, appears that both scales can be utilised by typical school staff without compromising on reliability.

Although some support has been found for the use of these measures, there is a practical question to pose, regarding whether, in a typical special school setting it is possible to implement an assessment framework that consists of data collection across these five measures. Therefore, assessing feasibility was an important secondary goal of this study given the demanding nature of teaching roles within special schools. Encouragingly, above 92% assessment completion was achieved for all measures. The BPI-S and SCQ achieved the highest level of completion by school staff at 98.8%. These scales tend to take 5-10 minutes to complete for each pupil. The fact that these measures yield some reliable and valid information about pupils' profiles, paired with the low response effort required to complete them, appear to make them ideal measures to add into an assessment framework in a busy special school setting.

The ABLLS-R and VB-MAPP both achieved a completion of 97.7%, which is encouraging, given that these are more complex to complete for each pupil than the

scales referred to above. Both assessments are completed via a combination of observation and direct testing over a period of time in the classroom. Although this could be interpreted as a high response effort, teachers commented that this was very similar to the National Curriculum assessments, whereby an assessment period of ongoing observation and testing with a pupil provides the necessary evidence for securing their judgement against expected standards. Teachers also commented that the information gathered in the completion of these assessments supported them to make judgements against National Curriculum Assessments, which may otherwise have taken them additional time. Therefore, a possible side effect of using these tools may be their contribution to the statutory assessments required.

The VABS achieved the lowest, but still encouraging, completion level of 92.2%. The VABS is well established as an outcomes measure and is arguably more clinically relevant than some other assessment tools for children with SEND given that parents or caregivers act as informants and the assessment, therefore, focuses on how pupils are generally functioning within their day-to-day lives rather than under prescribed testing conditions. VABS interviews were conducted with parents or caregivers via a telephone appointment unless a face-to-face appointment was appropriate (for example, if English was an additional language) and so did require a block of time to be available. This took between 30-45 minutes. However, as class sizes in special schools are small, each staff member was only responsible for completion of up to six VABS interviews. Teachers commented that the information collected about each pupil at an individual level was extremely helpful. Therefore, although in the current study data were collected by a staff member not known well to the pupil to avoid bias as much as possible, in day-to-day school practice, it is recommended that teachers conduct the interviews for the pupils that they directly

support. It is also important to note that the latest edition of the VABS (Sparrow, Cicchetti & Saulnier, 2016) includes a brief version that still allows standard scores in the main VABS domains to be generated, using much reduced time.

This study has presented an assessment framework used to monitor and evaluate pupil progress in a special school setting. The framework meets the requirement of assessing areas outside of the national curriculum (DfE, 2015), and including parental/caregiver voice (via the VABS) as part of the assessment process to achieve a more rounded picture of pupil progress (Gould et al, 2011). Assessments were feasible to conduct within a special school setting and provided valid and reliable information. The assessment framework in the current study therefore, represents a helpful approach to: (1) deliver reliable information to stakeholders about their child and about the school, (2) drive improvement by providing reliable information on broader areas of progress to teachers on which data driven decisions can be made, and (3) allow the special school to reflect on their quality of teaching, learning and support in line with the primary areas of need for pupils with ASD and complex learning needs.

Chapter 4: One-year outcomes for children and young people with autism and an intellectual disability entering a whole-school evidence-based educational model

Chapter 3 described and evaluated a whole-school assessment framework for the monitoring and evaluation of progress amongst pupils with autism and an intellectual disability. Findings suggested that the framework led to the collation of reliable and valid information and, in addition, was feasibly implemented by school staff. After establishing a framework to use for evaluation, Chapter 4 turns the reader's attention back to evaluation of school-based models of practice for children and young people with autism and an intellectual disability. This chapter therefore, addresses the third intention of this thesis; to use the assessment framework described in Chapter 3 to evaluate the impact of an evidence-informed school-wide behavioural model of practice. The data reported within this study was collected in the 2014-2015 academic year.

Abstract

The prevalence rates for Autism spectrum Disorder (ASD) amongst school-aged children has increased in recent years. Systematic reviews have been helpful in highlighting a number of evidence-based practices to support the education of those with ASD. However, there is a paucity of research on the translation of such practices into school-based models of provision, leaving a considerable research-practice gap. The aim of the current study was to evaluate the impact of a whole school model of practice in an autism specific special school setting previously described by Lambert-Lee et al (2015, Chapter 2). An assessment framework consisting of multiple measures focusing on learning skills across the curriculum, adaptive behaviour, autism characteristics and challenging behaviour was utilised (see Chapter 3). Baseline assessments were conducted for 35 pupils aged between 5-18 years upon admission to the school and were repeated 12 months later. Statistically significant gains with medium to large effect sizes were revealed across measures of learning and curriculum skills, adaptive behaviour, autism characteristics and challenging behaviour. In addition, at least 50% of pupils achieved reliable change for each of 12 out of the 16 domains measured, with no pupils showing regression. These data suggest that the behavioural model of practice described by Lambert-Lee et al (2015) (see Chapter 2) produced positive outcomes for pupils in a special school setting after accessing the provision for one year.

Key words: Autism; Applied Behaviour Analysis, School-based Intervention, School-wide models, Intellectual Disability, Autism Education

Introduction

The past three decades have seen a sharp increase in the prevalence rates for Autism Spectrum Disorder (ASD). ASD is now reported to affect 1% of children in the United Kingdom (National Institute for Health and Clinical Excellence, 2013) and 1 in 68 children in the United States (Centers for Disease Control and Prevention, 2014). Amongst the school aged population in the UK, ASD has been identified as the most prevalent primary need for all children and young people requiring specific Special Educational Needs (SEN) provision (DFE, 2018). In line with the increase in prevalence has been an increased focus from researchers on the evaluation of interventions to support children and young people with ASD (Wong et al, 2013).

A number of recent systematic reviews have been conducted to evaluate the quality of the ASD intervention evidence base as a whole and to identify evidence-based practices within the autism education field (Bond, Symes, Hebron, Humphrey & Morewood, 2016, National Autism Centre, 2015; Odom, Collet-Klingberg, Rogers & Hatton, 2010; Robson & Bond, 2017; Wong et al, 2015;). Although such reviews have been helpful in identifying empirically tested interventions, very few studies evaluated have been conducted in real world education settings and/or provided limited information on how interventions could be translated into everyday educational practice. This makes it difficult to assess their educational utility and highlights the persistent gap between research and practice in autism education (Parsons & Kasari, 2013). This gap is problematic given that long-term outcomes for individuals with ASD remain poor (Dingfelder & Mandell, 2011; Shattuck et al, 2012). For example, only 15% of adults of working age with ASD in the UK are in employment (Rosenblatt, 2008), with many unfortunately experiencing post-education outcomes of inactivity, unemployment, social isolation and residing with

parents into adulthood (Shattuck et al, 2012). Therefore, the need for practical and effective school-based models leading to a range of positive life outcomes for individuals with ASD should be considered a priority (Pellicano, Dinsmore & Charman, 2014).

With research efforts identifying suitable interventions and supports for children and young people on the autism spectrum, it is somewhat disappointing that long-term outcomes remain so poor. The distinct lack of translational research within the autism education field has been highlighted as a contributory factor (Bond et al, 2016; Cook & Odom, 2013; Wong et al, 2015) and has led researchers to call for a focus on translational research considering educational utility (Bond et al, 2016) in an effort to identify those models of evidence-based practice that can be implemented within school settings and to evaluate the contributions such models can make to the outcomes of those on the autism spectrum.

Studies that have focused on the use of evidence-based practices within existing service delivery systems have largely focused on children's pre-school years (Bond et al, 2016). For example, Perry et al. (2008) conducted a large community-based study (n=332) examining the progress of children accessing services through the Ontario Preschool Autism Initiative (Perry, 2002a), a province wide Intensive Behavioural Intervention (IBI) Programme in Canada. Results demonstrated significant reductions in characteristics associated with autism and improvements in standard test scores for cognitive skills and adaptive functioning. Similar results have also been demonstrated in other community-based Early Intervention Programmes (Freeman & Perry, 2010; Smith et al, 2010). Two large scale randomized controlled trials (RCTs) have also focused on evaluating models of service delivery for pre-school aged children on the autism spectrum with encouraging results. Dawson et al,

(2010) compared the Early Start Denver Model (ESDM); a comprehensive early intervention approach for children aged 12-48 months with treatment as usual, which consisted of interventions commonly available in local communities. Greater improvements in cognitive and language abilities, adaptive behaviour and autism symptoms for children in the intervention group in comparison to those referred for treatment as usual were clearly demonstrated. A further RCT evaluated the efficacy of the LEAP (Learning Experiences and Alternative Program for Preschoolers and their Parents) model, an inclusive class-wide model that incorporates evidence-based teaching procedures through incidental learning opportunities and peer facilitated interactions with typically developing peers. Pre-school classrooms utilizing the LEAP educational model received two years of training and coaching and comparison classrooms received intervention manuals only. Progress data after two years demonstrated significantly greater outcomes across measures of cognitive, language, social, problem behaviour and autism symptoms in favour of the experimental group (Strain & Bovey, 2011).

Although such results are encouraging, they focus largely on the translation of early intervention models into early years practice settings. Considering that children and young people with ASD will be of school age for many more years than those considered optimal for early intervention, it is particularly important for translational research to focus on the implementation and evaluation of evidence-based educational models within the school-aged population of children and young people with autism and therefore, directly within the school environment (Bond et al, 2016; Wong et al, 2015). Although in the United States schools must, by law, implement evidence-based practices (EBP), a view which is increasingly advocated with the UK education system (Goldacre, 2013), there remain limited examples in the literature of school-

based educational models and of the outcomes achieved by the children and young people served by them (Bond et al, 2016; Odom et al, 2014; Wong et al, 2015).

One of the most widely used educational models in special school settings supporting children and young people with autism is the TEACCH approach (Treatment and Education of Autistic and Related Communication Handicapped Children, Mesibov & Shea, 2010). The TEACCH programme advocates for close working relationships between families and practitioners, makes use of structured teaching experiences and adapts intervention to accommodate individual needs. Settings using the TEACCH approach organize the physical environment to minimise distractions, arrange activities in a predictable fashion (e.g. the use of visual schedules), and promote independence from adult directions (e.g. by using visual materials). Research on the outcomes of this model within school settings has been varied with studies often analysing different outcome variables and including different components or combinations of the TEACCH approach (Ortega, Julio & Pastor-Barriuso, 2013). Such variability precludes straightforward analysis of outcomes. Recent meta-analysis reports negligible effects across perceptual, motor, verbal, cognitive and adaptive repertoires including activities of daily living and communication, with moderate to large improvements in social and maladaptive behaviour (Virues-Ortega, Julio & Pastor-Barriuso, 2013).

SCERTS (Prizant, Wetherby, Rubin, Laurent & Rydell, 2006) is a more recent addition to the literature with the acronym referring to the focus on social communication, emotional regulation and transactional support. The SCERTS model provides a framework for ensuring that specific skills and appropriate supports stated as educational objectives are selected and applied in a consistent manner across a young persons' day at school. The model does not specify a specific teaching and

learning approach but instead provides a framework for target setting, lesson planning and measurement of progress. O'Neil et al (2010) wrote a descriptive article demonstrating how the SCERTS model had been applied for a small sample in a UK primary special school and described some anecdotal positive outcomes for pupils, staff and the school in general. A cluster randomized trial compared a classroom wide SCERTS intervention with typical autism education acting as a control (Morgan et al, 2018) for elementary aged children with autism (5-8 years of age). Researchers found significantly better outcomes in favour of the intervention group on measures of engagement, communication, social skills and executive functioning. This provides preliminary information that a class-wide and consistent approach may be helpful, however, to our knowledge, there are no evaluations of the SCERTS model at a school-wide level or for children over the age of eight.

A rare description of how evidence-based behavioural teaching methods were integrated into an autism specific class within a mainstream primary school setting in the UK was published by Grindle et al (2009). This study demonstrated that a behaviourally based education model was able to complement the statutory education frameworks in place within the school and the research team went on to publish some encouraging results for children who accessed this provision (Grindle et al, 2012). Moderate to large effect sizes were demonstrated for gains made in IQ and adaptive behaviour over one and two years indicating that children had learned skills more rapidly than expected given their baseline assessment results.

Children and young people on the more severe end of the autism spectrum with complex learning needs often attend autism specific special school provisions deemed necessary to meet their diverse needs. Such schools use a variety of approaches and interventions to meet the needs of their pupils, however, there are

very limited outcomes available for children and young people receiving their education in such specialist settings (Bond et al, 2016). In addition, despite schools being under increasing pressure to incorporate evidence-based practices within their settings, many continue to use practices that are unsupported by such research (Burns & Ysseldyke, 2009; Carter, Stephenson & Strnadova, 2011).

Lambert-Lee et al (2015) provided a description of a school-wide educational model underpinned by evidence-based practices and implemented at an autism specific special school in the UK (see Chapter 2). An initial pilot evaluation of the model demonstrated some statistically significant gains for a heterogeneous sample of pupils (n=53) across standardized measures of language, communication, socialization and daily living skills over a 12-month period. Significant change was also demonstrated across a wide range of learning skills measured by the Assessment of Basic Language and Learning Skills - Revised (ABLLS-R) (Partington, 2006). Such outcomes are encouraging as they demonstrate that evidence-based educational models may indeed translate into school-based provision within statutory education frameworks. The study did however, have some limitations. The data analysed over the 12-month period was for pupils' who had already been attending the school for some time. Therefore, baseline data prior to receiving educational support through the school's model was unavailable to draw comparisons against. In addition, only two outcome measures were used within the study (adaptive behavior and learning skills) which limits the conclusions that can be drawn with regard to the overall effectiveness of the model. Therefore, the authors called for future evaluations of the model to utilize a wider range of outcomes measures and to establish baseline data prior to admission into the school to obtain a better understanding of the models' impact on outcomes for pupils.

The current study aims to extend and contribute to the limited body of research on school-based educational models for children and young people with autism by evaluating the impact of the school-based model described by Lambert-Lee et al (2015) using a wider range of outcomes measures and with baseline data collected upon school admission.

Method

Setting

The study was conducted at an autism specialist school in London, UK. The school catered for the needs of children and young people with ASD, comorbid intellectual disabilities and complex learning needs between the ages of 4-19 years and had 85 pupils enrolled at the time of the study. All pupils attending the school had an Education, Health and Care Plan (EHCP) which named the school as responsible for meeting their educational needs. An EHCP is a legally binding plan for children and young people who require more support than is available to them through typical educational provision. EHC plans describe the educational, health and social care needs of the young person concerned along with the required provision to meet those needs (DfE, 2015). As such, all pupils attending the school are funded to do so via their home local authorities. Pupils live within a one hour driving distance and attend school between the hours of 9.00am to 3.30pm Monday-Friday during term time. Evidence-based approaches to teaching and learning underpinned by behaviour analysis have been integrated as a core feature of the school's provision model. This includes the employment of Board Certified Behaviour Analysts (BCBA), who work collaboratively with class teachers and allied health professionals to assess pupils needs, design personalized goals, formulate lesson plans incorporating evidence-

based approaches to teaching and learning, and to monitor and evaluate progress. The model of provision used at the school is fully described in Lambert-Lee et al (2015) (see Chapter 2).

Participants

The goal of the current study was to evaluate the impact of the school's model of provision on pupil progress, which required the analysis of both baseline and follow up data. As such, only pupils new to the school were selected to participate in the study so that baseline assessments of skills and behavioural repertoires could be completed upon school admission and then repeated twelve months later. Thirty-five pupils new to the school participated within the study. The pupils were aged between 5-18 years (mean= 11years) with 88.6% of the sample being male (n=31) and 11.4% of the sample being female (n=4). All pupils had an independent diagnosis of Autism Spectrum disorder (ASD) given by their community paediatrician prior to admission to the school along with a comorbidity of intellectual disability, usually described on EHCPs as global developmental delay or severe learning difficulties.

Measures

Vineland Adaptive Behaviour Scales II (VABS). The VABS (Sparrow, Cicchetti & Balla, 2005) is a standardized, norm-referenced assessment tool, which measures adaptive skills across four domains: communication, socialization, daily living skills and motor skills. The VABS is conducted via a semi-structured caregiver interview using open ended questions concerning how individuals are able to function in their everyday lives. Standard scores and age equivalents are generated across domains, along with an overall adaptive behaviour composite score (ABC). The

motor skills domain was not assessed during this study as the chronological age equivalent for behaviours measured in this domain has a cut off of seven years of age. The VABS has demonstrated both concurrent validity and reliability (Sparrow et al, 2005) and is a widely used measure in the literature for assessing adaptive behavior.

Behaviour Problems Inventory-Short form (BPI-S). The BPI-S (Rojahn et al, 2012a) is an informant-based rating scale designed to measure specific behavior problems in individuals with developmental and intellectual disabilities. The instrument measures behaviour across three subscales: (1) Self-injurious behavior, (2) Aggressive/Destructive behavior, and (3) Stereotyped behavior. Each item is rated on two scales measuring frequency of occurrence and severity, with each subscale preceded by a general definition of the behavioural construct being measured (self-injurious behavior (SIB), aggressive/destructive behavior and stereotyped behavior). Good reliability and validity data has been presented in the literature for this measure (Rojahn et al, 2012b).

Social Communication Questionnaire (SCQ). The SCQ (Rutter, Bailey & Lord, 2003) is a 40-item informant-report questionnaire based on the Autism diagnostic Interview Revised (ADI-R, Lord, Rutter & Lecouteur, 1994). Items are presented in a yes/no format and focus on the characteristics of behaviours associated with autism (social interaction, communication and restricted, repetitive and stereotyped behaviours). The SCQ has three main uses: to act as a screening tool for ‘at risk’ children who may require further autism diagnostic assessments, to compare overall sensitivity of autism symptomatology across a group sample, and, to indicate severity of autism symptomatology with respect to changes over time. As schools specializing in the education of children and young people with autism will prioritise goals in the core areas measured by the SCQ, this measure may be a helpful addition

to special school assessment practices (see Chapter 3). In the current study, the SCQ was used to gather data on the items covered in this measure and to analyse change on these items over time. The SCQ has established validity as a measurement of autism symptomatology (Berument, Rutter, Lord, Pickles & Bailey, 1999; Rutter et al, 2003).

Assessment of Basic Language and Learning Skills – Revised (ABLLS-R).

The ABLLS-R (Partington, 2006) is an assessment, curriculum guide and skills tracking system based on a criterion-referenced set of skills. The ABLLS-R measures foundational language and learning skills, providing a measure of a pupil's skills repertoire at a particular point in time, and can therefore, be used to track progress between assessment dates. The measure consists of 25 domains focusing on skills identified as being critical for individuals to learn to communicate successfully and to learn from their everyday experiences (Partington, 2006). A combination of observation and direct testing is utilized to complete the ABLLS-R. Each of the 25 domains consists of six to 52 skill descriptors which are rated on a 0-4 scale to determine whether each skill is an absent, emerging or mastered part of their repertoire. Previous researchers have grouped these domains into six related meta-domains in order to derive a smaller number of scores for analysis (Grindle et al, 2009; Lambert-Lee et al, 2015, Chapter 2) and this procedure was utilized within the present study. Emerging evidence of reliability and validity has been recently presented in the literature (Partington, Bailey & Partington, 2016; thesis Chapter 3).

Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP). The VB-MAPP (Sundberg 2008) is a criterion-referenced assessment tool, curriculum guide, and skills tracking system designed for individuals with autism, developmental disabilities or language delay. The tool consists of three assessment domains; (1) The milestones assessment focuses on 16 measurable language and

learning milestones balanced and sequenced across three developmental levels. Each milestone is individually assessed via a combination of observation and direct testing and scored as to whether the skill is present, absent or emerging in the individual's repertoire. A total score is generated from the milestones assessment. The barriers assessment consists of 24 common learning and language acquisition barriers faced by individuals with autism and related disorders and the transition assessment consists of 18 skill areas required for learning from the natural environment. Both the barriers and the transition assessment are scored in the same way as the milestones assessment and both yield one total score for the assessment domain. The milestones and barriers assessments have demonstrated some preliminary convergent validity in the evaluation of educational progress for children with ASD (see Chapter 3) and were used in the current study.

Design

A pre-test/post-test within-group design was employed in the study, with pupils being assessed upon admission with assessments repeated one year later.

Procedure

Data on all measures were collected at two distinct time points: (1) upon admission to the school, and (2) 12-months after baseline assessments were completed.

The VABS interviews were completed by senior school staff over the telephone with a parent or caregiver. An external assessor with significant experience in conducting the VABS also supported the school by completing VABS interviews as part of the data collection process. Some VABS interviews were completed face-

to-face where required, for example, if English was an additional language for the parent/caregiver and they felt more comfortable having a face-to-face conversation. Those assessing exercised every caution to obtain reliable and valid data. For example, staff did not complete assessments with the families of pupils with whom they taught or interacted with regularly to minimise bias.

Class teachers completed both the BPI-S and SCQ rating scales for the pupils within their class and had known the pupil that they were rating for 6 months or more. A one-hour training session was conducted by the first author to clarify understanding of the written directions on the assessment forms and to establish a shared understanding of the behavioural descriptors to be rated.

Multi-professional teams collaborated to complete the ABLLS-R and VB-MAPP for the pupils that they worked with regularly. Teams usually included a qualified teacher, a behaviour analyst, and a speech and language therapist. Other professionals were also involved in some pupil's assessments based on those pupils who received regular input from a particular role within the school (e.g. occupational therapist, subject specialist teachers, vocational specialists). Assessments were completed via a combination of observation, direct testing, and discussion. Each area within the assessment was scored to determine whether each skill was absent, emerging, or mastered part of the pupil's repertoire.

Results

Change in mean scores between intake and follow-up were analysed using paired samples t-tests for all measures. Results of this analysis are presented in Table 1 showing the mean scores and p values generated from the t-tests. Effect sizes were calculated using Cohen's d formulations, adjusted to account for the repeated

measures design (Dunlap, Cortina, Vaslow & Burke, 1996). Prior to carrying out statistical analysis, data related to outcome variables were found to be reasonably normally distributed (tested using one sample Kolmogorov Smirnov tests).

Table 1: *Changes in group means over 12 months across all assessment measures.*

Measure	N	Time 1		12 mo. later		p	d
		Mean	SD	Mean	SD		
SCQ	35	26.94	5.28	21.51	5.95	<.001	0.96
VB-MAPP	35	67.44	34.67	87.10	35.51	<.001	0.56
Milestones							
VB-MAPP	35	49.40	19.55	40.74	19.73	<.001	0.44
Barriers							
VABS	35	47.68	9.47	52.54	10.32	<.001	0.38
Communication							
VABS Daily	35	50.28	11.53	54.40	11.47	<.001	0.35
Living							
VABS Social	35	45.68	9.35	50.57	9.46	<.001	0.51
Skills							
VABS ABC	35	46.77	9.54	51.37	9.57	<.001	0.48
ABLLS	35	36.62	21.18	50.72	21.14	<.001	0.66
Learning Skills							
ABLLS	35	25.98	20.53	36.68	21.80	<.001	0.50
Language							
ABLLS Social	35	20.21	11.78	32.65	16.22	<.001	0.87
Skills							
ABLLS	35	17.25	20.74	26.06	22.23	<.001	0.36
Academics							
ABLLS Self	35	54.57	23.10	65.79	21.22	<.001	0.50
Help							
ABLLS Motor	35	63.52	24.38	74.94	21.60	<.001	0.49
Skills							

BPI-S SIB	35	12.37	7.71	5.37	5.26	<.001	0.87
BPI-S	35	17.80	11.34	8.48	9.09	<.001	0.90
Aggression							
BPI-S	35	42.74	15.01	25.17	12.39	<.001	1.27
Stereotypy							

SCQ = Social Communication Questionnaire, VB-MAPP = Verbal Behaviour Milestones Assessment and Placement Programme, VABS = Vineland Adaptive Behaviour Scales, ABLLS = Assessment of Basic Language and Learning Skills – Revised, BPI-S = Behaviour Problems Inventory – Short Form.

Adaptive Behaviour: Statistically significant change in mean scores was revealed across all VABS domains with Cohen’s *d* values ranged from .35 to .51 indicating medium effect sizes across the four domains. Given that the VABS yields standardized scores, these data suggest that pupils exceeded normative expectations with regard to progress over a 12-month period in relation to their previous assessment results.

Learning Skills: Statistically significant change was also demonstrated across all ABLLS and VB-MAPP domains with medium to large effect sizes demonstrated (range 0.36 to 0.87). This suggests that pupils were acquiring key learning-to-learn skills, were developing skills across different curriculum areas, and that behaviours representing barriers to learning were reducing over the course of an academic year at the school.

Behaviours that challenge: Outcomes from the BPI-S also demonstrate statistically significant results across all domains with large Cohen’s *d* values ranging from .87 to 1.27. Such results indicate that behaviours described as challenging, reduced over the academic year for this group of pupils.

Autism Specific Characteristics: A statistically significant reduction in SCQ scores was demonstrated over the year, with a large effect size of .96. These results indicate that pupils learned new skills or demonstrated other behaviour change in

areas particularly associated with an autism diagnosis such as communication, socialization, and interaction.

Analysis of outcomes for individual children: To explore whether the significant changes found at group level were reflected in outcomes for individual children, we applied the criteria outlined by Jacobson and Truax (1991) to establish thresholds for reliable change in outcomes. Computing a reliable change index score provides a criterion for outcomes on each assessment measure beyond which there is a 95% chance that the change demonstrated does not result from measurement unreliability or variability in scores. Table 2 shows the reliable change criterion value for each assessment measure, along with the percentage of pupils within the sample who achieved reliable change. Results are encouraging, ranging from 22.85% to 97.14% of pupils achieving reliable change, with over 50% of pupils achieving reliable change for each of 12 of the 16 measurement domains (75%).

Table 2: *Reliable change criterion for each measure and the percentage of pupils who met reliable change.*

Measure	Reliable change criterion (RCrit)	Percentage of pupils meeting RCrit
SCQ	6.08	48.57%
VB-MAPP Milestones	7.15	97.14%
VB-MAPP Barriers	5.24	77.14%
VABS Communication	4.10	57.14%
VABS Daily Living	5.18	37.14%
VABS Socialisation	3.91	65.71%
VABS Composite	3.70	68.57%
ABLLS Learning skills	6.13	94.28%
ABLLS Language	8.80	65.71%
ABLLS Social	15.49	22.85%
ABLLS Academic	2.30	91.42%
ABLLS Self Help	5.17	77.14%
ABLLS Motor	7.27	60.00%
BPI-S Self Injury	8.19	45.71%
BPI-S Aggression	7.84	62.87%
BPI-S Stereotypy	16.16	54.28%

SCQ = Social Communication Questionnaire, VB-MAPP = Verbal Behaviour Milestones Assessment and Placement Programme, VABS = Vineland Adaptive Behaviour Scales, ABLLS = Assessment of Basic Language and Learning Skills – Revised, BPI-S = Behaviour Problems Inventory – Short Form

Discussion

Children and young people aged 5 to 18 years made significant gains across a range of outcomes measures after accessing for the first time the school-based educational model described by Lambert-Lee et al (2015) over a one-year period. Positive outcomes were revealed in statistically significant gains with medium to large effect sizes across all measured domains. The VABS outcomes are particularly encouraging, considering the standardised nature of this assessment. Results indicate that children surpassed normative expectations of progress, in comparison to their baseline scores. Furthermore, as parents/carers acted as informants for this assessment, we can have additional confidence that the gains made by pupils were reflected in their day-to-day lives, rather than under prescribed testing conditions making this form of assessment an important addition to assessment frameworks for children and young people with autism who often experience generalisation difficulties (see Chapter 3).

We found statistically significant change in mean scores for all measured domains within the ABLLS-R and the VB-MAPP in addition to the BPI-S and the SCQ. Medium effect sizes were predominantly found for ABLLS-R and VB-MAPP domains, whereas larger Cohen's *d* values were demonstrated for the BPI-S and the SCQ outcomes. Although all encouraging outcomes, a possible explanation for the difference in effect sizes may be related to the focus of pupil's personalised programmes within their first year at school. For example, due to the school's designation to serve children and young people with complex learning and behavioural needs, pupils would typically enter school with a high rate and severity of behaviours that challenge, limited communication skills, and a history of disengagement with their education (Lambert-Lee et al, 2015; Chapter 2). As such,

considerable emphasis in a pupil's first year at school was placed upon understanding and supporting their behaviour, establishing basic communication skills and early 'learning-to-learn' skills such as motivation and attention to encourage engagement with learning. Gains in these areas would be directly measured by the BPI-S and the SCQ and as such may be reflected in the larger effect sizes. The ABLLS-R and VB-MAPP outcomes indicate that pupils had learned a variety of skills across different domains, however, it is perfectly possible that the focus on teaching the types of targets assessed by these measures may have only begun for pupil's midway through the academic year after stabilising pupil's communication, behavioural, and basic learning needs. Previous research has also found that children show more academic gains within their second year of intervention support due to the first year focusing on the early learning skills described (Grindle et al, 2012). A helpful area for future research would be that of sustainable progress, outside that of the initial year or two of intervention within a school context.

In the present study, we extended the literature by using Jacobson and Truax's (1991) reliable change criterion for the first time within an evaluation of a school-based educational model for students with ASD. This analysis yielded positive results, with at least 50% of pupils achieving reliable change for each of 12 of the 16 measurement domains (75%) and no children showing regression. To our knowledge, there are no existing published data from a school setting with a similar sample with which to compare and interpret these data. Future school-based evaluations utilising the reliable change index would allow for such comparisons.

Results are consistent with those found from early intervention studies using evidence-based models of delivery (Eldevik et al, 2009). However, there are significant differences between the present study and those from the early intervention

literature. For example, given that the goal was to evaluate an educational model delivered in a real-world school setting, we did not utilise inclusion or exclusion criteria for pupils with regard to age or level of intellectual disability. Children accessed educational support through their typical school day during term time only and there was no set requirement for parental involvement (however, this was encouraged where possible). These points are in stark contrast to much of the early intervention literature that has yielded similar results (Eldevik et al, 2009).

This study has a number of strengths in that it was conducted in a real-world school provision, with no selection criteria for participants other than the school's typical admissions process. The study design by nature, therefore, goes some way to addressing the distinct translational research gap in the autism education field (Odom et al, 2014; Wong et al, 2015; Bond et al, 2016). The educational model evaluated was delivered by school staff rather than researchers or clinic staff, and a range of measures was used to assess outcomes which is generally regarded as the gold standard in evaluation studies (see Chapter 3). However, the study is also not without its limitations. The sample size was relatively small ($n=35$) and no comparison or control group was utilised. Therefore, we cannot be sure that similar progress would not have been made with other approaches to educational practice. Due consideration must also be given to the fact that the educational model evaluated in the present study includes multiple components, and we could not isolate which of these components may have contributed to the positive outcomes more than others.

The present study has provided an evaluation of the educational model underpinned by evidence-based practices and described by Lambert-Lee et al (2015). Pupils in the sample made good gains across all assessment measures over a 12-month period after entering the school. Future research is required to compare

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outcomes achieved in the current study with those achieved by other school-wide models of practice. In addition, although pupils in the present study made significant gains within their first year of school attendance, the question of whether such models of practice lead to long term, sustainable progress year-on-year for school aged pupils requires further investigation.

Chapter 5: Sustainability of outcomes from a whole-school behavioural education model for children and young people with autism and an intellectual disability

Chapter 4 demonstrated some encouraging outcomes from a group of pupils who had been accessing the behavioural education model described in Chapter 2 for one year. Chapter 5 now turns to the question of sustainable progress. That is, does the model described continue to lead to positive outcomes for the whole-school cohort over a typical school year, beyond the first year evaluated in Chapter 4? This chapter therefore, addresses the fourth intention of this thesis; to explore whether an evidence-informed school-wide behavioural model of practice may lead to ongoing, sustainable progress for pupils with autism and an intellectual disability at a whole school level. The data reported in this study was collected in the 2015-2016 academic year.

Abstract

There is an emerging evidence-base for the inclusion of behavioural approaches within special school models of practice for children and young people with autism. However, studies conducted to date have focused on the impact of such models of practice for small groups of pupils after one year of application. This makes it difficult to assess the educational utility of such models at a school-wide level. The aim of the current study was to evaluate the behavioural education model described by Lambert-Lee et al (2015, Chapters 2 & 4) across a whole school population in an autism specific special school, to consider whether the model described can lead to sustainable progress for a whole-school cohort. The sample formed the total population of pupils attending the school (n=78) with an age range of 5-18 years. Pupils were assessed at the end of the school summer term, and then again 12 months later across measures of learning skills, adaptive behaviour, autism characteristics and challenging behaviour. Repeated measures t-tests revealed statistically significant gains across all measures for the school cohort over a typical year. Individual analysis of positive change is also presented. The study provides encouraging preliminary evidence that the implementation of an evidence-based behavioural education model delivered as standard special school practice, can lead to positive outcomes and sustainable progress for the school population.

Key words: Autism, Applied Behaviour Analysis, School-wide models, Intellectual disability, Autism education, School-based intervention, Special school models.

Introduction

Autism Spectrum Disorder (ASD) is acknowledged as the most prevalent special educational need amongst school-aged children and young people in the United Kingdom (Ofsted, 2018). ASD is estimated to affect 1% of the UK population (National Institute for Health and Clinical Excellence, 2013) with prevalence figures as high as 1 in 68 in the United States (Centers for Disease Control and Prevention, 2014). Such statistics have paved the way for increased research interest in evaluating interventions to support the educational needs of children and young people on the autism spectrum (Wong et al, 2013).

A number of systematic reviews have been helpful in identifying evidence-based practices within the autism education field (Bond, Symes, Hebron, Humphrey & Morewood, 2016; National Autism Centre, 2015; Odom, Collet-Klingberg, Rogers & Hatton, 2010; Wong et al, 2013; Robson & Bond, 2017; Wong et al , 2015), however, translating such practices into educational contexts has not enjoyed the same research attention, creating a persistent research-practice gap (Parsons & Kasarai, 2013). Unfortunately, outcomes for adults on the autism spectrum remain poor with life chances described as severely limited in comparison to those without ASD (Pellicano, Dinsmore, & Charman, 2014), with only 15% of adults of working age with ASD in the UK in employment (Rosenblatt, 2008). Therefore, with schools being encouraged to utilise evidence-based practices to improve outcomes in their settings (Goldacre, 2013) and for children with special educational needs to access their educational entitlements, further work is needed in order translate ‘what works’ into everyday practice within school settings (Guldberg, 2017).

Studies that have focused on the translation of evidence-based practices into service delivery models have demonstrated encouraging results for pre-school

children with autism within community-based early intervention programmes (Dawson et al, 2010; Freeman & Perry, 2010; Perry et al, 2008; Smith et al, 2010) and pre-school classrooms (Strain & Bovey, 2011). However, as children and young people with ASD will be attending school for many more years than they will be supported by early intervention approaches, it is paramount that researchers focus efforts on the translation and evaluation of evidence-based practices within school-based educational models for school aged children and young people with autism (Bond et al, 2016; Wong et al, 2015).

There is a paucity of research into whole-school models supporting the ASD population and the outcomes achieved by such models in everyday practice (Bond et al, 2016; Odom, Duda, Kucharezyk, Cox & Stabel, 2014; Wong et al, 2015). The Treatment and Education of Autistic and Related Communication Handicapped Children (TEACCH) is an approach widely adopted in special school settings (Mesibov & Shea, 2010). Defining features of the TEACCH approach include the organisation of the physical environment to minimise distractions and to provide activities in a predictable fashion, the use of visuals to promote independence from adult directions and the use of structured teaching experiences. Due to the variability in the combination of TEACCH components included in existing research studies, straightforward analysis of outcomes is challenging. However, limited gains were reported in a recent meta-analysis for adaptive, cognitive, motor and verbal repertoires with larger gains reported for social and maladaptive behaviours (Virues-Ortega, Julio & Pastor-Barriouso, 2013).

The Social Communication, Emotional Regulation, Transactional Support (SCERTS) model provides a framework for target setting, lesson planning and the measurement of progress (Prizant, Wetherby, Rubin, Laurent & Rydell, 2006).

Although not recommending a particular approach to teaching, the framework aims to ensure that specific skills and learning supports are stated as clearly defined objectives and applied consistently throughout the school day. As a recent addition to the literature, research into the application and effectiveness of this model is limited with only one known evaluation to date. Morgan et al (2018) utilised a cluster randomised trial comparing a class-wide SCERTS model with typically available autism education for elementary aged children with autism. Results on measures of engagement, social skills, executive functioning and communication were in favour of the intervention group after one year. These results are encouraging and suggest a systems-based consistent approach may well be helpful. However, to date there are no school-wide evaluations of the SCERTS model, nor studies into the use of this framework for children over the age of eight years old.

There is an emerging evidence-base for the inclusion of behavioural approaches within school-based educational models for children and young people with autism (Eikeseth, Smith, Jahr & Eldevik, 2002; Foran et al, 2015; Grindle et al 2012; Lambert-Lee et al 2015; Pitts, Gent & Hoerger, 2018; Chapter 4). Grindle et al (2009) described how evidence-based behavioural teaching and learning approaches were incorporated into an autism specific classroom within a mainstream primary school in the UK. Evaluation of this model demonstrated encouraging results for a group of 11 key-stage 1 children (aged between 4-7 years) after both one and two years of accessing the provision. Moderate to large effect sizes were found for progress made in IQ and adaptive behaviour scores indicating that children had learned skills more rapidly than expected given their baseline assessment results. The authors were also able to compare results with a group of children accessing

education as usual (EAU) with results in favour of the intervention group (Grindle et al, 2012).

Children and young people on the autism spectrum with complex learning needs and additional intellectual disability are often educated within special educational needs schools. However, very limited data are available on the outcomes of pupils attending such settings (Bond et al, 2016). In addition, many settings continue to use educational practices that are not supported by research, despite the use of evidence-based practices being encouraged (Burns & Ysseldyke, 2009; Carter, Stephenson & Strnadova, 2011). The inclusion and evaluation of evidence-based behavioural approaches within special school educational models is therefore, a promising step forward. Foran et al (2015) evaluated the inclusion of behavioural approaches to teaching, learning and behaviour support for a group of seven children aged between 5-7 years old in a UK special needs school. The authors trained teaching staff in the principles of behaviour analysis and Board Certified Behaviour Analysts (BCBAs) worked with teachers to design individual education plans and function-based behaviour support plans. Support was delivered across the school day for pupils via a mixture of 1:1 and small group teaching. After one year, significant gains on measures of social and academic skills, language and IQ along with decreases in challenging behaviour were demonstrated. Pitts, Gent and Hoerger (2018) extended this work with a sample of sixteen children aged between 4-13 years of age who received an educational model underpinned by evidence-based behavioural approaches across three classes within a special educational needs school. In a similar fashion to Foran et al (2015) school staff were trained in the principles of behaviour analysis and BCBAs worked with teaching staff to provide both teaching and behaviour support plans for the pupils in the sample. After one year, pupils made

significant gains across measures of social skills, language, adaptive skills, challenging behaviour and academic skills. Although these studies provide positive preliminary outcomes, both Foran et al (2015) and Pitts et al (2018) acknowledge the small sample sizes involved in the studies and therefore, encourage caution in the generalisability of results.

Lambert-Lee et al (2015) (see Chapter 2) provided a rare description of a school-wide education model underpinned by evidence-based behavioural approaches within an autism specific special school in the UK. The model involved; (1) all school staff being trained in evidence-based behavioural approaches as part of their typical school induction and ongoing professional development, (2) multi-professional involvement in the curriculum planning both for individuals and small groups, including qualified teachers, speech and language therapists, occupational therapists and behaviour analysts, (3) Curriculum delivery via individual and small group teaching using evidence-based teaching approaches, (4) The use of functional assessment and function-based positive behaviour support plans, and (5) the use of assessment measures other than the required UK National Curriculum assessments to measure progress and to inform individual learning goals. The authors included some preliminary data as part of a pilot evaluation study which demonstrated some positive outcomes over a 12-month period for 53 pupils between the ages of six and eighteen years across standardised measures of adaptive skills and basic learning skills.

Lambert-Lee et al. went on to conduct a more robust evaluation of this educational model (see Chapter 4) with 35 pupils new to the school aged between 5-18 years. Baseline data were collected for pupils upon admission to the school on measures of adaptive skills (communication, socialisation, daily living skills), learning skills across the curriculum, challenging behaviour, and difficulties

associated with an ASD diagnosis. Measures were repeated one year later and showed statistically significant changes in mean scores across all assessments with medium to large effect sizes indicating that pupils had learned a variety of skills across different domains and that challenging behaviours were reducing for pupils within the sample. To our knowledge, this is the first evaluation of a school-wide model delivered within a special school setting for children and young people with autism and intellectual disability.

Although the study described in Chapter 4 demonstrated some positive outcomes, such outcomes reflected gains made within the pupils' first year of accessing the described provision. This is also the case for Foran et al (2015) and Pitts et al (2018) who evaluated the impact of a model introduced into a school setting for smaller sample of pupils after the first year of provision. Although such studies provide important information about the type of educational support that may be helpful for children and young people with complex learning needs in school settings, they only go part way to narrowing the acknowledged research-practice gap in special education. Children and young people with special educational needs in the UK are entitled to an education that enables them to achieve their best possible outcomes and schools are accountable for ensuring that all pupils are able to make adequate progress (DfE 2015). In the mainstream school sector, accountabilities for schools' effectiveness is based on standardised test and examination outcomes along with annual judgements as to whether pupils are achieving pre-defined age-related expectations across the curriculum (DfE 2014). However, only 18% of children with identified special educational needs meet age related expectations at school (DfE, 2018). The 82% of pupils with special educational needs working below this level

have no equivalent measurement system in place nationally to provide guidance and evaluation of progress (see Chapter 3).

In the absence of a consistent measurement system for schools catering for pupils with special educational needs, the evaluation of the quality and impact of special school models is challenging and begs the question of how we can conclude whether the models in place in the special school sector are supporting children and young people to reach their best possible outcomes, specifically given that the outcomes for adults on the autism spectrum remain poor (Dingfelder & Mandell, 2011; Shattuck et al, 2012). Utilising the assessment framework evaluated in Chapter 3, the goal of the present study was to evaluate the behavioural education model described by Lambert-Lee et al (2015, Chapters 2 & 4) across the whole school population to begin to answer the question of whether the model described leads to sustainable progress for pupils. That is, does the model continue to lead to positive outcomes for all pupils attending the school across a typical school year?

Method

Sample

The sample formed the total population of children attending a specialist autism-specific special educational needs school in London, UK. Data were analysed from 78 pupils aged 5 to 18 years (mean = 13.5yrs). All pupils had a diagnosis of Autism Spectrum disorder (ASD) and 89% (70 out of 78 pupils) had an additional diagnosis of intellectual disability, usually described on EHCPs as ‘global developmental delay’ or ‘severe learning difficulties’. All diagnoses were given prior to school admission by local authority multi-disciplinary teams. Pupils’ had been attending school for an average of 6 years (range 1-13 years). All pupils were working significantly below

age-related expectations and the full sample met the school's criteria for a risk assessment of challenging behaviour (that is, that their behavior was putting themselves or others at risk). Pupils attending the school were all in receipt of an Education, Health and Care Plan (EHCP), a legally binding document that sets out the educational, health and social care needs of pupils who require more support than is available to them via typical educational provision (DfE, 2015). The school is named on each pupil's EHCP as responsible for meeting their educational needs and thus funding was provided for school placements via pupil's home local authorities. All pupils lived within a one-hour commuting distance from the school, resided with family members, and attended school between the hours of 9.00am and 3.30pm Monday to Friday during term time only. Seventy of the children (89%) in the sample were male and eight (11%) were female, making the male/female ratio in the sample 8.75:1.

Setting

The study was conducted in an autism specific special educational needs day school in the UK. The defining feature of the setting relevant to the current study is the evidence-based behavioural educational model in place at the school. This model is fully described in Lambert-Lee et al (2015) (see Chapter 2) and incorporates evidence-based behavioural approaches throughout the school provision in relation to teaching, learning and behavior support. Board Certified Behaviour Analysts (BCBAs) work alongside teaching staff and allied health professionals to assess pupils needs, design personalized goals and teaching approaches and evaluate pupil progress.

Measures

Vineland Adaptive Behaviour Scales II (VABS). The VABS (Sparrow, Cicchetti & Balla, 2005) is a caregiver interview that is semi-structured in nature using open ended questions concerning individuals' skills repertoires that are present or absent in day-to-day life as opposed to particular testing conditions. The assessment comprises of four domains: communication, socialization, daily living skills, and motor skills and provides both standard scores and age equivalents. An overall composite score is also generated. The motor skills domain has a cut off of seven years of age and as such was not assessed as part of this study given that the majority of the sample were above this age. The VABS is a widely used measure in the research literature and has demonstrated both concurrent validity and reliability (Bilt, Kraijer, Sytema & Minderaa, 2005; Sparrow et al, 2005).

Behaviour Problems Inventory-Short form (BPI-S). The BPI-S (Rojahn et al, 2012a) is a responder-based rating scale assessment used to measure challenging behavior in individuals with intellectual disabilities. The instrument consists of three subscales: (1) Self-injurious behavior, (2) Aggressive/Destructive behavior, and (3) Stereotyped behavior. Each subscale consists of a number of behavioural descriptions that are rated both on frequency and severity scales. The BPI-S has demonstrated good reliability and validity as a measurement instrument (Mascitelli et al, 2015; Rojahn et al, 2012b).

Social Communication Questionnaire (SCQ). The SCQ (Rutter, Bailey & Lord, 2003) is based on the Autism Diagnostic Interview Revised (ADI-R, Lord, Rutter & Lecouteur, 1994). It consists of an informant-report questionnaire of 40 items focusing on characteristics and behaviours associated with autism (social

interaction, communication and restricted, repetitive and stereotyped behaviours). Items are presented in a yes/no format. The SCQ can be used as a screening tool for those who may require further diagnostic assessments, to compare symptomatology across a group sample and with respect to changes over time. In the current study, the SCQ was used to gather data on the items covered in this measure given that all pupils with a diagnosis of autism would be supported to develop skills within these areas and to analyse change on these items over time. Scores were not used to question children's autism diagnoses. Validity as a measurement of autism severity symptomatology has been established in the literature (Berument, Rutter, Lord, Pickles & Bailey, 1999; Rutter et al, 2003).

Assessment of Basic Language and Learning Skills – Revised (ABLLS-R).

The ABLLS-R (Partington, 2006) is a criterion referenced assessment designed to measure basic language and learning skills. It provides a picture of each pupils' current skills profile and allows for tracking of progress over time. The measure consists of 544 key skills identified as essential for children to learn from their everyday environments. Skills are divided into 25 domains and are scored as present, absent or emerging in the individual's repertoire. The assessment is completed via a combination of observation and direct testing of skills. Previous researchers have grouped the 25 domains into six related meta-domains to derive a smaller number of scores for analysis (Grindle et al, 2009, 2012; Lambert-Lee et al, 2015, Chapters 2 & 4) and this procedure was utilized within the present study.

Verbal Behaviour Milestones Assessment and Placement Program (VB-MAPP). Like the ABLLS-R, the VB-MAPP (Sundberg 2008) is a criterion-referenced assessment tool that consists of three assessment domains (milestones, barriers and transition). The milestones assessment is sequenced across three

developmental levels and contains 16 observable descriptions of basic language and learning skills. Via observation and direct testing, each item is scored as present, absent or emerging in an individuals' repertoire culminating in one total score for the milestones assessment. The barriers assessment is designed to provide an overview of common learning and language acquisition barriers faced by individuals with autism and related disorders and consists of 24 items scored in the same way as the milestones assessment. The transition assessment scores were not used in the current study as they contain collated scores from both the milestones and barriers assessment.

Design

A pre-test/post-test within-group design was employed in the study. All pupils were assessed at the end of one academic year (Time 1) and re-assessed at the end of the following academic year (Time 2).

Procedure

Data on all measures were collected at two distinct time points with approximately 12 months between assessments as part of the school's typical annual assessment cycle. Thus, data were gathered at the end of the summer term (before the summer vacation) or at the beginning of the autumn (Fall) term, and then again 12 months later.

The VABS interviews were conducted over the telephone with a parent or caregiver by senior school staff or an external assessor with significant experience of conducting the VABS. Face-to-face interviews were also conducted where this was supportive for the family concerned, for example, if English was an additional

language and it helped to speak in person. As much caution as is possible in a practice setting was exercised to ensure data was reliable and valid, for example, staff did not interview parents and caregivers of pupils that they worked with directly.

The BPI-S and SCQ assessments were completed by the class teachers for the pupils within their class group after ensuring that each teacher had known the young person they were rating well for 6 months or more. Clarification of the written instructions and behavioural descriptions on the assessment forms was established via a short training session delivered by the first author.

The ABLLS-R and VB-MAPP assessments were completed collaboratively by teaching teams that supported the pupil regularly. Teams involved in these assessments usually included a qualified teacher, behavior analyst and speech and language therapist. However, depending on the needs of the pupil concerned, and therefore the different professionals involved in their personalized support package, additional roles may also be involved for some pupils (e.g. occupational therapist, vocational specialist, subject specialist teachers).

Results

Changes in mean scores between time one and time two data sets (approximately 12 months apart) for all outcome measures were analysed via paired samples *t*-tests. Results of this analysis are presented in Table 1 showing the mean scores and *p* values generated from the *t*-tests. Cohen's *d* values were estimated as effect sizes using the Dunlap, Cortina, Vaslow and Burke (1996) formula to account for the repeated measures design. Prior to carrying out statistical analysis, data related to outcome variables were found to be reasonably normally distributed using one sample Kolmogorov Smirnov tests.

Table 1: *Changes in group means over 12 months across all assessment measures*

Measure	N	Time 1		12 mo. later		p	Effect size (<i>d</i>)
		Mean	SD	Mean	SD		
VABS	69	45.63	9.45	50.63	9.57	<.001	0.379
Composite							
VABS	69	47.01	9.69	50.82	10.18	<.001	0.383
Communication							
VABS Daily	69	48.39	10.54	51.83	11.32	<.001	0.314
Living Skills							
VABS	69	45.18	8.57	48.85	9.96	<.001	0.358
Socialization							
ABLLS	78	52.31	24.47	60.00	22.00	<.001	0.330
Learning skills							
ABLLS	78	35.00	21.73	42.25	21.88	<.001	0.332
Language							
ABLLS	78	31.11	19.33	38.26	19.63	<.001	0.367
Social/Play							
ABLLS	78	31.82	32.42	34.96	41.96	<.001	0.308
Academic							
ABLLS Self-help	78	67.74	23.60	74.19	20.60	<.001	0.291
ABLLS Motor Skills	78	75.39	23.94	81.24	20.18	<.001	0.264
VB-MAPP	76	75.07	40.67	87.21	41.48	<.001	0.335
Milestones							
VB-MAPP	76	43.07	17.81	36.84	17.35	<.001	0.354
Barriers							
BPI-S SIB	65	9.70	7.38	6.09	5.58	<.001	0.551
BPI-S	65	15.43	12.36	9.36	9.74	<.001	0.545
Aggression							

BPI-S	65	42.09	16.15	25.84	13.64	<.001	1.00
Stereotypy							
SCQ Total	81	25.56	4.71	20.67	5.46	<.001	0.895

SCQ = Social Communication Questionnaire, VB-MAPP = Verbal Behaviour Milestones Assessment and Placement Programme, VABS = Vineland Adaptive Behaviour Scales, ABLLS = Assessment of Basic Language and Learning Skills – Revised, BPI-S = Behaviour Problems Inventory – Short Form.

Analysis was then conducted at the level of individual children to examine whether group level effects translated to individual progress. Table 2 presents descriptive data on the proportion of pupils demonstrating positive change across all outcome measures over the 12-month period concerned.

Table 2: *Proportions of pupils with positive change on all outcome measures over 12 months*

Domain/Outcome	Definition of Change	Proportion of pupils with positive change
VABS Composite	Increased or maintained standard score	63/69 (91%)
VABS Communication	Increased or maintained standard score	56/69 (81%)
VABS Daily Living	Increased or maintained standard score	53/69 (79%)
VABS Socialisation	Increased or maintained standard score	59/69 (89%)
ABLLS-R Learning skills	Increased proportion of mastered skills	78/78 (100%)
ABLLS-R Language	Increased proportion of mastered skills	78/78 (100%)
ABLLS-R Social/Play	Increased proportion of mastered skills	78/78 (100%)
ABLLS-R Academics	Increased proportion of mastered skills	78/78 (100%)

ABLLS-R Motor Skills	Increased proportion of mastered skills	78/78 (100%)
VB-MAPP Milestones	Increased proportion of mastered skills	78/78 (100%)
VB-MAPP Barriers	Decreased prevalence of barriers to learning	68/76 (89%)
BPI-S Self-Injury	Reduction in frequency of behaviours	50/65 (77%)
BPI-S Aggression	Reduction in frequency of behaviours	50/65 (77%)
BPI-S Stereotypy	Reduction in frequency of behaviours	55/65 (84%)
SCQ	Reduction in presence of characteristics measured by the SCQ	67/81 (82%)

SCQ = Social Communication Questionnaire, VB-MAPP = Verbal Behaviour Milestones Assessment and Placement Programme, VABS = Vineland Adaptive Behaviour Scales, ABLLS = Assessment of Basic Language and Learning Skills – Revised, BPI-S = Behaviour Problems Inventory – Short Form.

Adaptive Behaviour: Statistically significant change in mean standard scores was revealed across all VABS domains along with moderate effect sizes. Given that the VABS yields standardized scores, these data suggest that pupils exceeded normative expectations with regard to progress over a 12-month period in relation to their previous assessment results with 63/69 (91%) pupils increasing or maintaining their adaptive behaviour composite score.

Learning Skills: Statistically significant change was also found across all ABLLS-R and VB-MAPP domains with moderate but lower effect sizes ranging from .264 to .367. 100% of pupils demonstrated positive change with learning milestones and skill acquisition across the ABLLS-R domains and the VB-MAPP milestones assessment. This suggests that pupils were acquiring key learning-to-learn skills and were developing skills across different areas of the school curriculum during the

academic year. Barriers to learning were reduced for 68/76 (87%) of pupils as measured by the VB-MAPP barriers assessment.

Challenging Behaviours: Data from the BPI-S also demonstrated statistically significant results across all domains with 50/65 (77%) of pupils reducing their self-injurious and aggressive behaviour over the year and stereotypical behaviours reducing in 55/65 (84%) of the sample. Medium to large effect sizes were observed ranging from .545 to 1.00.

Autism Characteristics: A statistically significant reduction in SCQ scores was demonstrated over the year with 82% of pupils demonstrating improved skills in key areas relating particularly to an autism diagnosis for example, communication, socialization and stereotypical behaviours. A large effect size of .895 was demonstrated for change measured by this assessment.

Finally, in order to explore whether pupil age was related to outcome, a correlational analysis was conducted between assessment change scores and the age of pupils across the school. Pearson's correlation coefficients for this analysis are presented in Table 3. Results showed no significant relationships between the age of the pupils and their improved assessment outcomes over the course of the year, indicating that age was not significantly related to gains in this sample and that similar improvements were made by children and young people of all ages.

Table 3: *Associations (Pearson's correlation coefficient) between pupil age and assessment change scores over one year*

Assessment	Correlation with pupil age (<i>r</i>)
VABS Communication	.084
VABS Daily Living Skills	.038
VABS Socialisation	.079
VABS Adaptive Behaviour Composite	.067
ABLLS-R Total	.089
VB-MAPP Milestones	.085
VB-MAPP Barriers	.075
SCQ Total	.171
BPI-S Self Injury	.011
BPI-S Aggression	.163
BPI-S Stereotypy	.078

VABS = Vineland Adaptive Behaviour Scales, ABLLS-R = Assessment of Basic Language and Learning Skills – Revised, VB-MAPP = Verbal Behavior Milestones Assessment and Placement Program, SCQ = Social Communication Questionnaire, BPI-S = Behaviour Problems Inventory – Short Form

Discussion

We have presented what we believe to be the first evaluation of a school-wide approach underpinned by evidence-based practices for children and young people with autism and complex learning needs in an autism specific special school setting in

the UK. Group data, inclusive of the whole school cohort revealed significant gains with adaptive skills, learning skills across the curriculum, autism specific difficulties and challenging behaviours across a typical school year.

Outcomes of the VABS assessments are particularly encouraging. Given the standardized nature of the scores derived, we can conclude that pupils made more than expected progress over a one-year period with 91% of pupil's maintaining or increasing their overall adaptive behavior composite score. Given that the informant for the VABS is parents or caregivers, we can be confident that skills taught were carried over into home life. As such, this may provide a valuable addition to support schools' self-evaluation processes in ensuring that their provision is adequately preparing children and young people for adult life.

The positive outcomes revealed by the ABLLS-R and VB-MAPP Milestones assessments indicate that pupils were progressing with skills from a variety of domains and curriculum areas across the year. Furthermore, with 100% of pupils demonstrating improved skills on these assessments, it is clear that all pupils were continuing to make progress regardless of how many years they had been attending the school.

Positive outcomes were revealed by statistically significant change and moderate to large effect sizes for challenging behavior (measured by the BPI-S) and characteristics associated with an autism diagnosis (measured by the SCQ). This suggests that functional analytic behaviour support systems in the school may have been effective in supporting children to manage their behavior with 77% of pupils reducing behaviours that put themselves or others at risk. With the increase in communication skills revealed in the VABS and ABLLS data, we can see that problematic behaviours decreased within the context of progress with communication

and other meaningful and functional skills. A large effect size of .895 was found with the SCQ outcomes. Given that the SCQ measures typical areas of difficulty for children and young people with autism such as communication, social interaction and stereotyped behaviours which may act as a barrier to learning, these results are promising. An autism specific specialist school would naturally prioritise learning goals in these areas given their importance to functional everyday life and as such, these results suggest that teaching in the school targeted towards these particular areas of difficulty was associated with positive change for pupils. A correlational analysis revealed no significant relationship between pupil age and improvement on the assessment tools utilized within the study. This is an encouraging outcome given the common misconception that behaviourally-based intervention support are only effective for younger children.

Results are in line with those found by researchers piloting behaviourally-based interventions in special schools with smaller groups of pupils (Foran et al, 2015; Pitts et al, 2018). However, the current study evaluated a school-wide model underpinned by evidence-based behavioural practices that was universally accessed by all pupils attending the school and, therefore, involved a much bigger sample size and age range than the aforementioned studies. The impact of the school's model was previously evaluated (see Chapter 4) by assessing baseline skills for 35 pupils upon admission to the school and then repeating these assessments after one year. However, the goal of the current study was to ascertain whether the model would continue to lead to sustainable progress for the whole school cohort across a typical school year. Pupils' had been accessing the model in place at the school for an average of five years as opposed to the initial year, reported in previous studies (Foran, et al, 2015; Pitts et al, 2018, Chapter 4). As such, results are encouraging with

pupils' demonstrating positive change across outcome measures over a typical school year after a number of years of school attendance. Results from the current study are associated with lower effect sizes across all outcome measures than results from the evaluation study of new intake pupils (see Chapter 4). This is to be expected for a number of reasons. Firstly, as the school specializes in meeting the needs of pupils with complex autism and challenging behavior, pupils typically start school with a history of disengagement with their education, high rates of behaviours that challenge and limited communication skills. This places priority on the development of some key skills within a pupil's first year at school such as the establishment of a functional communication system. The development of such key skills makes it common to see accelerated rates of progress within the first year of intervention support. Secondly, the sample size is much larger, encompassing the whole school cohort (n=78) in comparison to the previous evaluation utilizing data from new intake pupils (n=35) (see Chapter 4). This naturally makes the sample more heterogeneous in nature and as such, higher variability may be found in assessment outcomes.

In line with the previous evaluation of this model (See Chapter 4), results are consistent with those found from studies utilizing behavioural models within early intervention (Eldevik et al, 2009). However, there are some salient differences in context and methodology. For example, no selection criteria were utilized other than the school's typical admissions process given that the sample was inclusive of the whole school population. In practice, this created a sample with a wide age range (5 to 18 years), whereas early intervention literature, and indeed, previous school-based studies have predominantly focused on younger children. The majority of pupils (89%) had a diagnosed intellectual disability in addition to their ASD diagnosis whereas much of the early intervention research literature screened out children with

moderate to severe intellectual disabilities (Eldevik et al, 2009). Parental involvement was not a requirement (although was encouraged by the school) and support was less intensive given the timings of the school day and school holiday periods.

The current study has a number of relative strengths. We believe it to be the first example of whole school outcome data achieved via the implementation of a school-wide model of teaching and learning support for pupils with autism and complex needs. As such the study was conducted in a school setting with no selection criteria for participants, thus going some way to bridging the translational research gap between the identification of evidence-based practices and their implementation and evaluation within everyday practice. The educational model evaluated was delivered by school staff as part of their typical role within the school as opposed to clinic staff or researchers and multiple measures were utilized to evaluate progress, which is recommended as the assessment method of choice (see Chapter 3). However, the limitations of the current study must also be acknowledged. With no comparison or control group, it is impossible to say whether other educational or intervention approaches may have produced similar rates of progress. In addition, the educational model incorporated multiple components (Lambert-Lee, 2015, Chapter 2) and as such does not provide an insight or understanding of which components contributed more than others to the positive outcomes achieved.

The current study provides positive preliminary evidence that the implementation of an evidence-based behavioural education model delivered as standard practice within an autism specific special school setting, can lead to positive outcomes and sustainable progress for the school population. Further research is required to see if such results are replicated in other settings and to compare outcomes achieved in the current study with other school-wide models of practice.

Chapter 6: General Discussion

Autism Spectrum disorder (ASD) has been identified as the most prevalent primary need amongst school-aged children in the UK (DfE, 2018). However, despite a healthy research focus on interventions to support the education of children and young people with autism, practices identified have not translated into school-based models of delivery (Guldborg, 2017) with adult outcomes for those on the autism spectrum remaining poor (Billstedt, Gillberg & Gillberg, 2005; Howlin et al, 2004; Howlin, Moss, Savage & Rutter, 2013). The intention of this thesis was to: (1) describe a comprehensive school-wide model of practice informed by evidence-based behavioural approaches and implemented within an autism specific special school in the UK, (2) evaluate an assessment framework upon which school-wide practices can be evaluated, (3) use this framework to evaluate the impact of a school-wide model of practice and, (4) explore whether such a model may lead to ongoing, sustainable progress for pupils with autism and an intellectual disability at a whole-school level. In the remainder of this discussion I summarise the findings from the four preceding research chapters and how they contribute to the current literature, before discussing the strengths, limitations, directions for future research and the implications of these findings for school-based educational practice. My personal reflections of the research process are then presented before the final conclusions of this thesis.

Chapter summaries and contributions to the literature

Chapter 2 provides a rare description of a school-wide behavioural model of practice implemented within an autism specific special school in the UK. Evidence-based behavioural approaches were embedded into the school setting as part of day-to-day practice across both teaching and learning, and behaviour support systems.

Existing progress data over a 12-month period was accessed via a file review for a group of pupils attending the school and analysed using repeated measures t-tests. Results demonstrated significant gains across measures of learning and adaptive skills with medium to large effect sizes, indicating that pupils exceeded normative expectations of progress over a 12-month period. Findings suggest that it may be feasible to embed an evidence-informed school-wide model of practice into special school settings within the UK and produce positive outcomes for pupils. When investigating the literature around evidence-based models of school-wide practice in autism education, I found that no whole school models in autism education had been described or evaluated to date. Lambert-Lee et al (2015, Chapter 2) is therefore, the first study to describe a school-wide model of practice and to provide some preliminary data of the impact of this model on pupil progress. As such, this study provides an important contribution to the existing literature on school-wide models in the context of autism education.

With the model described in Chapter 1 revealing preliminary positive outcomes, a more robust evaluation of the model was warranted. However, a barrier facing both the research community in the evaluation of autism education practices, and school settings in the evaluation of pupil progress and school effectiveness, is that of measurement. It is widely acknowledged that many of the measures used by schools for the assessment and monitoring of progress for pupils with autism are not fit for purpose (Wittemeyer et al, 2011). Chapter 3 explores the implementation and properties of tools used in a school-wide assessment system to monitor and evaluate progress for pupils with autism and an intellectual disability in line with both guidance issued by the DfE for schools to measure progress outside of the national curriculum (DfE, 2015), and the academic literature which cites the use of multiple

outcome measures as the gold standard (Gould, Dixon, Najdowski, Smith & Tarbox, 2011). Assessment scores for 78 pupils were analysed. Preliminary convergent validity of two previously unvalidated measures of learning skills, developmental milestones and barriers to learning (ABLLS-R & VB-MAPP) was established via correlations with the reliable and valid VABS. Measures of characteristics associated with autism (SCQ) and of behaviours described as challenging (BPI-S) previously used in the academic literature, maintained their internal consistency when data were collected in a school setting by school staff. In addition, over 92% of scheduled assessments were completed within the school year. Findings suggest that an assessment framework can be feasibly implemented in a special school setting and provide valid and reliable information to evaluate pupil progress and whole-school performance.

No information was found in the academic literature evaluating evidence-based assessment practices within school-based autism education although a limited number of studies had explored the use of particular assessment measures in the empirical evaluation of specific autism interventions (Fletcher-Watson & McConachie, 2015). In addition, a systematic review of outcome measures in autism research designed to make recommendations for practice, was unable to do so, citing the status of the research available for review as limited and unbalanced (McConachie et al, 2015). This study is therefore, the first example of a school-wide assessment framework implemented within a special school setting for children and young people with autism and an intellectual disability and as such, provides an important contribution to the literature.

Chapter 4 evaluated the impact of the model described in Chapter 2 for 35 pupils new to the school. The assessment framework evaluated in Chapter 3 was used

to collect baseline data upon the pupils' admission to the school and these assessments were then repeated 12 months later. Statistically significant gains were found across all assessed domains with medium to large effect sizes revealed. The study went on to analyse change at the individual level for pupils with the first application of the reliable change index in an evaluation study of a school-based model for children with ASD and an intellectual disability. Over 50% of pupils achieved reliable change for each of 12 out of the 16 domains assessed, with some domains showing reliable change for over 90% of pupils (ABLIS-R Academic; ABLIS-R Learning skills; VB-MAPP Milestones). This study is the first evaluation of a school-based behavioural education model in the literature and such encouraging results demonstrate that pupils made significant gains across a variety of domains in their first year of accessing the school-wide model. However, to date, there is no existing published data available evaluating school-based models of practice, nor examples of the application of the reliable change criterion in a school context with which to compare these results.

Having demonstrated that the model described in Chapter 2 can lead to positive outcomes for pupils within their first year of access, the study presented in Chapter 5 focused on the issue of sustainable progress. That is, does the model lead to positive outcomes for the whole school population across a typical school year? Seventy-eight pupils were assessed using the framework described in Chapter 3 at the end of the summer term and then again 12-months later. Group data showed significant change in mean scores over the course of a typical school year in learning skills, autism characteristics, challenging behaviour and adaptive skills. A measure of positive change was utilised in this study in place of the reliable change criterion utilised in the study presented in Chapter 4. The rationale for this decision lay in the

focus of the research question in exploring the issue of year-to-year sustainable progression for pupils. Given this context, less concern was placed on the statistical power or magnitude of change between assessment periods, with more attention being paid to the previously unresearched question of whether change was indeed continuing to occur in a positive direction for pupils (however, big or small for each individual) year-on-year. A salient feature of this study was the heterogenous sample, with no selection criteria, a wide age range and pupils having all attended school for different periods of time. This is the first study in the literature to evaluate a school-wide behavioural education model across a whole school population. Results suggest that the implementation of a behavioural education model as standard practice within an autism specific special school can led to positive and sustainable progress for the school population.

In addition to each research study being the first example of its kind in the literature, the sequence of studies described in this thesis collectively provide some important contributions to the existing evidence-base surrounding school-based educational practice for children and young people with autism and an intellectual disability. One issue cited throughout this thesis is the widely acknowledged and persistent research-practice gap in autism education. That is, considerable evidence exists regarding interventions and supports that may impact the education of pupils with ASD, however, this evidence has not translated into practice settings, despite schools being encouraged to use practices informed by evidence (Goldacre, 2013; Hattie, 2008). Both the research community and policy makers have identified the need for translational research to bridge this gap, calling for researchers to collaborate with schools and for research evaluations to occur in the school settings in which interventions, models and practices will be embedded; with the pupils whom will be

supported by them; and with the staff who will be implementing them in their day-to-day practice (Anderson, Smith & Wilezynski, 2018; Guldberg, 2017; Kasari & Smith, 2012; Robson & Bond, 2017). From this perspective, the research within this thesis provides a key contribution; each of the studies were conducted within a day-to-day practice setting in collaboration with the school concerned; staff members employed at the school delivered the described model of practice as a core feature of their role and collected or informed the necessary data for analysis; the data analysed was that of the children and young people attending the school with the findings used both for research and as part of ongoing school evaluation. The research described, therefore, goes some way to narrowing the identified research-practice gap and is a demonstration of translational research that is currently lacking in the literature.

A further contribution of this research lies within the use of an assessment framework with which school practice evaluation can take place. Researchers have been criticized for using a narrow range of outcome measures which demonstrate progress with very specific skills only rather than the impact of approaches on a child or young persons overall development and progression (Guldberg, 2017). In addition, schools have been criticized for using assessment methods and approaches that are ill suited for pupils with autism and an intellectual disability (Wittemeyer et al, 2011). Chapter 3 explored an assessment framework designed to capture progress across different areas of life for pupils and demonstrated the feasibility of implementing this in a special school setting yielding reliable and valid information. This framework was then used in the studies described in Chapters 4 and 5 to evaluate the school-wide model described in Chapter 2, thus providing an example of how an assessment framework can be applied to evaluate a school-wide model within a practice setting, and an example of the use of a system of data collection to inform school evaluation.

The additional use of the reliable change criterion for the Chapter 4 study and the measure of positive change utilised in Chapter 5, also demonstrate relatively simple ways that researchers could support practice-based research in school settings and which schools could use as part of their practice, however, neither have been used in the research literature around school-based autism education to date.

Furthermore, the research collectively contributes to the evidence-base surrounding educational approaches for older children with autism and an intellectual disability. Much of the existing research into comprehensive approaches to support the education of children and young people with autism has been focused on young children, with only limited examples in the literature evaluated with children over the age of seven (Bond et al, 2016; Wong et al, 2013). The current research focused on school-aged children from 5-18 years old and therefore, the findings from all studies are reflective of this wider age group. This is an encouraging addition to the literature, suggesting from the study described in chapter 4, that older children may benefit from a behavioural education model in a school setting and from the study described in Chapter 5, that the continued use of a behavioural education model may continue to lead to sustainable progress for this group of pupils.

Strengths and limitations of the research

Each research chapter in this thesis makes a valuable contribution to the existing literature in this area. The main strength of this sequence of studies lies in the practice-based nature of the research; achieving such positive outcomes for a heterogenous sample of children and young people with autism and an intellectual disability in a real-world setting. However, despite the encouraging outcomes, there are a number of limitations that are important to consider. Several of the limitations

are relevant to the research studies collectively and others are specific to individual chapters. They will be described respectively.

A limitation of all chapters is the focus solely on one school which limits the generalizability of the findings. There was no way around this particular limitation as the research conducted for this thesis formed part of my own employed role at the school. However, the research does provide a helpful first example of how evaluation of school-based models may be conducted. The research methodology for the evaluation studies described in Chapters 2, 4 and 5 did not include a comparison or control group within the study design. Therefore, despite the positive outcomes demonstrated, we cannot be sure whether comparable gains would have been achieved with other educational models or in alternative settings. In addition, the behavioural education model evaluated in Chapters 2, 4 and 5 is made up of multiple components but has been evaluated as a whole. As such we cannot be sure if any particular elements of the model contributed more or less to the results achieved. Furthermore, staff opinions of the model described, or of the assessment framework evaluated in relation to social validity, were not formally obtained as part of this research. The literature currently indicates that teachers do not tend to use evidence-based approaches within their practice (Lather, 2004), therefore, establishing whether they valued the practices in place as part of this research would have been helpful.

The study described in Chapter 2 contains its own limitations. Firstly, the data analysed was obtained via a file review and as such only existing data could be included. This limited analysis to two measures only for a group of pupils in the school for whom data were available (the ABLLS-R and the VABS). In addition, no baseline data were available for pupils and as such pupils in the sample, had all been attending school for different periods of time. However, these limitations were

addressed in the Chapter 4 study where baseline measures were taken and the full assessment framework described in Chapter 3 was utilized for data collection. However, the smaller sample size ($n=35$) may also limit the findings of this study.

One factor that could be considered both a strength and a limitation of the research contained within this thesis relates to my personal context, having been employed as the Deputy Head of the school during the period of time when the studies were conducted. Both academics and policy makers have called for research to become embedded within schools and for school staff to become leaders of their own research and evaluation in a bid to improve the research practice gap that has been widely acknowledged within the special education field (Goldacre, 2013). Indeed, a number of studies cited within the introductory sections of the empirical chapters within this thesis, include the use of ‘embedded researchers’ meaning that members of the research team were also staff members within the various schools concerned (Foran et al, 2015; Grindle et al, 2009, 20012; Pitts, Gent and Hoerger, 2018). From this perspective, my dual status of Deputy Head and researcher could be interpreted as a strength. However, embedding researchers within practice settings may also bring some key threats to validity. For example, being a senior school leader meant that I had some authority over the staff members who supported with data collection for the current studies, therefore, the impact of a possible power imbalance cannot be ruled out.

Future research

It would be beneficial for further evaluations of the school-wide behavioural education model explored throughout this thesis to be conducted in other special school settings. This would allow for exploration of whether the model described can be feasibly implemented in other special school settings and whether the positive

outcomes achieved through the current studies are replicable. A further area for future research to explore is the comparison of this model of educational practice with other whole-school models or typical special education as usual. No data currently exist in the literature examining the outcomes of school-based models of practice for school-aged children with autism and an intellectual disability and as such comparison is not currently possible. Therefore, evaluation of any form of whole-school model of practice for this population would be a step forward in closing the research-practice gap cited throughout this thesis. In relation to the model evaluated in the current studies, future research would also be beneficial in beginning to identify which elements of the model may have more or less influence on the positive outcomes achieved.

Chapter 3 presented and evaluated an assessment framework used to measure pupil progress and whole-school performance. Although the feasibility data in implementing this assessment framework in the current study was positive, it should be acknowledged that this is a vastly different approach to school-based assessment and data collection than that with which most schools are familiar. As such evaluations of the use of this framework in other schools would be an important next step in the research process. In addition, future research should consider evaluating other assessment tools and approaches to compliment those used in the current study. The aim of exploring assessment methods outside of the traditional national curriculum measures, was to ensure that important areas of progress and development for children with autism and an intellectual disability are captured and used to inform planning to make evidence-informed decisions. The current study did not include measures of emotional wellbeing and/or quality of life and this would be a promising

area for future research in ensuring that we are meeting the diverse needs of this population whilst at school and beyond.

A further valuable area for future research would be that of teacher's perceptions and attitudes towards the school-based models of practice used to support pupils with ASD and an intellectual disability both in terms of teaching and learning, and assessment practices. Exploration of this area with school staff may reveal further understanding of why approaches recommended by research are rarely put into practice within the classroom (Lather, 2004) and as such why the translation of evidence-based practice into schools remains such a challenge.

Finally, the impetus for much autism education and intervention research is the continued poor outcomes for adults on the autism spectrum. Therefore, longitudinal studies would be an important factor in future research to investigate whether gains achieved from school-wide models of practice are sustainable over the long term and if such practices do therefore, impact on adult outcomes.

Implications for practice

Due to the practice-based nature of the research contained in this thesis, there are some encouraging outcomes for practice settings to consider. Firstly, guidance asks schools to ensure that they are using 'what works' to support the outcomes of their pupils (Guldborg, 2017). With such a paucity of research into school-based approaches for children and young people with autism and an intellectual disability, making evidence-informed decisions for this population of pupils appears to have been a challenge for schools, with many using practices unsupported by such research (Carter, Stephenson, & Strnadova, 2011). The current studies demonstrate that it was possible to include evidence-based approaches within a day-to-day whole school model and as such provides a helpful example for other schools to begin this process.

Furthermore, schools supporting pupils with autism and complex learning needs are under pressure to generate innovative ways of measuring progress for their pupils, given that assessment frameworks that are recommended for typically developing children are unsuitable for this population (Wittemeyer et al, 2011). However, no guidance has been provided to schools on how to go about this process. This creates a vulnerability for many special schools. It has been challenging for schools to meet their statutory obligations surrounding accountability for pupil progress and critically, for this information to then inform school development and improvement. The current study has provided an example of a whole-school assessment framework that was practical to implement within the special school setting. Special schools would benefit from introducing an assessment framework, such that information gathered from such a process can feed back into school development. This, in turn, should support schools to become evidence-informed settings and to develop the relationship between evidence-based practice and practice-based evidence. Although no social validity data was collected as part of the current research, staff working at the school commented anecdotally on numerous occasions that they felt the assessments were helpful to inform their decision making for pupils.

Personal reflections

Throughout the duration of the research studies reported in this thesis, I was employed full time as Deputy Head of the school concerned. This research-practitioner status brought both many privileges and challenges to my PhD journey. Being fully immersed in the day-to-day pressures of running a school meant that I carried a unique understanding of what would and wouldn't be possible to achieve throughout the research process. For example, what assessments could be embedded

within staff roles and what would carry too much additional workload. As Deputy Head, my position also afforded me with some authority which meant that I was able to 'insist' where necessary. A good example of this would occur regularly when class staff may not hand back their pupil rating scales to a set deadline. In such circumstances, I was able to arrange a time for them to complete the scales and hand them in. This would not of course, be possible for an outside researcher and as such, I am sure that my dual research-practitioner role went some way to ensuring that data were collected as required for analysis. This does demonstrate the need for school senior leaders to be highly involved in any research or evaluation work within their setting as, without this commitment, it would be impossible to implement school-wide systems such as an assessment framework. Therefore, perhaps the best place to start in supporting schools to become more evidence-based in their approach to pupils with complex needs, is with school leaders.

The main challenge of my dual research-practitioner role came in the form of blurred lines. That is, my day job became part of my PhD and my PhD became part of my day job. From this perspective it was often very hard to keep track of where I was up to and, when other school priorities arose that were urgent or important then progression towards PhD goals was always the first thing to slide.

One thing that I learned as part of this journey about conducting research in practice settings is that nothing ever goes to plan! It was rare that assessments were completed exactly to time and scheduling the completion of the VABS interviews with families/caregivers was a considerable challenge with many cancellations and no shows until we got in the swing of things. We found ways around these challenges but again, I have no doubt that this was because I knew the school so well and had the authority to take decisions. Had this not been the case then I dare say that some of

these challenges may have been the end of the research process. This is in stark contrast to highly controlled research methodology, however, had I enforced a more stringent approach, this would likely have resulted in no data to analyse which may be a factor in why the existing research-practice gap remains so prevalent. Cited throughout this thesis is the recognized need for practice-based research and for this to move forward, researchers need to acknowledge that it won't be methodologically sound. This does not make practice-based research less valuable and arguably makes it more likely to influence practice, given that the settings themselves are contacting the outcomes of such research.

A valid concern with applied research is whether settings will continue with approaches used within the research period and thus, influence practice into the future. Encouragingly, the school in the current research has continued with the assessment framework and has used findings to continuously inform their work around the use of evidence-based practices with their pupils. A further acknowledgement of the good practice in place at the school is an outstanding Ofsted judgement in which Her Majesty's Inspectors comment specifically on the quality of teaching, learning and behavior support, and the robust assessment practices in place at the school.

I am now privileged to have recently taken on Headship of another new, developing special school in which findings from this research will be both implemented and extended in collaboration with both Bangor and Warwick Universities. I look forward to seeing what this brings for both the children and young people in our care, and for the evidence-base surrounding the education of children and young people with autism and other complex needs.

Conclusions

This thesis has described and evaluated an evidence-informed whole-school model of practice for children and young people with autism and an intellectual disability. Findings provide preliminary evidence that the model described can be feasibly implemented within a special school setting and lead to positive and sustainable outcomes for pupils between the ages of 5-18 years. Additionally, the challenges faced by schools in relation to the assessment of progress for the same group of pupils have been considered. A whole-school assessment framework has been presented and evaluated which produced reliable and valid information. Strengths and limitations of the research have been presented along with possible avenues for future research. Considerations and implications for practice settings have also been outlined with a clear focus on supporting special school settings to become more evidence-informed in their day-to-day practice.

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APPENDICES