Department for Education

SEN support: A rapid evidence assessment

Research report

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Julia Carroll, Louise Bradley, Hayley Crawford, Penny Hannant, Helen Johnson & Angela Thompson

Coventry University

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Disclaimer

This research is not an endorsement by DfE of any of the strategies and interventions described. Neither does it represent Government policy or indicate future policy direction.

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Background

Children and young people on SEN support have been identified with special educational needs (SEN) and require different or additional support to meet these needs, but do not have a statement of SEN or an Education, Health and Care plan (EHCP). It can be difficult for education professionals to know how best to support these individuals. However, in recent years there has been a dramatic change in the quality, quantity and availability of research evidence to support teaching, and this report aims to summarise recent research that addresses the issue of what practice is effective for children and young people on SEN support in mainstream schools and colleges.

All practice described in this report reflects the research identified and reviewed through the the rapid evidence assessment, and does not represent an endorsement by DfE or a reflection of Government policy.

Approach

The evidence was collected by means of a rapid evidence assessment, a search of the literature aimed at drawing out key findings in an area. The literature search focused on studies of approaches, strategies or interventions supporting children and young people with SEND in mainstream schools and colleges. Over a thousand papers were reviewed, with over 500 meeting criteria for inclusion.

Key Findings

The report is structured in terms of the four broad areas of need highlighted in the SEND Code of Practice 2015, with an additional introductory section on overarching issues that draw across more than one type of need.

- There is good quality research evidence about effective interventions in the areas of cognition and learning, social, emotional and mental health, and communication and interaction. However, the evidence about high quality teaching and adaptations that can support these needs is significantly less extensive.
- A key finding was the important role of training for all education professionals. Teaching assistants can provide good quality intervention if they are well trained, while even highly qualified professionals have less impact if they do not understand the principles and motivation behind the approach they are using.
- A second overarching finding related to the role of each stage of the graduated approach advocated in the SEND Code of Practice. While this review focused on

interventions and support strategies, it was clear that detailed assessment of individual children is necessary to select the most appropriate approach, and progress should be monitored when using any intervention to assess whether it is effective for that particular child.

- A third broad finding relates to transfer. It can be tempting to assume that training to remediate a particular weakness will automatically improve the target academic skill (be it motor skills to improve handwriting, phonological skills to improve reading or memory skills to improve learning) – known as transfer. However, such transfer should not be assumed. In most cases, the evidence suggests that training needs to explicitly link the tasks being practised to an academic skill. For example, phonological training is most effective when explicitly linked to spelling and reading, and motor practise is most effective when explicitly linked to writing. Educators should be wary of programmes that do not make this link explicit.

Gaps in the evidence base

- The research evidence for supporting physical and sensory needs is much less extensive than for the other three areas of need and is often based on small scale case studies.
- Most existing high quality research is based on work in primary schools. There is much less research carried out in secondary schools and colleges.
- Most research studies provide a comparison between a particular approach and a ‘no-treatment’ control. This makes it very difficult to know which of two different approaches is likely to be more effective.
- Very little research examines individual differences in responsiveness to interventions. While all teachers know that certain approaches work better for some children than others, there is very little evidence as to why this occurs.

There is good quality research evidence to back up a range of approaches in supporting literacy difficulties, socio-emotional development and language and communication. This allows us to draw some conclusions about effective provision in these areas. More research is needed to understand which approach is better than another, and why some approaches work better for some students than others.

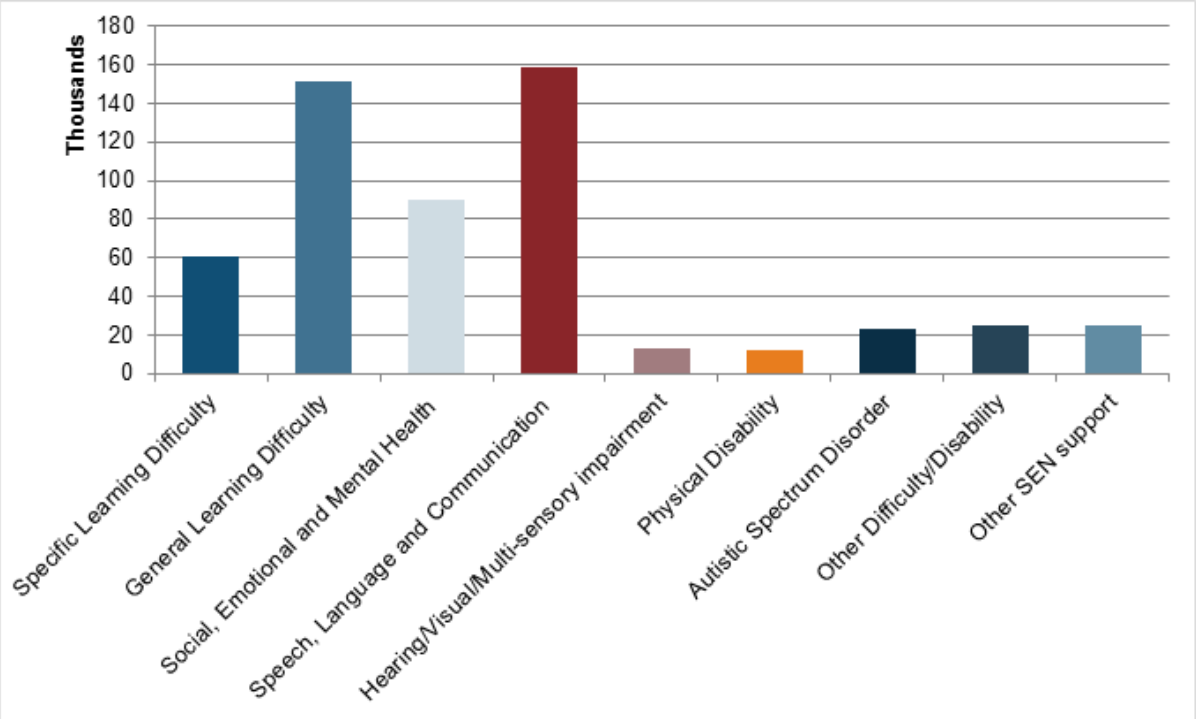
Introduction

The population of children and young people on SEN support

Around 12% of pupils in primary school and 10% of pupils in secondary school are on SEN support (DfE, 2016). In mainstream Further Education (FE) colleges, around 19% of 16-19 year olds and 16% of 19-24 years olds have a self-declared learning difficulty or disability (LDD), the majority of whom will be on SEN support (DfE, 2014). SEN support is the term given to children and young people who have been identified with special educational needs or disabilities (SEND) and require support, but who do not have an EHC plan or statement of SEN. Almost all children on SEN support are educated in mainstream schools rather than special schools or units.

Figures 1.1 and 1.2 show the proportion of children on SEN support in maintained mainstream schools with each primary type of need. Within primary schools, the most common primary types of need are speech, language and communication needs (28.4%); moderate learning difficulties (26.7%); social, emotional and mental health difficulties (16.1%) and specific learning difficulties (10.8%).

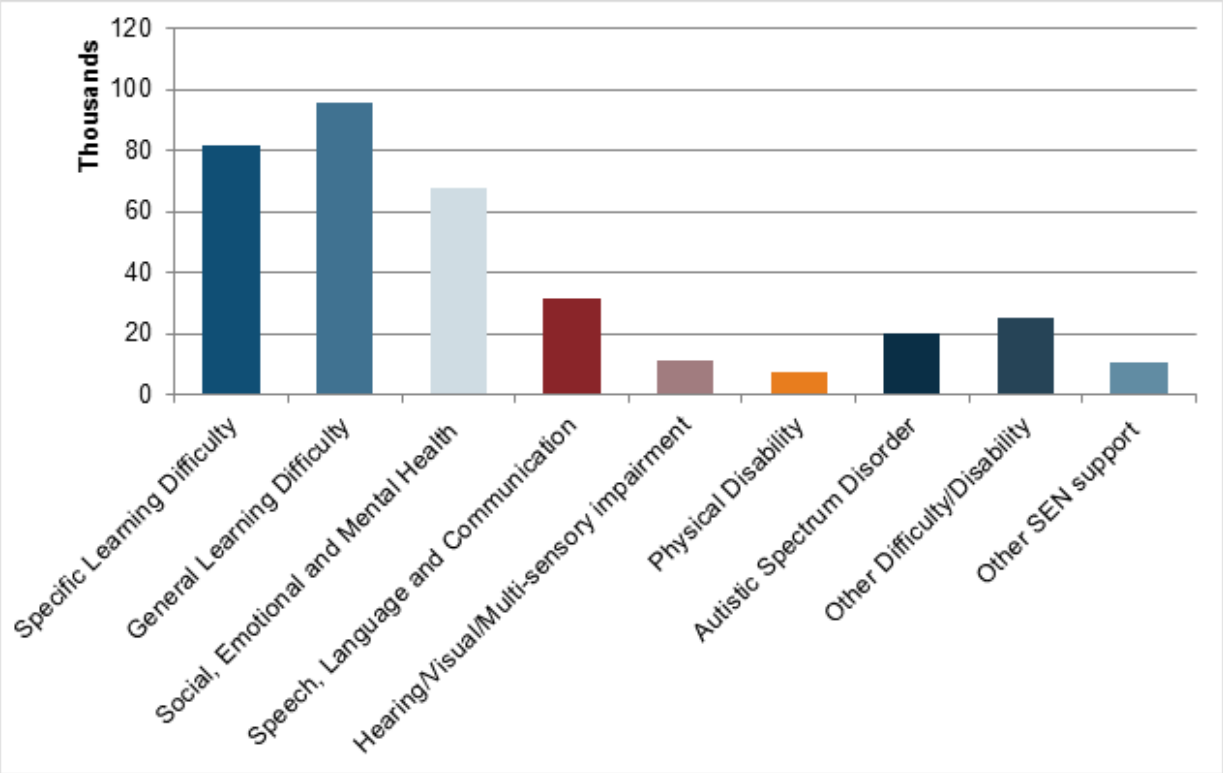
Figure 1.1 Number of pupils on SEN support in mainstream primary schools by type of need



In secondary schools, moderate learning difficulties are the most common type of need (27.0%), followed by specific learning difficulties (23.0%) and social, emotional and mental health difficulties (19%). The incidence of speech, language and communication as a primary type of need is significantly reduced in secondary school (9.0%). Other

primary types of need in children on SEN support include autistic spectrum disorder (4.7%), physical disability (2.2%), hearing impairment (1.6%) and visual impairment (0.9%).

Figure 1.2: Number of pupils on SEN support in mainstream secondary schools by type of need



It is important to remember, however, that these statistics reflect only the primary type of need for each individual child, and many are likely to have multiple needs. Furthermore, some of the descriptors used do not indicate the types of support an individual needs. For example, one child with an autistic spectrum disorder may need support with language and with planning, while another might need support with social interaction and communication. In addition, these needs will differ according to the age of the individual and the demands set for them. A student with specific learning difficulties in further education may have greater issues with planning and self-organisation than with word reading and spelling. For these reasons, we have chosen to structure the review of interventions in terms of the aims of each intervention or adaptation, rather than in terms of the group of individuals for whom it is aimed. Nonetheless, where interventions are particularly aimed at specific groups, we will highlight this.

The research context

Over the past fifteen years, there has been a greatly increased emphasis on using research evidence to guide teaching practice. This has been exemplified in recent years by the work of the Educational Endowment Foundation (EEF), which has funded a large

number of research studies in different areas of education. Their focus has been on supporting children experiencing economic disadvantage, but much of their work is highly relevant for this review.

With this change has come an understanding that existing education and psychology research is not always well designed to provide guidelines for practice. Historically, education research has tended to be difficult to generalise to other contexts, as it is often small scale and specific to a particular situation. Conversely, developmental psychology research has focused on the child and taken relatively little notice of the context in which that child is learning.

In the past fifteen years, researchers have started to carry out larger scale studies with higher experimental rigour, combining psychology and education approaches. However, it can be difficult to draw conclusions from these studies for a different reason – the careful experimental control, examinations of intervention fidelity and randomisation mean that they create a very different context from that of a typical classroom. Ideally, for each intervention, we would have three types of research:

- **Efficacy studies** to demonstrate that the intervention can change outcomes;
- **Effectiveness trials** to demonstrate it can work in a normal school or college context, and
- **Process evaluations** to examine which elements of the intervention contributed to its success.

In reality, it is rare that we have all of these types of evidence.

There is also an issue with the comparisons used for the particular approach or intervention. It is rare that studies compare two different interventions: normally a particular intervention is examined in comparison to ‘business as usual’ or no-treatment control groups. This makes it difficult to know, in many circumstances, which of two interventions is likely to be most effective. This is a significant issue for future research.

Our task is to consider the existing research with respect to children with SEN in the classroom, and to highlight findings about what approaches may be most successful for children with different types of needs. However, we acknowledge that it can be difficult to draw those conclusions for some of the reasons outlined above, and therefore we point the reader to original sources and to relevant further resources where possible.

Method

The basis of this report is a Rapid Evidence Assessment (REA). The overarching question for the REA was as follows:

What strategies and approaches have been shown to be effective for supporting children and young people with special educational needs to achieve well in mainstream schools and colleges?

REA methodology guides recommend focusing on a single database (Thomas, Newman & Oliver, 2013). We used ERIC (Education Research Information Complete), the most comprehensive education database in the world. The initial search was carried out by an experienced research assistant.

The following search terms were used:

Special educational needs/difficulties/disorder/impairment

AND support/intervention/teaching/pedagogy/approach

AND learning /autism /attention/ dyslexia /speech /language / reading /hearing /visual /sensory /physical/social /emotional /behavioural/ conduct

The following exclusionary criteria were used:

- Studies were limited to those published between 2000 and 2016
- Studies must be carried out with children or young people aged between 4 and 19.
- Studies must report on an empirical investigation of an intervention, adaptation or approach: general good practice guides were not eligible for inclusion unless they reported on data.
- Single case studies were excluded, but multiple case studies were included in areas where there was little other research (autism, sensory difficulties and physical difficulties).
- Studies must be published in English in a peer-reviewed journal, but could be carried out internationally.
- Approaches were limited to those feasible in UK mainstream schools or colleges (e.g. approaches including medication were excluded).

The initial searches produced a list of 722 papers, which was saved to a shared Paperpile database. They were given preliminary labels according to the broad topic covered (i.e. language and communication, social, emotional and mental health, behaviour management, general cognitive skills, physical and sensory impairment). The papers were allocated to specialists with different areas of expertise for

assessment (Professor Carroll: specific learning difficulties, speech and language difficulties and hearing difficulties; Dr Crawford: autism and learning difficulties; Dr Johnson: emotional and mental health; Dr Bradley: attention and behavioural difficulties; Ms Hannant: physical and sensory difficulties; Ms Thompson: executive function and learning difficulties).

Each of these experts then supplemented the database with further relevant papers as necessary when they found a search area had been under-represented. The advisory board also provided advice on further sources of evidence. This resulted in a final total of 1046 papers.

Following this, all studies were given three separate labels: a ‘topic’ label indicating which area or areas this paper was relevant to; a ‘design’ label indicating what research design was used; and an ‘ecological validity’ label indicating whether the research had been carried out in mainstream schools or colleges in the UK, in other settings, or by trained specialists (e.g. speech and language therapists or counsellors). Studies showing high experimental rigour and high ecological validity (e.g. randomised controlled trials carried out in UK schools) were given most weight in the report.

During this stage, papers were carefully examined to ensure they fit the criteria above, resulting in 505 papers being excluded. The majority of these papers did not report on empirical data but provided general reports of good practice.

The narrative report was supplemented where appropriate from findings from recent high quality reports carried out by the Department for Education, the Educational Endowment Foundation or relevant UK charities such as the National Deaf Children’s Society.

Overarching issues

In reading the papers selected in the rapid evidence assessment, there were some issues that cut across the different areas of need. We have chosen to highlight some of these issues below.

Working with parents and families

The SEND Code of Practice (2015) highlights the vital role that parents play in supporting children and young people with SEND. This modified Code of Practice follows the Lamb report (2009), which suggested that parents were sometimes excluded or marginalised in decisions about their child, whereas they should be considered partners in their child's education, and a process of communication and engagement with parents is key. Schools and colleges need to have regard to views, wishes and feelings of children, young people and parents and make sure that information, advice and support is available to children and young people, as well as parents. When a young person turns 16, schools and colleges need to default to working directly with young people without excluding parents from the process. This is a change which requires judgement and sensitivity to ensure that the young person's needs are prioritised – especially where parents and young people have different views.

Parents are the best placed individuals to provide details on the health and early development of their child and the support they have received outside the school system, particularly when a school is first assessing a child's needs. They can also provide information on whether any difficulties have been noted at home or elsewhere, to help to understand whether they are limited to or exacerbated by the school environment. All of this information is crucial for a thorough assessment of a child's strengths and weaknesses.

Parents of students with SEND may require additional support from educational settings in order for them to feel comfortable to be open and honest about their child's needs. Parents are often required to take on an 'advocate' role for their child and this can be a time consuming and emotionally laden responsibility. They may also have different concerns to other parents, for example, they may be more worried about whether their child is safe in school or college, whether they are making friends or what other parents may think of their child, rather than focusing on academic performance.

A key issue to consider is the goal of any support or intervention. In recent years there have been a number of debates raised about different interventions which have been put in place to support children and young people, particularly with regard to individuals with autism spectrum conditions (ASC). While these arguments are beyond the scope of this rapid evidence assessment, it is important to acknowledge them and to remember that

therapy or support should be based around the needs of the individual learner and their family's views rather than a desire to make a child 'fit in' to a classroom situation.

Parents can also provide support and consistency for any approaches or interventions used at school. The EEF-Sutton Trust Toolkit includes a review of 14 meta-analyses on the topic, which indicates that parental involvement in children's learning has a small positive effect, though most of the studies cited focus on young children and many on parents reading with their child. However, parents sometimes need support to know how best to help their child: Maloney et al (2015) find that parents who are anxious about maths and help with maths homework can have a negative, rather than a positive, impact.

Assessment of students' strengths and weaknesses

Our rapid evidence assessment focused on support, rather than identification or assessment. However, a recurrent theme across the literature is that the most effective support relies on a full and recent assessment of a child or young person's individual strengths and weaknesses. A wide range of underlying difficulties can cause certain symptoms or behaviours. For example, difficulty in following classroom instructions could indicate hearing difficulties, language difficulties, attention difficulties, short-term memory difficulties or frustration at other, seemingly unrelated situations such as friendships or home life. A child often seeming worried or anxious could have learning difficulties, sensory processing issues, worries from outside of school and so on. Until these different options have been explored and a full picture of a child or young person's strengths and weaknesses, in terms of cognitive skills, relevant medical issues such as hearing and vision, and family support, motivation and engagement is considered, support is likely to be sub-optimal.

This assessment does not need to be lengthy in most cases. Discussion with the parents is likely to provide much useful background information. Observation of how the child behaves in the classroom, small groups and individually can also provide a guide on what aspects of the learning environment a child finds most difficult. Hearing and sight tests can be carried out at the GP or the opticians at the request of the parents. This can usefully supplement information from academic tasks completed in school time.

Supporting students with SEND in a classroom

Teacher awareness and effective training

Typically, teachers, especially secondary school teachers, receive minimal information on SEND as part of their initial teacher training. This knowledge is often something that comes informally, piecemeal and from experience. There are some good reasons for

that: children and young people with SEND show a huge variety of individual needs, and it is not normally useful to assume that 'all' those with a particular need will require the same type of support. Mitchell (2014) suggests rather that:

"my strong advice to you is that you should develop a repertoire of such strategies nested within your own philosophy…professional wisdom, and above all knowledge of the characteristics and needs of your students".

We intend that this report, and the associated reports, will help teachers to develop this repertoire.

Classroom based versus individualised support

The requirement for children and young people with SEND to have their needs met in inclusive educational settings has become established over the past two decades. The SEND Code of Practice advises that schools should provide a culture that has high expectations for those with SEND and must facilitate participation and achievement.

An issue that is often raised is the role of mixed ability classes or groups versus setting by ability. The EEF-Sutton Trust Toolkit indicates that setting is disadvantageous to lower achieving students in most cases. Being in lower sets is associated with lower self-belief on the part of the students, as well as lower expectations on the part of the teachers. Both of these factors combine to mean that that lower achieving students do less well on average in classrooms where they are placed in ability groupings.

Creating a truly inclusive classroom is challenging, and as Mitchell (2014) highlights, most of the research studies examining classroom climate do not focus on students with special educational needs, and are therefore beyond the scope of this review. However, it is clear that an environment in which students feel emotionally safe, in which there are clear rules, predictable consequences and positive goals is good for those with and without SEND.

In recent years, schools have made more use of techniques such as collaborative learning or peer tutoring in order to support mixed ability teaching. These approaches can be very helpful for students with SEND, as well as for typical students, as described in the EEF-Sutton Trust Toolkit. However, peer tutoring needs to be carefully planned and managed, with appropriate training for the tutors and a task set at the correct level, where it is challenging but achievable for the tutee. Mitchell (2014) notes that students with SEND can also be effective tutors, particularly tutoring younger children, and that this can help to build confidence and consolidate knowledge. For more information, see the section below on Peer-mediated social skills training.

Effective use of teaching assistants

In UK schools, teaching assistants form a significant part of the workforce, providing much of the support for children and young people with additional needs. The Educational Endowment Foundation has recently published a review of the effective use of teaching assistants, and our review of the existing evidence on SEN support is in line with the conclusions from this report. Teaching assistants can certainly provide benefits to students with special educational needs, but they need to be appropriately supported to do so.

For example, teaching assistants can deliver structured, evidence-based interventions effectively to individuals or small groups, but they should be given proper training, a thorough knowledge of a child's strengths and weaknesses, and adequate time to prepare and record their teaching.

Teaching assistants should be working as part of a team with the classroom teacher, SENCO and relevant professionals to ensure that the additional support is linked to the curriculum and that the teaching assistant is following best practice. In many cases the teaching assistant is able to spend more time than the class teacher working closely with and getting to know an individual child, and their knowledge of that child should form part of the overall planning process.

Motivation and engagement

There is a growing body of evidence that a child's motivation and engagement is a key factor in how they respond to support or intervention. Motivation can be divided into two types: intrinsic motivation (doing an activity because you want to) or extrinsic motivation (doing a task for external reward or acknowledgement). Intrinsic motivation is associated with good progress in school, while extrinsic motivation is associated with poorer progress. This may be partly because it can encourage a 'surface' approach to task completion, where a child aims to complete a task as quickly and easily as possible, rather than trying to understand the task and produce their best work. Unfortunately, children with SEND often have low intrinsic motivation to complete academic tasks for multiple reasons, including because of prior experience of failure, and educators are often tempted to provide extrinsic motivators as a substitute.

Ideally, it is better to foster intrinsic motivation for a task rather than to use extrinsic motivation (tangible rewards, merit points or golden time). Extrinsic motivators can have a role in some situations (for example, to encourage novel behaviours to become habitual), but should not generally be relied upon long-term. Positive verbal feedback does not act as an extrinsic motivator in this way (Deci, Koestner & Ryan, 1999), and is positively associated with intrinsic motivation.

Intrinsic motivation can be increased in the following ways:

- By setting tasks that are challenging but achievable, to allow experience of success in academic tasks. This allows the development of self-efficacy (belief that one can achieve a particular task, Bandura, 1990)
- By highlighting the intrinsic value of the task (how it will be useful in the future) rather than focusing on exam results or external rewards.
- By allowing students some degree of autonomy in setting their goals or selecting the materials to use.
- By encouraging a 'growth mind-set' that all students make mistakes and that mistakes can be learning opportunities rather than failures (Dweck, 2000).

Deci & Ryan (2000) argue that the distinction between extrinsic and intrinsic motivation is too crude. Students may do a task for a fully extrinsic reason (e.g. to directly receive a reward), for a mainly extrinsic reason (e.g. in the expectation of receiving social recognition), for a mainly intrinsic reason (e.g. because doing school work is what they are supposed to do) or for a fully intrinsic reason (e.g. they get inherent satisfaction from the task). Partially intrinsic motivations are also associated with good academic progress, and so it is useful to encourage partially intrinsic motivation as well as fully intrinsic motivation.

Supporting students post-16

Students between the ages of 16 and 18 are expected to either be in education or undertaking an apprenticeship or traineeship. This therefore means that many more students with SEND require support with their education after the age of 16. Further education tutors can undertake specific qualifications[1] to enrich their knowledge and build their skills for working with students with SEND. The government has produced a guidance document for further education establishments implementing the SEND Code of Practice. This sets out that colleges have a duty to use their best endeavours to provide support for individuals with SEND who are registered with their institution. In some cases, this will be up to the age of 25.

There is, unfortunately, a much weaker evidence base on what works to support students with SEND in adolescence and young adulthood. There are so many differences in students of this age group in comparison to younger ages that it is very difficult to draw conclusions on what works from studies on school children. We highlight some of the

[1] Further information about FE qualifications can be found here

findings here, and return to specific findings with post-16 students in later sections where possible.

Some research has examined the characteristics of individuals who have successfully overcome learning difficulties. While these are often qualitative, retrospective reports, they can provide helpful information. Reis et al (2000) argue that schools focus on remediation of basic skills rather than developing compensatory strategies for weaknesses. It is likely that compensatory strategies are particularly useful at the college level, when students start to manage their own learning to a greater extent. Compensation strategies highlighted by successful students include study skills, time management, organisation, memorisation strategies and the use of assistive technologies such as Dictaphones and speech to text programmes (Ries et al., 2000). Many of these are discussed in more detail in the section on executive function below.

Transitions to employment

Hakkarainen et al (2016) examined the education and employment outcomes at age 20 of students who had had literacy, numeracy, behavioural or social difficulties at age 15. They found that having literacy difficulties or behavioural difficulties was associated with not graduating from high school, while numeracy difficulties and social difficulties were associated with individuals being not in education, employment or training (NEET), raising the possibility that different sets of skills are associated with educational success and career success. However, it is difficult to generalise from this work, as the sample size is relatively small (590 students across the range of ability) and the study is carried out in Finland, in a different educational context.

Goldman-Mellor et al (2016) examine the characteristics of young British people who are NEET. They found that individuals with a history of behavioural difficulties, attention deficit hyperactivity disorder (ADHD) or depression in childhood are much more likely to be NEET at age 18, even after accounting for socio-economic background, cognitive abilities and reading skill. Adolescents with mental health difficulties are particularly vulnerable to becoming NEET in adulthood, and therefore should be carefully supported and prepared for the transition to employment.

Type of need 1: Cognition and learning

The area of cognition and learning is the most common type of need for pupils on SEN support. In 2016, 50% of secondary school pupils and 37.5% of primary school pupils on SEN support had either moderate or specific learning difficulties listed as their primary type of need.

This area encompasses both general and specific learning difficulties. General learning difficulties cause problems across the curriculum, while specific learning difficulties refer more to a specific aspect of learning, such as literacy (sometimes known as dyslexia) or numeracy (sometimes known as dyscalculia). General learning difficulties can be designated as moderate, severe or profound learning difficulties, but we have assumed that most children and young people with severe or profound learning difficulties would be receiving support through an Education and Health Care Plan (EHCP), and therefore have focused the work on those with moderate learning difficulties and those with specific learning difficulties. While dyspraxia, or motor co-ordination difficulties, is also known as a specific learning difficulty, we have chosen to address it in Type of Need 4: Physical and Sensory Needs.

Perhaps unsurprisingly, children with general or specific learning difficulties are among the groups of children on SEN support with the poorest academic attainments, with only 11% of those with moderate learning difficulties and 32% of those with specific learning difficulties achieving GSCE English and Maths at A*-C, compared to the national average of 63% (DfE, 2017).

Despite their name, specific learning difficulties frequently show additional co-occurring difficulties, and the types of support most effective for children with literacy or numeracy difficulties seem to be similar regardless of whether a child has a specific or general learning difficulty (Stanovich, 1988). For these reasons, we have organised this section in terms of the intervention aims, rather than the type of learning difficulty a child shows. We begin by focusing on broader learning skills and go on to discuss specific aspects of the curriculum (literacy, writing and numeracy).

‘Thinking Skills’ interventions

One of the largest areas of need for students on SEN support relates to supporting generalised learning skills, or ‘thinking skills’: attention, working memory and processing difficulties. Children and young people with moderate learning difficulties are likely to find it difficult to access multiple areas of the curriculum. In this section, we review the evidence on how to support children with difficulties in these areas. We begin with a general overview of the terminology used in the literature.

To access the curriculum, a number of skills are needed. A child needs to focus their attention on the task at hand, inhibit inappropriate responses, hold information in mind, transfer information to long term memory, make decisions on the basis of the information and plan how best to organise their response. All of these skills come under the umbrella term of Executive Function (EF).

Operational definitions of executive function

EF is a broadly understood theoretical construct of an individual's mental capacity for planning, organisation, efficient decision making and action. It has impact on both emotional and thinking processes (Ortero, Barker and Naglieri 2014). While there is a wide range of definitions of EF, most include planning, working memory, attention and inhibition within them.

Attention

The sensory (hearing, looking and sensation) systems provide a constant source of competing input, that has to be selected for (for example listening to teacher) and selected against (not listening to sounds of traffic or background chatter). This is carried out by the attention system. This is a process by which a child chooses which information to focus on. Children and young people with attention difficulties are easily distracted by other stimuli. There are two key elements: selective attention, or the ability to focus relevant information, and sustained attention, or the ability to maintain focus over time.

Short-term memory

Short term memory is a system which holds information 'in mind'. Baddeley and Hitch (1974) suggest that there are separate verbal and non-verbal short term memories, with the verbal system being a kind of 'auditory loop' where information is repeated and the non-verbal system being a kind of 'sketchpad' remembering the location of different items. Short term memory is heavily limited, with most adults being able to hold approximately seven items in mind at once. For children, especially children with learning difficulties, this might be more like three or four items.

Working memory

Most definitions of EF include Working Memory in their description. An analogy for the system referred to as working memory is a limited capacity mental 'workbench' which processes, manipulates and transforms incoming information linking it to established knowledge. While short-term memory stores information for brief periods, working memory acts on that information. Due to working memory having a limited storage capacity, it can be subject to experimental testing and measured, and it has been extensively researched.

Planning

Planning encompasses the ability to have solid mental representations of time, space and ability to sequence activities, as well as integrating that with the prospective memory system (ability to remember to do things in the future, the classic example is to remember to post a letter). Many individuals with SEND find it very difficult to understand how to mentally sequence activities to complete a complex task.

Development and impact of executive function

EF capacity is understood to be predominantly anchored in the frontal areas of the brain. Development of EF is relatively slow, with significant brain changes between the ages of 8 and 15 years (Blakemore & Choudhury, 2006). Nonetheless, classroom learning places significant demands on the executive function system, particularly in secondary school and college, and it can often be useful to consider how to support executive functions in students with SEND. Evidence from examining EF suggest three strategies to address difficulties in this area. Firstly, reduction of environmental load that adds to processing demands; secondly using external supports to reduce demands, particularly where disruption in a sequence can occur (note systems, technology, prompts systems including human, routines and strategies, mnemonics, reinforcement approaches) and thirdly specifically and systematically taxing and strengthening the underlying subsystems of the EF structure. The value of each of these to improving outcomes for SEND will be considered in turn.

Supporting attention and on-task behaviour

Self-management or *self-regulation* interventions describe a number of strategies students can use to monitor, record and assess their behaviour (Reid et al., 2005). One type of self-management strategy that has proven to be effective for children with and without SEND to increase on-task behaviour is *self-monitoring* (DuPaul and Weyandt, 2006). Self-monitoring requires the student to first recognise the occurrence of a targeted behaviour (e.g. daydreaming) and then make positive changes to modify that behaviour. The majority of self-monitoring interventions play audio cues (beeps, chimes or recorded phrases) at timed intervals during the lesson to prompt students to monitor and check if they are focused and on-task. Self-monitoring is a flexible intervention in that while it can be used to assist specific students it can also be implemented as a whole class intervention. Several studies have evaluated the effectiveness of audio cues (e.g. Graham-Day et al., 2010; Slattery et al., 2016) to find on-task behaviour increases, but a limitation of audio cues is that they can disrupt the classroom environment. To overcome this limitation *tactile-cued self-monitoring (TCSM)* interventions use a vibrating pager-like device (e.g. MotivAider) that can either be clipped onto clothes or placed in the student's pocket. The device is set to vibrate at timed intervals and act as a cue for the individual student. Using a TCSM was found to increase on-task behaviour substantially during a

study conducted in a secondary school setting, and students maintained improvement when tactile cues were systematically faded. The study also found that, in contrast to audio cues, tactile cues were seen by the teachers and students as a more socially acceptable self-monitoring intervention (Morrison et al., 2014).

More recently, self-monitoring is being delivered through the use of technology such as tablets or mobile devices. *I-Connect self-monitoring intervention* is an app that has alarms, checklists, and prompts to help students self-monitor and check they are on task. A study assessed the effectiveness of I-Connect in two secondary school aged students who used the app on their mobile phone to improve on-task behaviour. The study found that using I-Connect resulted in positive and stable improvements of on-task behaviour in both students, (Wills and Mason, 2014).

Self-monitoring interventions

- Devices e.g. MotivAider are widely available, and can also be delivered through tablets or phones
- Easy to implement
- Suitable for older students
- Intervention goes beyond the classroom as students can use the app outside of school to help them develop organisational skills
- Flexible according to student needs

Headphones have been found to be a useful intervention for students with attentional difficulties as they help block out distractions to keep the student focused and on-task. A comparison study found that playing white noise to students through headphones decreased off-task behaviour in students with ADHD compared to a non-intervention group (Cook et al., 2014). However, the study did not find that white noise had an effect on task completion or accuracy.

Headphones

- Suitable for students of all ages across all educational settings
- Easy to implement
- A practical adaptation would for students to listen to calming music (music without words) when individual work or silent work needs to be completed

"RAPID" Cognitive-Behavioural Therapy Program for Inattentive Children is an evidence-based UK intervention that is delivered in UK schools to children with attentional problems. RAPID is a manualised group intervention that teaches psychological

techniques to improve attention span, self-regulation skills and an awareness of how thinking and emotions affect their behaviour. A unique feature of RAPID is that students meet weekly with an appropriate adult who 'coaches' them to help them transfer their newly taught skills into everyday life. An evaluation study was conducted with children in Years 4, 5 and 6 in order to assess the feasibility of delivering RAPID in primary schools. The study found significant improvements in attention, emotion and conduct in children aged 8-11 years who were not presenting difficulties in these areas, and so this suggests even greater benefits would be expected for children experiencing these difficulties (Young, 2012).

RAPID

- Suitable for all students (with and without a formal diagnosis) experiencing attentional difficulties
- Suitable for students also experiencing interpersonal difficulties. See 'Social Skills Training' section

Mindfulness training is discussed in the section on Type of need 3: Social, emotional and mental health as it has been found in a recent systematic review and meta-analysis to be an effective intervention for improving mental health symptoms (stress, depression, anxiety and quality of life) in children and young people (Kallapiran et al., 2015). Mindfulness has also been used to improve attention and increase on-task behaviour, but here the evidence for its effectiveness is less strong. Maynard et al (2017) in a recent systematic review, conclude that mindfulness based interventions have small positive effects on attention skills, but no significant effects on academic grades or behaviour.

In one small scale study with students with ADHD, researchers observed students to identify when off-task behaviour was at its most frequent, and then delivered mindfulness at those identified times twice a week for 30-45 minutes. Each student (4 boys aged between 8-11 years) received a minimum of 10 sessions. Improvements were seen in all students, although the number of sessions needed was varied as one child received 17 sessions before improvement was seen. After intervention, the mean percentage of on-task behaviour increased on average by 40% for all students, while the greatest increase of on-task behaviour for one student was 60% (Carboni et al., 2013).

Mindfulness

- Mindfulness has small, but significant, effects on attention and emotional wellbeing
- It should be delivered by someone trained in mindfulness
- Suitable for students of all ages across all educational settings
- Mindfulness should be considered as a long-term intervention as improvement time was varied

The role of physical activity in attention

Some work has suggested that children who show overactivity in classroom situations – finding it difficult to sit still and inhibit movement – can be encouraged to direct their activity in other ways. Reilly et al (2008) has demonstrated that maintaining balance, sitting or standing, including postural support, draws upon attentional resources and that this is in competition for the resources to undertake academic tasks. Hence, some children may find it difficult to concentrate and sit still at the same time.

Small scale work has considered the usefulness of *fiddle toys* or fine motor activity to assist in redirection of attention resources (Kercood et al., 2010). The results are mixed, there is some indication that such fiddle toys may have use when auditory tasks are being undertaken e.g. responding to verbal questions with verbal answer, but of less use or may even be counterproductive when a visual task such as reading of a board is undertaken. However, the sample sizes are extremely small and given that the results are mixed, this does not provide unequivocal support for the use of fiddle toys but suggests that on a case by case basis they may be of use under specific conditions.

In another study (Davies et al., 2011) examining the effectiveness of *standing tables*, a side finding was that for children with SEN the use of the standing tables was associated with improved functionality in concentration and attention in class and at home. It was not the focus of the study (which was on childhood obesity) so the data is qualitative, based on reports and ratings of teachers and parents, however it was noteworthy enough to have a section in the research discussion. This finding is consistent with Goodmon et al's 2014 study of dyslexic pupils on the use of *exercise balls* as seating helping with behavioural and attention profile in class. There is therefore some emergent low level evidence of interactions between developmentally immature neurological system, attention, environment, educational access and outcomes that is worth detailed systematic inquiry. While there is not strong enough evidence at this stage to recommend posture management as an intervention for attention, there is enough evidence to suggest that giving a child who has difficulty with attention a choice of work station styles is a worthy approach that may be of individual benefit.

Meta-analysis work by Cerrillo-Urbina et al (2015) in evaluating the impact of *exercise* on children with ADHD has found that there was a positive although weak impact of exercise on ADHD and that it was useful alongside other interventions. A moderate to large effect across a number of studies was found for aerobic interventions of 6-10 week duration on inattention, hyperactivity, impulsivity, anxiety, executive function and social disorders in children with ADHD. These interventions normally involved two or three aerobic sessions per week of around 50 minutes.

Physical activity

- Regular aerobic activity helps to reduce symptoms of hyperactivity and inattention
- Suitable for a range of ages
- Flexible according to the situation

Memory skills

Reduction of processing load in classroom learning

It is useful to consider what the executive function demands of a particular task are and reduce irrelevant information when possible. One strategy is to *reduce the load* of sensory information and its associated processing. Work by Dockrell and Shield (2006) using a randomised control design at classroom level has shown that children with SEN are more negatively impacted to a significant degree by the background babble of typical busy classroom environments compared to their non-SEN peers and particularly when compared with settings where children are working quietly. The noise conditions significantly impacted on verbal literacy task performance for children with SEN. Children of typical development also had difficulty in the background classroom noise condition. They performed worse in persistent babble conditions when doing non-verbal tasks but were less impacted on verbal ones, for example reading. Both groups however responded more favourably when there was intermittent interruption to the background babble and it was hypothesised that this allowed for refocusing on the task when the task demands were of limited duration and no time pressure. When time pressures were applied, the quiet classroom condition was the most effective. The value of limiting auditory reverberation via the use of acoustic panelling was supported.

Overall, programmes designed to support EF subsystems or immature neurological development can have contributory roles in access to education, however consideration also needs to be given to environmental factors that may also provide ways of reducing or increasing the demands on the attention system.

Providing support for EF in classroom learning

The second strand of strategy is to provide *scaffolding* and *support*. This can be through breaking a task down into component parts or chunks and organising them hierarchically, so that EF capacity can be directed at content rather than planning and organisation. The teaching of strategies and the range of strategies that may be required through explicit and systematic instruction also falls into this category. This may be particularly useful at the later stages of education.

Mitchell (2014) describes various strategies to support memory development, including use of *mnemonics*, links to help call to mind specific factual information (for example, learning 'never eat shredded wheat, or NESW, for the points of the compass). Many memory strategies involve linking different types of information (for example, a visual cue with a linguistic cue) or elaboration (consideration of information from many different angles). Others involve creating '*chunks*' or groups within a series of information – for example remembering the phone number 3328342 and 332 and 8342. Learning systems such as Jolly Phonics successfully use mnemonic actions to help to link letters and sounds in early literacy. Using these strategies is very effective for learning, with a substantial increase in what is learnt for both typical students and those with a wide range of special educational needs. These strategies are useful when learning key facts rather than for learning information which requires critical analysis.

The EEF-Sutton Trust Toolkit highlights the value of meta-cognitive approaches ('learning to learn'). Teaching students explicit strategies to plan, monitor and evaluate their work and their understanding can be very powerful for a wide range of students.

Reducing and supporting processing load

- Reduction of extraneous noise in the classroom may be a large task, but it benefits a wide range of students, including those with attention difficulties and mild or moderate hearing loss
- Using strategies to help with learning key facts is a low cost and well evidenced approach
- Suitable for all ages and abilities

Interventions to improve working memory and processing

A great deal of work has gone into trying to train EF skills directly, much of which is unsuccessful. Recent meta-analyses have indicated that while children can be taught to complete working memory tasks more efficiently, for example, this training will not necessarily generalise to academic tasks which seem to involve much the same skills (Melby-Lervag & Hulme, 2013). We should not assume that training working memory will result in improvements in learning, though it may help to improve organisational skills.

Nonetheless, working memory can be trained and Diamond (2012) highlights that effective training programmes use graduated approaches of increasing difficulty and repeated practice.

Planning and organisation skills

Organisation and classroom preparation are necessary skills to meet the everyday demands of school or college, particularly for older students who are expected to be more independent and ensure they arrive on time, hand in work to deadlines, and take the necessary equipment to different classes etc. (Gureasko-Moore et al., 2006). Although the following evaluation studies have been carried out in settings outside of the UK, the interventions would be suitable to implement in schools and colleges in the UK.

Student Logs allow students to identify and write down organisational or class preparation difficulties. If necessary, support should be given to help the student do this by discussing incidences that are problematic based on teacher observation. The student then writes down goals on a *self-monitoring checklist* which work to directly address the identified difficulties, for example ‘did I stop what I was doing when the teacher began class instruction’, ‘did I have my pen/pencil out’, ‘did I write my homework down’. The student uses the self-monitoring checklist during lessons to monitor and check they are meeting their goals and developing their skills to be more organised and prepared for class. One study measured the effectiveness of the intervention to find classroom preparation behaviours improved between 40-53% for all students (3 students aged 12 years old), and that improvements were maintained after the intervention was systematically faded to one meeting a week (Gureasko-Moore et al., 2006). The paper provides an example of a self-monitoring checklist and procedural checklists for staff.

Homework, Organization and Planning Skills (HOPS) is a one-to-one intervention delivered during the school day over an 11-week period, each session lasting no longer than 20 minutes. HOPS is a manualised intervention that can be implemented by teachers and support staff to target school material organisation, homework recording, management, and planning. A study evaluated the effectiveness of HOPS among 47 students between the ages of 11-14 years. In a wait list comparison study, it was found that students in the intervention group demonstrated significant improvements across parent-ratings for organisation, planning and homework completion. Teacher-ratings showed improvement but these were not significant, although teachers reported that the intervention was easy to implement and that they were likely to use HOPS in the future (Langberg et al., 2012).

Self-monitoring for organisation and planning

- Interventions are easy to implement
- Particularly suitable for secondary school and post-16 students
- Flexible according to the situation

Literacy needs

A widely-accepted view of reading is that it relies on two key skills: recognising individual words and understanding connected language. This is known as the 'simple view' of reading (Tumner & Gough, 1986). These two skills involve different processes and it is therefore worth considering whether a child who presents with literacy needs shows weaknesses in single word reading, language comprehension or both. The nature and impact of literacy difficulties changes throughout development, and so we have considered different age groups separately.

Literacy in foundation stage and key stage 1

In the first few years of education, children are typically learning to read, in the sense of understanding how written language represents spoken language. It is very well established that a programme that includes *structured, systematic phonics*, in addition to engaging with book reading, is the most effective way to teach early literacy (Melby-Lervag et al., 2012). Partly as a result of this extensive research, the UK education system now ensures that children are taught to use phonics early in school, with a phonics screening check at the end of year 1. However, literacy does not rely on phonics alone, and many children fail to progress well despite this early focus on phonics. The EEF – Sutton Trust provides a useful guide on how to best support literacy in key stage 1.

In some cases, these children can benefit from some additional *small group tuition* which focuses further on phonics, in combination with learning key sight words and reading good quality texts (Bowyer-Crane et al., 2008; Hatcher et al., 2004; 2006). Phonological awareness tuition is most effective when it is closely linked to learning about letters, words and phonemes (Hatcher et al., 1994; Schneider et al., 2000). This is also true of children who have additional difficulties such as Down Syndrome (Burgoyne et al., 2012) or hearing impairments (Bergeron et al., 2009), though phonics interventions with high risk samples are not always effective (Duff et al., 2014), and may need to be delivered more slowly and intensively for children with additional difficulties.

For many children, an early focus on broader *oral language* skills can be a crucial element to preventing reading failure. Many previous reports, including Rose (2006),

have highlighted the vital role that oral language skills such as vocabulary and story production play in literacy development. For more information on how to develop oral language skills effectively, see the Speech and language section in this report.

For children with more severe difficulties, an approach that combines phonics with oral language instruction and sight word learning can be useful. Duff et al (2008) describe an effective intervention for children who have not responded to a standard phonics intervention which combines vocabulary instruction with reading intervention.

A large body of research has examined the extent to which it is useful to focus on 'precursor' skills for these children. These precursor skills include *auditory processing*, *rhythmic processing* and *articulatory awareness*. There is at best equivocal evidence for each of these approaches. *Auditory processing* approaches such as *Fast ForWord* do not seem to be effective (Strong et al., 2011). There is some preliminary evidence suggesting that *rhythmic processing* may be effective, but at present the evidence suggests that it is not more effective than phonics (Thomson et al., 2013). Studies including *articulatory awareness* as part of phonics training are effective (Magnan & Ecalle, 2006; Torgesen et al., 2010), but again there is no evidence that they are more effective in general than standard phonics interventions. Nonetheless, as some children do not respond to standard phonics support, rhythmic and articulatory approaches may be a useful and effective option for these children.

Small group literacy interventions

- There are a wide range of well established intervention programmes to improve early literacy
- Effective programmes tend to have multiple activities, including structured phonics teaching, sight word practice, book reading and writing
- This approach is suitable for children with specific literacy difficulties and those with more generalised difficulties

Literacy development in key stages 2 and 3

By around the age of 7 or 8, most typically developing children have mastered the basics of literacy and begin 'reading to learn' instead of 'learning to read'. Most children can read largely accurately and with understanding, and they are beginning to write longer pieces of text. A great deal of new vocabulary is encountered through books. Literacy needs at this stage can include difficulties in reading accuracy, reading fluency (e.g. they read very slowly), spelling, writing, reading comprehension or any combination of these.

Teaching approaches

Teaching comprehension

There are many possible explanations of why a child may struggle with comprehending connected text. If a child reads accurately, it is often easy to assume that they understand what they are reading, but this is not always the case.

The EEF-Sutton Trust Toolkit reports that *reading comprehension strategies* can be effectively taught, and that making these strategies explicit can improve reading comprehension. This review covers a wide range of strategies, however, and advises teachers to select a few strategies to focus on based on the needs and characteristics of their students.

In some cases, children and young people have difficulties with reading comprehension because of underlying language weaknesses, perhaps because of a related condition such as autism spectrum conditions (ASC). For these students, it is crucial to work on oral language skills such as core vocabulary, as described in the section on speech and language. It can also be useful to use visual means such as *story frames* to help discuss story structure (El Zein et al., 2014). In fact, use of *graphical organisers* such as cognitive maps or story frames to help depict story structures can help to improve reading comprehension in a range of children with learning difficulties, though these improvements do not necessarily generalise to new comprehension tasks (Kim et al., 2004).

Teaching comprehension strategies

- Explicitly teaching individuals how to understand and reflect on what they are reading can improve reading comprehension
- Explicit teaching of key vocabulary is also beneficial
- Suitable for a wide range of ages and abilities

Morphological approaches

Morphemes refer to the units of meaning that make up words. English is a morphophonemic language in the sense that spelling is determined both by phonology and by the morphemes used (e.g. the difference in spelling between mist and missed is explained because missed is a root morpheme (miss) plus a past tense morpheme (ed)). Most words that are encountered in written text are morphologically complex, and so understanding this principle is key to understanding spelling and vocabulary. Recent research (Breadmore & Carroll, 2016; Carroll & Breadmore, in press) suggests that poor readers may have difficulties in understanding morphemes in words alongside their phonological difficulties. A good quality meta-analysis (Goodwin & Ahn, 2010), suggests

that including *morphological awareness training* in literacy instruction can help to improve both spelling and comprehension skills.

Morphological approaches

- Helping children to understand the morphemes (units of meaning) within words can support vocabulary learning, spelling, grammar and comprehension of unknown words
- Suitable for students from key stage 2 onwards
- Can be an interesting and engaging approach to grammar and spelling

Visual approaches

Some educators have argued that reading difficulties are normally associated with difficulties in the visual system, sometimes called visual stress. This is a condition in which individuals find it difficult and tiring to focus on letters, and sometimes words seem to 'jump around' on the page. Most researchers would now argue that visual stress is not the main factor underlying literacy difficulties, but it may be a cause of a minority of reading problems. There are some adaptations which are used to deal with visual stress, including *coloured overlays*. There is evidence that coloured overlays are a relatively ineffective way of improving reading (Henderson et al., 2013; Mitchell et al., 2008). Studies that have shown a benefit of *coloured filters* have focused on children who show clear visual symptoms after a thorough ophthalmic examination (Bouldoukian et al., 2002).

Orthographic learning

There are several studies emphasising the importance of helping children *learn visual word patterns* as well as phonics. Gustafson et al (2007) compared phonological and orthographic training for individuals with dyslexia. The orthographic training involved recognition of letters, words and morphemes, while the phonological training involved highlighting sound similarities and decoding. Both interventions were effective at improving reading, but the phonological approach was more effective for students with phonological weaknesses while the orthographic approach was more effective for students with orthographic weaknesses. This suggests tailoring the content of an intervention to the students' needs can be useful. There is also evidence that training efficient recognition of word orthographies (*sight word learning*) can improve reading fluency (Ise & Schulte-Korne, 2010; O'Brien et al., 2011). However, much of this work is relatively small-scale and carried out in languages other than English.

Orthographic learning

- Includes a range of strategies to help students recognise words immediately rather than sounding out
- Particularly useful to improve reading fluency
- Can employ a range of strategies such as flash cards and computer based practice
- Suitable for a wide range of ages and abilities

Multi-faceted interventions

The most effective tuition is closely matched to students' needs (Griffiths & Stuart, 2013). Nonetheless, there is strong evidence that a wide range of structured literacy interventions can be helpful at improving general literacy skills, particularly between the ages of 7 and 11 (Suggate, 2010, 2014). These approaches often cover elements of reading accuracy, phonics, reading comprehension and fluency in a single programme. For example, Bunn (2008) reports on the success of Additional Literacy Support, a largely scripted literacy intervention programme aimed at years 3 and 4.

Training reading fluency

Some children can decode accurately, but have difficulties in recalling words quickly enough to read fluently. This is sometimes true for children who have had reading difficulties and have received phonics tuition which allows them to 'sound out' words, but they have not been able to automatise that knowledge sufficiently.

Interventions focusing on fluency alone have a tendency not to show good transfer to new material, meaning that children can be taught to read the specific set of words in the training quickly, but do not generalise that knowledge to words that have not been trained (Hintikka et al., 2008). Some success has been shown for interventions that encourage strategies to break longer words down into syllables and assemble syllables before attempting to read the whole word. Suggate (2014) also suggests that *reading fluency interventions* are less likely to be associated with long term improvements in literacy. For these reasons, it is likely that reading fluency is best developed as part of a broad-based programme which focuses on learning to recognise and understand words in different contexts as well as recognising words quickly.

Literacy interventions in key stages 2 and 3

- In key stages 2 and 3, interventions should include elements of reading comprehension and reading fluency instruction to allow the child to become a fluent independent reader
- It is also useful to provide explicit instruction in vocabulary and morphology, as these can be useful tools in spelling and comprehension
- Interventions should have some flexibility to address the individual strengths and weaknesses of the learner

Literacy skills in key stage 4 and post-16 education

As students grow older, some of the literacy demands they will encounter change. Students are often expected to read and understand complex texts independently, and write essays and reports. Literacy tasks at this stage will often involve planning, organisational and other skills which are related to executive functions, described earlier in this report.

Adaptations

At this stage, there are many adaptations that can help students demonstrate their understanding. The use of *word processors*, *spell checkers* and *voice recorders* can allow students to demonstrate their knowledge more accurately. Assistive technology should always be chosen with the learner as an active participant, selecting support that works well with their strengths and weaknesses.

Interventions

The EEF have recently carried out a review of the evidence on supporting struggling students in the 16-18 age bracket . They highlight small scale evidence for the effectiveness of a wide range of interventions that follow similar principles as literacy interventions for younger students: structured approaches containing elements of word learning, phonics, book reading and linguistics (Boulay et al., 2015). There was also positive evidence shown for studies involving peer mediation, as long as the participants were given training in peer mediation strategies (Wexler et al., 2015). However, study of two interventions in which students were removed from normal English lessons to have catch up literacy lessons did not show significant gains in comparison to students remaining in mainstream classrooms, suggesting that any tuition should be provided in addition to class teaching, rather than as a replacement.

Literacy support in key stage 4 and post-16

- Less strong support for specific interventions for older students, though these can be useful if they are supplemental to mainstream provision rather than replacing it
- Provision needs to be catered around the wishes of the student
- Assistive technology can be very useful in supporting older students

Supporting writing skills

Writing is a common area of difficulty for children and young people with SEND. Effective writing is key to allowing a child to communicate and demonstrate their knowledge. The effectiveness of writing is a mediating factor on academic outcomes and associated life chances and therefore of strategic importance to those with SEND. Students with literacy difficulties usually also demonstrate writing difficulties, and these can be more difficult to resolve than reading difficulties.

Berninger (1999) argues that successful writing depends on a triad of skills: transcription skills (handwriting, spelling and punctuation knowledge); language skills (vocabulary and knowledge of argument structure) and working memory (required to hold information in mind while writing). When pupils are asked to do a task involving writing-by-hand/writing there are several concurrent demands being made of them. The outcome of their work and barriers for access to education encountered in this activity are mediated by any one or more areas of difficulty described below, which may not be immediately obvious. It is therefore important to assess a child's skills in each area. Although the outcomes of almost all pupils' work in mainstream education have a common presentation, most often work completed in school books or on test papers, they are in fact very specific and individual in their formulation. Consequently, deficits need to be explicitly addressed at an individual level. Recognising that there can be multiple levels of developmental need and difference for a child with 'writing difficulties' regardless of whether they are numerical, symbol or alphabetic in form is an essential first step, and while addressing these areas of deficit ensuring that barriers to educational access are mitigated or removed. Information in the Speech and language and 'Thinking Skills' interventions sections. Support for language difficulties and executive function difficulties are dealt with elsewhere in this review.

The sections below outline some evidence demonstrating the complex nature of writing-by-hand difficulties, the impact of technology on this activity, and the broad area of writing. Harris & Graham (2013), studied the transition from novice to competent writer and observed for this process there were many levels of changes and transitions pupils undergo around knowledge about writing, motivation to engage and what was termed writing behaviours.

Support for students with fine motor and handwriting difficulties

Clear, legible and fluent handwriting is necessary to embed spelling patterns (Cunningham & Stanovich, 1990) and also to ensure that a child can adequately demonstrate their abilities in other areas of the curriculum. Handwriting is associated with other tasks that require detailed finger movements, such as using cutlery or scissors accurately, (Smits-Engelsman, 2001), finger gnosis (recognition) (Feder & Majnemer, 2007) and with motor learning, described by Zwicker and Harris (2009) as “a set of processes associated with practice or experience leading to relatively permanent changes in the capability for movement”. As a consequence, studies have shown that both *motor instruction* and / or the *direct teaching of handwriting* greatly increases legibility.

However, problems in ‘bottom up’ visual motor integration and fine motor control do not appear to preclude the development of functional handwriting (Klein et al., 2011), as proprioceptive information and motor learning appear to be the fundamental elements of handwriting (Vinter & Chartel, 2010). Consequently, by school age, current best practice favours a top down approach, focusing on *handwriting practice* and the development of essential motor programs (defined as communications in the central nervous system that are based on past experience and can generate planned postural adjustments and movements, Brooks 1983), as opposed to remediation of motor difficulties (Cramm and Egan, 2015). This *direct instruction* of handwriting has been shown to result in significantly greater legibility and fluency than non-instruction and motor instruction (Santangelo & Graham 2016; Hoy et al., 2011; Feder & Majnemer, 2007; Denton, 2006). More specifically, *hand manipulation* and *kinaesthetic awareness* training have been shown to not be as effective, and sometimes deemed ineffective, without handwriting practice (Datchuk, 2015); with greater than 10 hours of direct instruction being considered necessary (Santangelo & Graham 2016). This can be observed where *kinaesthetic training* has been compared to direct task driven instruction. A study by Weintraub et al (2008) targeted at a sample of 55 children between the second and fourth grades, demonstrated that task driven *direct handwriting instruction*, such as using different writing tools in different activities to consistently practice handwriting, made and maintained significantly more gains in handwriting when compared to kinaesthetic training based on a multisensory program that included making letters from play dough, writing in rice and oral letter stating, with some handwriting instruction. Direct teaching of handwriting can include the following: individualised instruction, using technology, copying models from memory, using self-evaluation, facilitated peer modelling and evaluation, and teaching letters with motor models (Santangelo & Graham, 2016; Case-Smith, 2014).

The top down approach is favoured as best practice. However, visual perception difficulties appear to be associated with the speed of handwriting (Brown & Link, 2016; Poon et al., 2010) and therefore bottom up approaches can be successful in this area.

For example, computerised *visual perception training* increased the speed of handwriting in Chinese first grade children perceived to have handwriting difficulties by their teachers (Poon et al., 2010). Additionally, physical intervention on postural stability and vestibular awareness has also been shown to predict manual skill (Flatters et al., 2016), although the outcome measure in this instance was tracing and not handwriting.

There are also some physical adaptations aimed at bottom up approaches which have proven beneficial (Srivastava, 2016; Zwicker & Hadwin, 2007). Examples here include *Thera bands* to strengthen finger muscles, using paper towels under pages to increase awareness of pressure, using textures to finger trace letter shapes and a slanting desk to support vision and posture. Thus, difficulties in handwriting practice would benefit from consultation between health and educational professionals as this leads to tailored co-teaching and frequent concise feedback (Case-Smith et al., 2014). Interestingly, adapting pencil size and width do not appear to impact writing, despite children in preschool appearing to prefer short skinny pencils and children in kindergarten picking long oversized pencils to write with (Sinclair & Szabo, 2015).

While some handwriting programmes follow goal driven handwriting practice and others have sensory considerations, some programmes include cognitive interventions and are based on learning theories that involve self-instruction and verbal mediation, such as including the ability to name and identify letters, modelling, imitation, discussion and practice (Zwicker and Hadwin, 2007; Graham et al., 2000). An example of such an intervention is the randomised control trial by Zwicker and Hadwin (2007), which assigned 72 first and second grade Canadian children to cognitive intervention, multisensory intervention or a control group. The first-grade children's handwriting improved with or without intervention, however the second-grade children showed a sizeable improvement with cognitive intervention compared to multisensory.

Additionally, it is important that self-esteem is considered in handwriting practice and child directed and self-determined goals used as important motivators (Hoy et al., 2011; Datchuk, 2015). Examples of such incentives have been identified in technology 'treatment media' (Poon et al., 2010) where children have been eager to participate in visual perception and *visual motor integration* training, although this intervention was found to increase speed of handwriting; not legibility. This finding was mirrored in Santangelo & Graham's meta-analytic review (2016) and in a small-scale U.S. study by Wells et al (2016) demonstrating that traditional methods of handwriting practice are deemed more successful in terms of letter recognition and legibility, whereas letter instruction using tablets increased productivity.

Sumner, Connelly and Barnett (2014) and Prunty (2016) have examined the difficulties shown in poor writers using tracking technology. They found that these children could form letters as quickly as typical writers, but were more likely to pause within and

between words. This suggests that writing difficulties are often not explained by difficulties in letter formation but by broader planning difficulties.

Handwriting Support

- Difficulties in handwriting are often associated with difficulties in planning rather than movements
- Evidence suggests that 'top down' or 'cognitive' approaches are most effective – that is, children practicing writing letters rather than working on general motor movements
- This is particularly suitable for younger children.

Developing the content of writing

Torgerson and Torgerson's (2014) examined the effectiveness of a writing strategy approach (instruction that involves explicitly and systematically teaching steps necessary for planning, revising, and/or editing text). This robustly designed study examined one approach, *Self-Regulated Strategy Development* (SRSD). They found a large positive impact on the writing skills of pupils who were not expected to meet the minimum threshold for literacy at the end of KS2. However, this intervention had no significant impact on spelling, grammar or reading, so evidence of transfer was limited.

Andrews et al (2004) found the teaching of grammar was better accomplished by using the strategy of *sentence combining* than formal instruction. Sentence combining strategy is where sentences of increasing complexity are created and grammar and syntactical rules are applied within the activity to achieve this. This is consistent with Graham and Perin's (2004) meta-analysis which found a small statistically significant negative effect on writing for the explicit and systematic teaching of part of speech and structure of sentences. One consideration therefore for children with SEND is to make use of sentence combining strategies to both secure grammar and increase the efficiency and effectiveness of higher order expression. This can aid ability to work within specified time frames by creating less volume of writing to express ideas and thoughts.

Self-regulated strategy development

- Explicit teaching of the steps needed for planning, writing and editing text is effective in improving the writing of children in key stage 2
- Does not generalise to related skills such as reading and spelling

Use of word processors

Graham and Perrin (2004) suggest in a meta-analysis that the use of *word processing* was associated with positive effects in writing quality. The use of word processing may be particularly helpful even at initial stages for pupils who are developmentally delayed in writing-by-hand, as a mechanism for reducing barriers to engaging in aspects of education.

For older students, *word processors* and *graphic organizers* can be a useful approach to support essay writing and planning. Evmenova et al (2016) describes the use of a computer based graphic organizer to help students with learning difficulties prepare and plan essays. They were taught in four sessions how to use the graphic organizer, which made use of metacognition such as explicit goal setting, self-instruction through a mnemonic, self-monitoring using check boxes, self-evaluation and self-efficacy, the latter as self-ratings scores, as well as talking through decisions. The students showed effective transfer of essay writing skill to situations without the graphic organizer after training.

The *graphic organizer* allowed students to construct their essay either horizontally i.e. from goal to one idea to brainstorm around that idea to a single sentence and then build up paragraphs that way, or vertically i.e. from goal to all ideas, to full brainstorm to sequences of sentences forming paragraphs. What was observed was that the planning and writing phase was highly interactive for these students so there was no clear demarcation between planning and writing, and that different students adopted different strategies in using the organiser. This suggests that a prescriptive form of systematic instruction or strategy in which stages of a task are strictly demarcated may have limitations in this group of students.

Word processors to support literacy

- Using a word processor helps even younger children to produce better quality text
- This is likely to be because of the increased opportunities for editing
- Graphic organisers can be a useful way to help older students organise their ideas

Numeracy needs

Dowker (2009) has written high quality reviews regarding what works for supporting children with mathematics difficulties in UK schools. She highlights that difficulties in mathematics can occur for a wide range of reasons, and therefore it is worthwhile carrying out detailed individual assessment of what a child does and does not understand. The usefulness of individualised instruction for struggling students is

emphasised by Fuchs et al (2015), who compared small group interventions with class-based support.

Dowker highlights three different types of mathematical knowledge: factual knowledge (knowledge of number facts such as number bonds and times tables); procedural knowledge (knowledge of how to carry out mathematical operations) and conceptual knowledge (understanding arithmetic operations and principles). Children may have difficulties in one or more of these areas, and each of these areas need to be assessed and supported for children with mathematics difficulties.

Interventions for numeracy

Following the recommendations of the Dowker (2004) report and the Williams (2008) report, a UK intervention programme called *Numbers Count* was developed to target children with significant mathematics difficulties. There is strong evidence that this programme is effective at improving numeracy skills in year 2 children in the UK (Torgerson et al., 2013), and it seemed that individual or small group (pairs or triplets) instruction was equally effective (Torgerson et al., 2012).

Holmes and Dowker (2013) describe positive results from *Catch-up Numeracy*, an individualised intervention delivered by teaching assistants in two fifteen minute sessions per week. The results indicate that numeracy interventions do not need to be intensive or delivered by specialists to be effective, but that it is important they are targeted to the specific level of the learner and follow a structured progression. Strikingly, children who had received the same amount of extra support from teaching assistants without the structured assessment and individualisation did not show significant progress.

Numeracy interventions

- The most effective numeracy interventions are carefully matched to the individual needs of the students
- There is little research on how to support difficulties in numeracy at secondary school and post 16

The role of self-belief

Mathematics, perhaps more than any other area of the curriculum, can be associated with anxiety and negative beliefs, and struggling children often believe that they ‘can’t do’ maths or that they will be unable to improve. Johnstone-Wilder and Lee (2010) show that promoting mathematical resilience can help to improve mathematics attainments, though the study describes a case study of a single secondary school only. Further research is

needed into the role of promoting so-called ‘soft skills’ in relation to mathematics, particularly for older and disaffected students.

Computer assisted instruction for mathematics

Computerised mathematics interventions are widespread, but studies of them are not universally positive (Seo & Bryant, 2009). In a meta-analysis, Kroesbergen & vanLuit (2003) found that computer assisted instruction tended to give smaller improvements than face to face instruction for children with mathematical difficulties. Dowker (2009) emphasises that computer interventions should be seen as an addition to face to face instruction, rather than as a substitute. *Computer assisted interventions* may be more effective when they can individually adapt to the student’s level (Schoppek & Tulis, 2010) and for gaining fluency with mathematical facts (Burns et al., 2012) and procedures, rather than with conceptual understanding.

Computer assisted instruction in counting skills may, however, be a useful early intervention for supporting children at risk of mathematical difficulties. Rasanen et al (2009) found that a computer game that focused on linking numerals with amounts (*GraphoGame – Numbers*) was more effective in improving early mathematics than a game focusing on magnitude comparison (*Number Race*). Praet & Desoete (2014) found that an intervention focusing on counting skills helped at-risk children aged 5 to 6 in their number knowledge and mental arithmetic skills.

Computer assisted instruction for mathematics may be particularly useful for children with additional needs such as attention difficulties (Mautone et al., 2005). A computer interface can be engaging for children who have difficulties in focusing attention.

Computer assisted mathematics interventions

- These approaches can be useful if they supplement teacher-led learning rather than replacing it
- Computer assisted instruction is well suited to providing extra practice in newly taught skills
- It may be particularly suitable for children who have trouble focusing attention

Type of Need 2: Communication and interaction

Speech and language

Speech and language difficulties are a key issue for UK schools. Recent UK research indicates that approximately two children in every class demonstrate a significant language difficulty at school entry (Norbury et al., 2016). Language difficulties are more common in children who are young in the academic year and in children who have behavioural difficulties (Norbury et al., 2015), and children from lower socio-economic background (Meschi et al., 2012). Behavioural and emotional difficulties are associated with language difficulties throughout the school years (Chow & Wehby, 2016; Lindsay & Dockrell, 2012), perhaps because children who have difficulties in understanding instructions and communicating their views are likely to act out in other ways. The prevalence of speech, language and communication needs in the UK school population reduces with age, with around 24% of primary school children on SEN support and 9% of secondary school pupils on SEN support demonstrating this as their primary type of need (DfE, 2016).

These issues were highlighted in a high-profile government review in 2008 (Bercow, 2008), and the following Better Communication research programme (Lindsay & Dockrell, 2012).

Oral language difficulties can be usefully distinguished from speech sound disorder. Speech sound disorder is the term used to describe children who have difficulties in producing particular sounds, or phonemes, within words. Speech sound disorder is relatively common children aged 3 to 5, but speech sound disorder is also particularly responsive to therapy (Baker & McLeod, 2011) and in many cases will resolve by age 6. In most cases, speech sound disorder which is not accompanied by broader language difficulties is only slightly associated with longer term difficulties (most commonly in literacy, Hayiou-Thomas et al., 2017).

Language support in primary schools

Children with difficulties in understanding spoken language and in producing complex sentences are at greater risk of long-term difficulties throughout the curriculum. Language difficulties often go unrecognised as children can try and hide what they do not know.

As part of the Better Communication research programme, Dockrell et al have produced a useful classroom audit tool to ensure that schools are environments where communication is well supported.

There is good quality evidence that *small group interventions* delivered by teaching assistants can improve the oral language skills of children at risk of language difficulties at school entry. For example, Fricke et al (2013) show significant improvements in oral language in children in nursery and reception following an oral language intervention. Bowyer-Crane et al (2008) and Lee and Pring (2016) describe similar findings in reception aged children. All three studies use randomised controlled trial designs, and Bowyer-Crane et al compare results with a treated comparison group taking part in a phonics intervention.

There are some intervention programmes aiming to change underlying brain responses to sounds in order to improve language and literacy outcomes. A recent meta-analysis suggests that some of these programmes are ineffective (Gillam et al., 2008; Strong et al., 2011). Programmes that focus directly on improving language difficulties show better evidence for their effectiveness.

There is some small-scale evidence that *peer tutoring* can be a useful approach to supporting children with language difficulties (Grunke et al., 2016), though this is based on evidence in a specialist school (see also Lego therapy, described in the section on Peer-mediated social skills training).

For more detailed evidence on effective language interventions, visit the Communication Trust 'what works' database.

Oral language interventions

- Good quality evidence that trained teachers and teaching assistants can improve the language skills of children through structured small group interventions
- These interventions normally focus on children in key stage 1 or even younger
- The interventions are often largely scripted, and generally involve explicit teaching of key vocabulary and work on narrative production

The role of the speech and language therapist

Historically, children with speech and language difficulties would be given specialist treatment from a speech and language therapist (SaLT). There is evidence that intervention carried out on a one to one basis with a qualified SaLT is effective (Ebbels, 2014; note that Law et al have also planned an updated Cochrane review in 2017). There is also evidence that children who have received early speech and language therapy, particularly phonological awareness instruction, show better literacy skills later in school (Kirk & Gillon, 2007). However, it is also expensive and in order to provide support for a wider range of children, SaLTs have explored a more consultative model, working with parents, teachers and teaching assistants.

Providing *speech therapy* via telecommunications can be as effective as face to face therapy (Grogan-Johnson et al., 2013), if it is provided by a trained clinician, and there is also evidence that assistant speech and language therapists can be as effective as fully trained SaLTs, and that group therapy is as effective as individual therapy (Boyle et al., 2007). However, these studies do not use teaching staff to deliver speech and language therapy, and a follow up study using the same interventions as Boyle et al but with teaching assistants did not show significant improvements (McCartney et al., 2011). This suggests that models from speech and language therapy cannot be directly transferred to an education setting. It is therefore important to use a programme designed to be delivered by educators rather than speech and language therapists.

Gallagher & Chiat (2009) compared direct *SaLT intervention* with a nursery based group intervention for four-year-old children with significant language difficulties. The group that received nursery intervention performed better than waiting list controls, but less well than those who received direct SaLT input, indicating that specialist tuition is the most effective support for these children, but that classroom based support can also be useful.

This finding is echoed in other studies. Mecrow et al (2010) show that trained teaching assistants can provide effective speech and language therapy in consultation with SaLTs, though it should be noted that this study contained no control group and used an intensive form of intervention (approximately 38 hours of individual tuition for each child).

Language support in secondary schools and post-16

Speech, language and communication is a much less common primary type of need in secondary school. Meschi et al (2012) investigated progression in this group and found that approximately 25% were no longer recorded as having SEN, while 20% of the group changed category to specific learning difficulties or moderate learning difficulties. The needs of significant numbers of these children therefore changes with age, and in many cases underlying language difficulties can present as difficulties with reading comprehension in secondary school.

Effective interventions in secondary school often focus on the link between oral and written language and encourage a focus on understanding and creation of extended narratives, as well as developing vocabulary. This approach has a significant impact on reading comprehension skills (Styles & Bradshaw, 2015; Ward-Lonergan et al., 2016).

An alternative approach for older students is to focus on metalinguistic approaches which involve teaching grammatical rules explicitly. These can focus on different aspects of language and can use different ways of making rules explicit. For example, *Shape Coding* and *MetaTaal* are two programmes that use colours and shapes on written language to indicate different parts of speech (Ebbels, 2007; Zwitserlood et al., 2015). This has been used effectively in a specialist setting, but there is no current research in

which teachers or teaching assistants use these approaches in mainstream schools.

Learning grammar rules through meta-linguistic approaches

- Students are taught a code for different parts of speech using colours or shapes
- Existing evidence focuses on using these for secondary aged students in special schools

Finally, there is evidence that providing training to secondary school teachers in *language modification techniques* can improve outcomes in adolescents with language difficulties (Starling et al., 2012). Teachers took part in 10 small group sessions with a SaLT which focused on ways in which they could modify their oral and written language to support students with difficulties. These included teaching key vocabulary words, presenting instructions explicitly and in separate sessions, and using visual planners to help students organise and sequence knowledge. The training was effective in improving the written expression and listening comprehension of struggling students in comparison to a waiting list control group. This is an approach which could be useful in schools and in post-16 institutions.

Language modification techniques

- Teachers were taught strategies for modifying their language to support students with language difficulties which improved writing and listening comprehension
- Particularly suitable for older students

Social communication

A variety of children may benefit from work on social communication skills. Research studies evaluating the effectiveness of different social communication interventions have typically involved participants with autism spectrum conditions (ASC), due to the impairment in social communication associated with this population. There is currently little evidence investigating the extent to which these interventions are suitable for children without autistic symptomatology.

Interventions targeting social communication skills within school settings have typically focussed on turn-taking, listening, conversational strategies, and emotion recognition, amongst other skills. Existing research suggests that interventions within a child's typical classroom setting produce more positive effects than interventions implemented in pull-out sessions (Bellini et al., 2007). However, in many of these studies, there is reason to be cautious in considering the evidence. Many are carried out in the US, with small sample sizes, and most previous research has been based on interventions carried out

by specialists such as speech and language therapists and psychologists rather than teaching staff.

Finally, there is also support for personalised interventions depending on child characteristics. For example, children with low teacher closeness or high conflict benefited more in areas of social connections if they received teaching-based social skills but individuals with high teacher-child closeness improved more from social skills teaching during naturalistic interactions on shared activities between peers (Kasari et al., 2016). Interventions are grouped below into the following areas: teaching-focussed social skills training, peer-mediated social skills training (including Lego Therapy), video modelling, visual strategies, and technology-based interventions. Although the interventions are grouped in this way, research has also investigated multi-component social skills interventions, which include a variety of methods. However, these are often delivered outside of a school setting and, although they provide some positive evidence, this is not consistent (Bond et al., 2016). Many interventions, particularly those using visual strategies and communication devices, are case studies reporting effects from a small number of participants. This may be due to the necessity for individualised interventions where target skills that are the focus of the intervention differ between individuals. A meta-analysis of 55 single-subject design studies evaluating school-based social skills interventions reported that school-based social skills interventions are minimally effective for children with ASC (Bellini, Peters, Benner & Hopf., 2007). Randomised control trials, well established in other areas of education, have only recently been introduced in social communication research. Future research should continue to adopt this approach.

Teaching-focussed social skills training

These interventions involve direct teaching of social communication skills in individual or group sessions. Group intervention sessions including direct teaching to enable pupils with ASC and their peers to interact more successfully have reported positive effects (Bond et al., 2016). However, many of these have been delivered by clinicians or researchers within a school environment, rather than teachers. Further work is required to understand what training teachers would require to deliver the programmes.

Social Use of Language Programme (SULP) involves direct teaching based around stories, group activities and games. Lessons include eye contact, listening, turn taking, proxemics and prosody. Research has identified a decrease in maladaptive behaviour, and an increase in communication and socialisation following 18 weeks of one hour weekly lessons (Owens et al., 2004). No change was reported in autism-specific social difficulties, nor in direct observations of social behaviour in the school playground.

The *Programme for the Education and Enrichment of Relational Skills* (PEERS) programme (Laugeson et al., 2009) is a manualised direct teaching intervention focussed

on improving friendship quality and social skills among adolescents with ASC. In the majority of studies evaluating the effectiveness of PEERS, the intervention is administered by licenced clinical psychologists, who have undergone thorough training in the intervention, in a clinic-based setting. However, Laugeson et al (2014) introduced the PEERS Curriculum for School-Based Professionals in which teachers are trained to deliver the intervention to adolescent school students. The intervention consists of daily 30 minute lessons for 14 weeks. In this study, significant improvement on a standardised teacher-report measure of social functioning is reported. Specifically, improvements in social responsiveness, social communication, social motivation and social awareness are reported. Adolescents also self-report improvement on social skills knowledge, and frequency of hosted and invited get-togethers with friends. To date, this intervention has only been evaluated in schools outside of the UK.

SKILLS (see Kasari et al., 2016) targets social skills including greetings and goodbyes, nonverbal communication, humour, conversation, perspective taking, emotions, and friendship tips. An evaluation of the intervention reported an increase in peer engagement and decreased isolation during playtime following sixteen 30-45 minute sessions held twice weekly.

Peers Engaged in Effective Relationships-Decision Making (PEER-DM) is designed to teach concepts of peer pressure alongside a four-step strategy for making effective decisions. More effective decision-making responses to situations involving negative peer pressure were reported after the six 30-45 minute sessions involving three-to-four students (Khemka et al., 2016).

The Conversation Club curriculum (Muller et al., 2016) focuses on teaching participants basic skills identified as necessary for successfully engaging in a conversation. These include a) thinking about a conversational partner and remembering what they have said, b) selecting topics of mutual interest, c) maintaining on-topic conversation by asking follow-up questions and making comments, d) demonstrating active listening, e) using attention-gaining strategies to ensure partner is listening, and f) repairing simple conversational breakdowns. The Conversation Club curriculum is a nine-month programme where 14 lessons are repeated over a two-to-four week period until participants acquire the target skill. Research evaluating the effectiveness of the Conversation Club curriculum reported increases in peer-directed interactions, number of questions asked, use of strategies to introduce new topics or extend conversation on existing topics, and attempts at conversational repair. Some evidence for increased use of attention-gaining behaviours was also reported (Muller et al., 2016).

Teacher focused social skills training

- There is a range of effective interventions for improving social skills in children with difficulties in these areas
- Perhaps the approach with the strongest empirical support is PEERS, a programme specifically for use with adolescents.
- Most of these interventions have been carried out in non-UK schools and have been delivered by clinicians rather than teachers

Peer-mediated social skills training

These interventions involve naturalistic group-based activities, which incorporate teaching and demonstration of appropriate social communication skills. There are mixed results regarding whether peer-mediated social skills interventions are more effective than didactic teaching-based social skills interventions, as reported above. When directly compared, some studies report more positive results from peer-led groups (Kasari et al, 2011), while others report the opposite pattern (Kasari et al., 2016). Recent research indicates that these inconsistencies may be due to results being moderated by additional factors such as child-teacher closeness (Kasari et al., 2016). Furthermore, there is support for social skills groups to consist of all children with social challenges rather than mixed groups of individuals with and without social communication difficulties (Kasari et al, 2016). A systematic review of the literature indicated that social skills groups are often delivered as a component of a broader treatment package, thus the effects of social skills groups in isolation requires further confirmation (Reichow et al., 2010). Despite this, studies generally indicate positive results (Bond et al., 2016), with some reporting more inconsistent effects (Reichow et al., 2010).

Lego Therapy (LeGoff, 2004) involves collaborative Lego play, which aims to motivate children to work together by building in pairs or small groups. Children are typically assigned different roles (engineer, supplier, builder) to complete the task of building a Lego project, thus allowing children to practice joint attention, turn taking, sharing, joint problem solving and listening. Studies have reported improvement in participants aged between 6 and 16 years on a) direct observation of initiation and duration of social interaction (LeGoff, 2004), b) standardised measures of autism symptomatology (Gilliam Autism Rating Scale; LeGoff, 2004; LeGoff & Sherman 2006; Owens et al., 2004), and c) maladaptive behaviour (Owens et al., 2004). Gains in social interaction have also been reported in a three-year retrospective study (LeGoff & Sherman, 2006). However, within research studies, administration of Lego therapy has either been conducted by the developer of Lego therapy (LeGoff) or by a professional who attended a week-long training course in the USA led by LeGoff. Therefore, further research is required to determine the extent to which Lego therapy can be administered within a school setting without intensive additional training.

ENGAGE (Kasari et al., 2016) is a naturalistic activity-based intervention was designed to improve social communication skills in groups composed of children with and without ASC. Positive gains in social communication skills were moderated by teacher-child relationship in that children with a close child-teacher relationship benefited more from ENGAGE than a didactic-teaching style intervention.

Peer-mediated social skills training

- Peers can be very effective in helping to improve social skills
- Most of the existing research is based on researchers or clinicians guiding the children
- Social skills work conducted at school is more likely to transfer to other school situations (e.g. play time)

Social Scripts and Social Stories

For students who have difficulties in verbal skills, it can often be useful to link verbal information to visual information (for example, using visual timetables: Betz et al., 2008).

Specific visual strategies that have been used to improve social communication skills include *Social Scripts* and *Social Stories*.

Social Stories are individualised stories that describe social cues in a given situation. They are used to give students, typically students with an ASC, social information about situations they find difficult, to help them respond more appropriately or to help them prepare for new experiences. Perhaps due to the highly personalised nature of Social Stories, most studies examining their use have been case studies. Bozkurt and Vuran (2014) carried out a meta-analysis of these case studies and concluded that there was promising, rather than good, evidence for the effectiveness of Social Stories in teaching social skills to children with an ASC.

Social Scripts involves teaching children who have repetitive phrases or perseverative speech a set of simple phrases or sentences to use in a range of situations. Evidence suggests that these can be useful in some situations. They can help to reduce perseverative speech (Ganz et al., 2008), and to help initiate social interactions (Bond et al., 2016), but they do not seem to lead to a wider variety of speech beyond the taught phrases.

Social scripts and social stories

- Social stories are widely used and guidance on how to write social stories is readily available, however there is mixed evidence for their effectiveness
- Social stories are extremely adaptable as they can be written about any real-life situation
- Suitable for students of all ages as social stories can be made accessible for younger students through the use of pictures or drawings

Other approaches

Video modelling is an approach where a child watches a video of someone modelling a target behaviour and then imitates the target behaviour. The child is then encouraged to use the behaviour in a variety of different situations. The child can watch the video as many times as they want, and videos can be tailored to individual behaviours. A meta-analysis (Bellini et al., 2014) and systematic review (Reichow et al., 2010) report that video modelling is an effective strategy for addressing social communication skills.

Video modelling

- Engaging for the learner and can be watched many times to encourage learning
- Adaptable and easy to create
- Reduces the social demands of receiving instruction on carrying out a task
- Suitable for a range of ages

Bond et al., (2016) report that computer-assisted emotion recognition interventions to develop social understanding have received moderate evidence. *Mind Reading* software is a set of computer-based games and tasks aimed at improving recognition of different emotions through faces and voices. There is evidence that this is effective at improving the emotion recognition of children and adults (Lacava et al., 2007; Golan & Baron-Cohen, 2007).

There is good quality evidence for the use of *Augmentative and Alternative Communication* (AAC) devices with non-verbal students. A meta-analysis has indicated that 89% of studies meeting criteria for best evidence analysis revealed gains in speech, although modest, following AAC interventions (Millar et al., 2006). AAC devices can include communication boards with a series of pictures representing words or phrases, or more complex speech production devices. However, children requiring these levels of support would most commonly have a statement of SEN or an Education, Health and Care plan (EHCP) and therefore we do not provide further details on these.

Type of need 3: Social, emotional and mental health

Social, Emotional and Mental Health difficulties is an overarching term for children and young people who demonstrate difficulties with emotional regulation and/or social interaction and/or are experiencing mental health problems. Children and young people who have difficulties with their emotional and social development may have immature social skills and find it difficult to make and sustain healthy relationships. These difficulties may be displayed through the child or young person becoming withdrawn or isolated, as well as through challenging behaviour. Social, emotional and mental health needs are common in both primary and secondary school, with 16.1% of primary pupils on SEN support and 19.2% of secondary pupils on SEN support having this identified as their primary type of need (DfE, 2016), and there is some evidence that these rates are increasing (Collishaw et al., 2010). Many more students are likely to have social, emotional and mental health needs that are secondary to other types of SEND, and educators should be alert to these needs in students with all types of SEND.

Clarke et al., (2016) conducted an extensive review to determine the current evidence on the effectiveness of programmes available in the UK that aim to enhance the social and emotional skills development of children and young people aged 4-20 years. Many of the findings are outside the parameters of this review, however practitioners may find it beneficial to also refer to this. Providing a positive, consistent and supportive classroom environment is a key element of High Quality Teaching which can help to prevent SEMH problems from developing. School wide or classroom wide SEMH support can be helpful in preventing and reducing issues for a wide range of children with and without SEND, and we begin this chapter by presenting evidence of effective programmes.

For children and young people with identified SEMH needs, it may be necessary to focus on more targeted approaches. Ideally, they would also be supported by the Child and Adolescent Mental Health Service (CAMHS) within the NHS. In any case, there is a need for support within the school environment as well as externally. We go on to discuss targeted SEMH support in the broad categories of supporting behaviour and emotional regulation, and mental health needs.

In some cases, interventions or approaches are more appropriately delivered by mental health professionals with specialist training – clinical psychologists, counsellors or psychiatrists. In these cases we highlight when interventions have been carried out by mental health professionals.

Classroom and curriculum skills interventions

The most common form of universal SEMH support is the use of classroom and/or curriculum skills training to teach skills and competencies. The universal intervention programmes have been developed in UK, US and Australian contexts. They are

designed to enhance children's social and emotional skills and support mental health and wellbeing, and as such have roles both as prevention and intervention. Students involved in universal SEMH support programmes have been found to have significantly improved social and emotional skills, attitudes, behaviours and academic performance (Durlak et al., 2011).

Zippy's Friends is a programme for emotional wellbeing that has been specifically designed to support all children aged between five and eight years old to develop their emotional wellbeing, not just those who have been identified as being at risk. The intervention involves a 24-week programme divided into 6 modules focusing on feelings, communication, relationships, conflict resolution, dealing with change and coping skills. Originally developed in the US, this programme has been evaluated when used in Irish and UK schools. A small-scale study in the UK found improvements in pupils' emotional literacy skills and hyperactivity levels and found both teachers and pupils rated the programme positively (Holmes & Faupel, 2004; 2005). In Norway, an randomised controlled trial found that the programme had a significant positive impact on coping skills, particularly in girls and children from low socio-economic backgrounds, and also on mental health difficulties in daily life, particularly in boys (Holen et al., 2012). An randomised controlled trial conducted in Ireland reported significant improvements in pupils' emotional literacy and coping skills, reduced hyperactivity and improved relationships in the classroom. These results were maintained at a 12-month follow-up.

FRIENDS is a universal CBT-based programme designed to treat and prevent anxiety, improve emotional resilience and teach coping skills. It is a 10-week programme that has been led by health professionals and school staff. Stallard et al (2014) conducted an randomised controlled trial which found significant reduction in anxiety scores for pupils who participated in the health professionals-led group. This improvement was not however replicated in the teacher-led groups. Research has also found that pupils who took part in the FRIENDS programme did not show any difference in educational outcomes compared to those who attended PHSE lessons (Skryabina et al., 2016).

Promoting Alternative Thinking Strategies (PATHS) is a curriculum designed to promote social and emotional thinking in primary schools. It is based on the ABCD (affective, behavioural, cognitive, dynamic) model of development. PATHS is delivered by teachers through weekly lessons and can then be used in activities during the rest of the school day to practice skills. Teachers using PATHS in their classrooms are encouraged to talk about their own feelings and encourage children to think and talk about theirs and others. Research conducted in the US indicates that in school where PATHS is implemented teachers were more often observed to teach children about emotions, support children's expression and regulation of emotions and facilitate children's understanding of peers' emotions (Morris et al., 2014). However, in the UK there has been mixed findings

suggesting that PATHS may not be as effective when implemented outside the US (Humphrey et al., 2016).

Positive Action is a school-wide programme designed for pupils from reception through to the end of secondary school. It is designed to improve students' academic progress, behaviour and character and involves all teachers and staff in schools, parents and the community. It contains 140 lessons per year group which last approximately 15 to 20 minutes which totals 35 hours of teaching. The programme uses interactive approaches between students and teachers including games, role plays and practice of skills. It contains six units focusing on self-concept, physical and intellectual actions, social/emotional actions, getting along with others, being honest with yourself and others and continuous self-improvement. At the present time, there have been no UK evaluations of the implementation of Positive Action in schools. Studies from the US have indicated that participation in the Positive Action programme can lead to reductions in violence, bullying, substance use and disruptive behaviours (Li et al., 2011) and lower absenteeism and suspension rates (Snyder et al., 2010).

Strengths GYM is a class-based programme based on positive psychology to encourage students to build and learn strengths and recognise strengths in others. It consists of in-class exercises, discussion and real-world homework activities where the students apply what they have learnt in their own lives. Proctor (2011) carried out a study with 319 Year 8 and 9 students. The programme has three levels of implementation for Years 7, 8 and 9 with different age appropriate activities for each year group and is delivered through 24 lessons. The results of the study indicated that students who participated in the programme had higher life satisfaction that students who did not.

The *Penn Resiliency Program* is a US group-based cognitive-behavioural intervention. Originally designed to prevent adolescent depression, it now has a broader remit to build resilience and promote realistic thinking. It focuses on supporting young people to challenge negative beliefs, make appraisals of others' behaviours and situations and supports the development of coping mechanisms. It uses 18 hours of workshops led by facilitators who receive intensive training. A meta-analysis found that those who participated in the programme report lower levels of depressive symptoms and this continues for a least 12 months compared to those who did not receive the intervention (Brunwasser et al., 2009). The *UK Resiliency Programme* used the Penn Resiliency Program in UK schools. This found that the impact was stronger for more deprived and lower-attaining pupils and those who started school with worse psychological health, particularly girls.

Circle Time is a programme which is employed by teachers on a day-to-day basis as part of their regular classroom teaching to enhance universal self-esteem of pupils. Miller and Moran (2007) report that students who participated in Circle Time gained in terms of their development of self-worth. *RTime* is a 15 minute weekly whole school universal

intervention which focuses on improving relationships in schools including reducing bullying and raising enjoyment which can improve pupils' ability to engage across a range of curricular areas. This intervention lasts for 30 weeks and can be used for pupils throughout primary school. While containing many similar elements to Circle Time such as reciprocal communication and sharing time together, RTime overcomes some of the barriers faced in Circle Time such as implementation difficulties due to large class sizes through the use of 'random pairs' which avoids waiting time. Hampton et al (2010) found that using RTime can have a positive impact on children's development of relationships and friendships. In addition, the random pairing work not only supported pupils in developing friendships within class but also enhanced their skills in working together and as a team.

Classroom based social and emotional wellbeing programmes

- There is a range of programmes available for both primary and secondary aged children
- Most take the form of regular group sessions working through structured material
- The programmes vary in the extent of training that is required for the facilitators
- These programmes work well to support children at risk of emotional difficulties

Mindfulness training has been found in a recent systematic review and meta-analysis to be an effective intervention for improving mental health symptoms (stress, depression, anxiety and quality of life) in children and young people (Kallapiran et al., 2015). These findings were echoed in a recent systematic review by the Campbell Collaboration (Maynard et al., 2017), although the authors emphasise that the effects are relatively small.

Mindfulness

- Mindfulness can have small, but significant effects on mental health symptoms
- Would need to be delivered by someone trained in mindfulness
- Suitable for students of a wide range of ages

Overall, this research indicates that a range of different programmes can be effective in improving emotional wellbeing at the whole class level, and that this can be an appropriate approach both in primary school and in secondary school. There is some evidence that these approaches can be particularly useful for children at high risk of social, emotional and mental health difficulties.

Targeted SEMH support

As described above, classroom wide approaches are often effective, but some pupils may need a more targeted approach, often working individually or in small groups. We divide these approaches into two broad areas. For some students, the school environment and meeting classroom expectations are problematic, which can present as challenging behaviour. Other students may be experiencing mental health issues such as anxiety and depression, which can be for a wide variety of reasons. While these difficulties may present very differently in terms of observed behaviours, both can have a wide range of (sometimes similar) underlying causes. It is therefore important to identify the underlying causes as well as dealing with the observed behaviours.

Interventions to reduce challenging behaviour

Research studies evaluating school interventions for students experiencing behavioural difficulties are often carried out with children with ADHD, as behavioural difficulties are commonly associated with this group of students. Many of the studies discussed here have targeted children and young people with ADHD to participate in the interventions being evaluated. However, it is likely that the interventions discussed would be suitable for students displaying challenging behaviour for a variety of other reasons as well.

Consequence-based interventions are a common strategy used to address disruptive behaviour in the classroom, with verbal reprimands or removal being most typical. However, an exclusive reliance on punishment-based interventions is rarely effective (DuPaul and Weyandt, 2006). The literature suggests that reprimands are more successful when made in a brief, calm and quiet manner, ideally delivered in private (DuPaul and Weyandt, 2006), and that researchers and professionals should look beyond the child to identify the causes of disruptive behaviours (Humphrey and Brooks, 2006). Schools are encouraged to have a consistent school-wide approach to behavioural support to promote an inclusive environment and ensure children and young people with SEND both achieve and develop a healthy sense of self.

Monitoring and mentoring approaches

A *Daily Report Card (DRC)* or ‘home-school note’ is an evidence-based intervention that helps students change problematic behaviours that interfere with their learning and wellbeing (see Murray et al., 2008). Each day teachers monitor and record on the DRC how the student is doing and provide immediate feedback, praising them and providing guidance and support when needed. The DRC is sent home at the end of each day for parents/carers to read and sign. The intervention involves having a reward system in place at home to encourage the positive changes being made (e.g. extra play time or gaming time). Although DRCs are used in UK schools the following evaluation studies were carried out in schools outside of the UK.

A randomised controlled trial found students within a treatment group using DRCs for one school year significantly improved their classroom behaviour compared to a non-intervention group. The study did not find any significant difference in academic achievement. Therefore, for students who also need academic support, DRCs should be used alongside evidence-based academic interventions (Fabiano et al., 2010). It seems that either teachers or parents can deliver the rewards (Palcic et al., 2009), suggesting that the key element is the immediate teacher feedback in lessons rather than the later rewards.

Another study looked at DRC adherence over the course of a year to see how sustainable DRCs are as an intervention. Adherence was relatively stable throughout the year, although teacher adherence increased slightly around monthly research observation visits when adherence was being assessed (Vujnovic et al., 2013). Therefore, best practice would be for SENCOs or Student Support Teams to support teachers using DRCs to ensure adherence and consistency are maintained.

Check and Connect is an evidence-based intervention for students displaying signs of disengagement and those at risk of dropping out of education. The Check and Connect mentor (support staff) meets with the student at least weekly to monitor attendance and progress, and put specific interventions into place to meet the needs of the student. Although Check and Connect is a US intervention it is available to purchase as a manualised intervention. A randomised controlled trial found that Check and Connect students (144 students aged 14-15 years) were statistically significantly less likely to have dropped out of school at the end of a four-year follow-up year (Sinclair, 2005).

Monitoring and mentoring approaches

- Easy to implement and successful if used consistently
- Information on creating a DRC is freely available
- Suitable for students of all ages within primary and secondary schools, and possibly suitable for colleges if adapted
- Provides consistency, which is often much needed for students with SEN

Social skills training

Social skills training teaches students interpersonal skills (e.g. listening skills, verbal communication, working in groups etc.) to help them relate better to other people, respond more appropriately in social situations, and read social cues more effectively. These types of approaches are very similar to those described in the Social communication section above, and we recommend reading this section as well.

In a recent meta-analysis, Gresham (2015) found 65% of students aged between 3 and 18 years experiencing social and emotional difficulties showed improvement after attending social skills interventions. Nearly all the studies included in the meta-analysis were suitable for individual or small groups of students, but there was a lack of empirical studies for universal social skills interventions or intensive interventions for students with severe SEN needs such as autism, intellectual difficulties, or severe antisocial behaviour patterns (Gresham, 2015). Some educators believe if social skills training is not received early enough behaviours become entrenched in older students and intervention is ineffective. Howver, Cook et al (2008) refuted this in a meta-analysis of social skills training for secondary students (aged between 11 and 19 years) and found a 66% improvement rate for students receiving social skills training compared to a 34% improvement rate for students in the control group.

The following studies have been grouped together under the category of social skills training as they are evidence-based interventions that target specific areas of social-emotional development.

Cognitive-behavioural anger management (CBAM) is an 'umbrella term' for a range of interventions that teach children and young people cognitive and behavioural skills and techniques to understand anger and manage this emotion more effectively. A meta-analysis found CBAM interventions were an effective intervention for children and young people with anger-related difficulties (Sukhodolosky et al., 2004). Humphrey and Brooks (2006) assessed the effectiveness of a 4-week CBAM intervention (6 one hour sessions) that was delivered in a UK secondary school to 12 young people between the ages of 13 and 14 at risk of exclusion. The programme taught strategies and problem-solving skills to enable the students to control anger more effectively inside and outside of school. The study found a significant reduction in emotional outbursts, conduct, hyperactive/inattentive behaviour and prosocial behaviour during the course of the intervention. At 4-week follow up all domains other than hyperactive/inattentive behaviours were maintained (Humphrey and Brooks, 2006).

Cognitive behavioural anger management

- Needs to be delivered by a practising therapist
- Suitable for secondary school aged students
- Can be delivered as a group intervention

RAPID Cognitive-Behavioural Therapy Program for Inattentive Children is discussed in more detail in Supporting attention and on-task behaviour section above. It is mentioned here again because it also teaches students techniques to improve self-regulation skills, emotional control, social-perspective taking, listening skills, problem-solving skills, and an awareness of how thinking and emotions affect their behaviour. The students who

attended RAPID reported that the intervention had impacted positively on their interpersonal relationships with both their family members and/or peers. Parents most frequently rated emotional control as being most improved after intervention.

RAPID

- Suitable for improving social skills and interpersonal relationships
- Suitable for students who are also experiencing attentional difficulties, see 'Attention and on-task behaviour' section
- Teachers and a SENCO delivered the intervention after attending a 3-day training programme

The Support Group Initiative is a programme devised and implemented in a Scottish secondary school over a 4-year period. Support groups consist of 4-6 students that have been identified as experiencing difficulty in coping with the constraints of school life (Mowat, 2010a; 2010b). Students meet weekly for one hour for half the school year with a Support Group Leader (pastoral care/support staff). Mowat (2010a) conducted an evaluative study to investigate the effectiveness of Support Groups to help students develop intrapersonal skills, emotional intelligence, emotional regulation, forming and maintaining good relationships, empathy, self-esteem and confidence, and a positive disposition towards learning. Post intervention assessments found that the frequency of school referrals for the support group students was reduced to a significant extent. Although the frequency of school suspensions was not reduced, there was a significant reduction in the duration of suspensions, indicating that the severity of difficulties had lessened.

Support groups

- Support groups can help students feel less isolated and encourage them to talk openly and honestly about their experiences and feelingsEncourage students to talk openly and honesty about their experiences and feelings
- A holistic way to help students support each other
- Suitable for older students

Exercise interventions

The following section examines the effectiveness of exercise on a range of behaviours that can be barriers to learning for many students. A recent meta-analysis found that aerobic exercise had a moderate to large effect on attention, hyperactivity, impulsivity, anxiety, executive function and social difficulties, and that yoga was found to reduce the core symptoms of ADHD (Cerrillo-Urbina et al., 2015). A recent systematic review found that physical activity improves behaviour, cognitive function and increases attentiveness,

with some studies also demonstrating benefits in specific subjects such as mathematics and English (Reeves et al., 2016).

Physical activity was found to have a positive impact on behaviour and cognition for students involved in a moderate-high intensity physical activity program three times a week for 45 minutes during lunchtime for 10 weeks. The study found post-test differences in attention, behavioural difficulties, and in social difficulties and isolation as it gave students with ADHD the opportunity to practise appropriate behaviour and improve social relations (Verret et al., 2012; see also Kang et al., 2011; Smith et al., 2011 for similar findings).

Yoga was found to have a calming effect and reduce restlessness, impulsivity and inattentiveness in boys who had weekly yoga sessions over 20 weeks compared to boys who did not (Jensen & Kenny, 2004).

Exercise interventions and yoga

- Suitable for students of all ages across all educational settings
- Yoga may need to be 'bought-in' if a member of staff is not trained.
- Good evidence to suggest exercise interventions are effective for students with a diagnosis of ADHD and students experiencing the core symptoms of ADHD without diagnosis

Interventions to support mental health

Anxiety and depression are among the most prevalent psychological issues faced by children and young people and have been linked to on-going issues in adulthood if not treated. For many children and young people, accessing support for anxiety and depression issues can be difficult and over the past decade there has been increasing interest in incorporating interventions and support into educational settings.

Cognitive-Behavioural Therapy for depression and anxiety

Cognitive-Behavioural Therapy (CBT) can be effective in reducing symptoms of depression and anxiety in young people (Hofmann et al., 2012). There has, however, been interest in how effective such support is when transferred from clinical to school or college settings. Education settings are a potentially favourable location for providing interventions for pupils with anxiety and depression as they are accessible, familiar settings and reduce the need for absence. Mychailyszyn et al (2012) conducted a review of how effective school-based CBT interventions were in reducing anxiety and depression symptoms in young people. They found that anxiety interventions were moderately effective and depression interventions were mildly effective. Those targeted

at students who had been identified as being at risk of depression and anxiety were more effective than universal interventions. The effects were no longer present at 12 month follow up, showing the need for ongoing support.

It was reported that interventions delivered by school staff were as effective as those delivered by the research team which supports the use of such interventions in school settings.

Computer-based CBT

There has been much interest in the use of *computer-based Cognitive-Behaviour Therapy* interventions in schools. CBT is commonly recommended for children and young people with anxiety or depression, however there can be barriers such as lack of training, funding or resistance from the young person to access face-to-face therapy sessions. Computer based methods have proved popular with young people and would appear to provide a cost-effective means to help a wider population.

A review of *computer-based CBT* interventions found that, in young people aged between 12 to 25 years with a risk of diagnosed anxiety or depression, computerised CBT had small, but significant, positive effects (Ebert et al., 2015). In a wider population without risk of diagnosed anxiety or depression there were also small positive effects. For children aged between 5 to 11 years there was uncertainty regarding the effectiveness of such interventions (Pennant et al., 2015).

An example of a computer-based CBT approach for reducing and preventing symptoms of anxiety and depression is the Australian intervention *MoodGYM***.** It is a self-directed intervention which uses CBT techniques and contains five modules. Calear et al (2013) conducted an randomised controlled trial involving 1477 students aged between 12 to 17 years. The MoodGYM programme was delivered by a class teacher over a 5 week period (one module per week). The study found that those students who had high adherence to the programme (who completed at least 20 out of the 29 activities over the 5 weeks) showed greater intervention effects for anxiety and depression. The study also found that pupils who lived in rural areas and who had reported higher levels of depressive symptoms were more likely to adhere to the programme. It was suggested that pupils who lived in rural areas may have had less access to mental health services which therefore encouraged their participation. Furthermore, teachers in these areas may have been aware of the lack of services and therefore supervised the implementation of the programme more thoroughly. Those pupils with high levels of depressive symptoms may have adhered to the programme more due to the increased relevance and potential benefit to them. The benefit of MoodGYM is that, unlike many other universal programmes, it is available to students who are at secondary school and college level.

Computer based CBT

- More suitable for older students
- Accessible for students in a wide range of locations and situations.
- Cost effective and do not require specialist training for teachers

Child-Centred Play Therapy (CCPT) is a mental health intervention which focuses on the relationship between the therapist and child as the primary healing factor. It is targeted at children aged between 3 to 12 years and while it can be conducted in a school setting, it does require a trained therapist. A meta-analysis conducted by Ray et al (2015) found that CCPT is an effective intervention in school settings in terms of externalising behaviours and academic outcomes. The mean number of sessions that were required was 12 and it has advantages in that it is possible to intervene with children at much younger developmental levels.

Child centred play therapy

- Suitable for primary school children
- Effectiveness is well established
- Requires a qualified therapist to administer it

Type of need 4: Sensory and/or physical disabilities

In the SEND Code of Practice sensory and / or physical needs are categorised as one of the four broad areas of need and support. This is a wide ranging category including children and young people with physical disabilities, vision (VI), hearing (HI) and multisensory impairments (MSI). We have chosen to also include in this area the following needs: co-ordination difficulties (including both fine motor difficulties such as handwriting and gross motor difficulties), and sensory processing difficulties (often, though not always, associated with autism spectrum conditions (ASC). Approximately 2.2% of children on SEN support have physical disabilities as their primary type of need, while 1.9.% have a hearing impairment, 0.9% have a visual impairment and 0.2% have a multi-sensory impairment. Because some of the needs covered are relatively rare, schools may have little experience on how to support children with these specific needs.

The impact of sensory processing, coordination, sensorimotor difficulties or impairment of the senses not only hinders learning and cognition but can have a pervasive and serious effect on the emotional wellbeing of children and young people, and further impacts life chances in adulthood (Gagnon-Roy 2016). In the following sections, we first address motor difficulties (both in terms of gross motor difficulties and fine motor difficulties), visual impairment, hearing impairment and sensory processing difficulties

High Quality Teaching and adaptations for motor difficulties

For many individuals with physical needs, physical adaptations in the environment are very effective ways to ensure learning is accessible. In many cases these do not require research evidence as their effectiveness is immediately obvious. These could include: ramps, writing slopes, stand / sit stations, spring-loaded scissors and pencil grips. Considering purposeful adaptations using the M.A.T.C.H acronym can have considerable benefits: Modifying the task; Altering expectations; Teaching specific strategies; Changing the environment; and Help by understanding (Missiuna, 2004). It is often assumed that such adaptations are universally employed as aids in physical conditions. However, without a firm understanding of the difficulties children and young people with physical needs face in the classroom, these aids will be less effective. Providing adaptations with support from a specialist professional is likely to be the most effective approach.

The Dyspraxia Foundation also provides guidance on supporting children with coordination difficulties within the classroom, which is useful regardless of whether or not a child has a diagnosis of dyspraxia. This guidance is separated out by type of difficulty experienced by the child, for example difficulties with balancing, self organisation, bumping into people or objects, handwriting or getting dressed.

In addition to physical adaptations, assistive technology is also useful within the classroom. When taking the child's age into account the following technologies can be beneficial: touch typing (which is shown to improve legibility and motivation; Klein et al., 2014); ergonomic keyboards; predictive text; speech to text and mind mapping software; and assistive APPs such as those that allow information to be typed directly on to worksheets (such as *SNAP TYPE*) and those that help line up columns in mathematics (such as *MOD MATH*). However, it should be observed that the use of assistive technology does require extensive training and supportive environments.

As children grow older, it may be most effective to focus support around specific functional goals selected by the child. For example, considering from the child's perspective: a specific social interaction problem, a particular loop in handwriting that is impeding letter formation or a particular sporting activity, and then identifying and developing the sensory and motor behaviours and procedures that support the activity (Schaaf et al., 2014).

Support for students with gross motor difficulties

Children who have difficulties with coordination struggle to engage in activities that form an essential part of child development. Such activities include not only educational tasks, but also the taking part in and understanding social activities, and adapting functionally to home life (Wang et al., 2009). Research has indicated that the participation in childhood and educational activities impacts cognitive, affective and physical development (Mandich et al., 2001). Moreover, many children with atypical coordination also display challenging behaviour and attention difficulties (Tsai, 2009), where motor problems can go unnoticed (Rivard et al., 2007). Yet, children who do not have their coordination needs supported often have on-going academic and social frustration and go on to have mental health challenges (Gagnon-Roy, 2016), and are more likely to live with their parents in adult life when compared to children with other learning difficulties (Kirby et al., 2008).

The prevalence of gross motor coordination difficulties should be considered. In Europe it is thought that the current prevalence of Developmental Coordination Disorder or Dyspraxia is between 5-6% of children, although other quoted percentages fall between 5-20% (European Academy of Childhood Disabilities Guidelines, 2011). In addition to this, motor coordination deficits are often found to be co-occurring in other neurodevelopmental conditions such as ADHD, language impairment, ASC, sensory processing disorders and specific learning difficulties such as dyslexia. Furthermore, conditions such as prematurity, cerebral palsy, traumatic brain injuries and malignancies also present with severe motor difficulties.

In a similar pattern to fine motor skills, early intervention that helps support the underlying processing deficits and facilitates neuromaturation are recommended as minimum 'best practice' (Baranek, 2002; Blauw-Hospers et al., 2007; Goodway & Branta, 2003), and

historically this pathway to intervention has continued through school age. However, at this stage, current research favours approaches that focus more on the acquisition of specific skills based on child chosen functional goals (Mandich et al., 2001; Cacola et al., 2016; Sugden & Chambers, 2007). Such remediation suggests that intervention needs to be functional, goal-based, structured, errorless and non-generalised (meaning that learning needs to be practised in different environments and conditions; Jackson, 1999).

One such approach is *CO-OP* (Rodger & Bradenburg, 2009). CO-OP is a task-orientated problem-solving approach that has three main objectives: skill acquisition in a child chosen task; development of cognitive strategies to acquire and apply the task; and the ability to generalise and transfer the learned skills to various scenarios and applications (Missiuna et al., 2001), where skill acquisition is achieved in stages, first with verbal guidance from a therapist, then self-dialogue and eventually on to independent application (Polatajko & Mandich, 2004). In a Canadian pilot study, targeting twenty 7-12 year olds, CO-OP intervention was compared to more traditional methods focusing on the 'bottom up' motor aspects of skill acquisition, such as the multi-sensory and biomechanical approaches. The results demonstrated the child task directed CO-OP approach had greater benefits and more long-term gains (Miller et al., 2001). This method was also found to be beneficial in a UK based longitudinal cross-over intervention study by Green et al (2008), where one hundred children aged between 5 and 10 years old received CO-OP. This finding was reiterated in a critical review by Armstrong (2012) where CO-OP was found to be the most effective method of improving occupational performance. Such child centred approaches may also be underpinned by the Self Determination theory where the interpersonal behaviour of significant others in the child's life (such as parents and teachers) have the ability to influence the child's motivational behaviour, both intrinsically and extrinsically (Katartzi & Vlachopoulos, 2011).

CO-OP

- Effective in improving motor skills
- Flexible approach suitable for a wide range of tasks
- Should be delivered by a trained therapist

However, as for fine motor skills and handwriting, despite top down approaches showing more promise at school age, bottom up approaches should not be discarded, as a longitudinal study over a period of three years based in Sweden demonstrated improvements in motor skills and attention with extended physical activity and motor skill training (Ericcson 2008). Furthermore, a 10 week table tennis training programme, based in a Taiwan school setting, showed significant improvements in motor and cognitive function in children aged 9-10 years of age with coordination difficulties (Tsai, 2009). Physical Education lessons that focus heavily on balance training, such as controlled

jumping, rotations and trampolining, have also proven to be significantly effective in improving motor function by reducing movement flaw, side asymmetry and redundant movement while improving body posture, contraction, force, rhythm, balance and body stability (Giagazoglou et al., 2015).

Exercise training programmes

- Suitable for a wide range of ages and abilities
- Engaging and fun for the pupil
- Evidence suggests it is beneficial, though not as beneficial as other approaches

Attention to balance within *interactive video games*, now a pervasive part of modern society, has also been successfully explored. For example, in a study based in the Netherlands recruiting forty-eight children aged 6-12 years of age, balance was the specific focus, such as video games that require the use of a balance board. This study showed significant improvements in balance, bilateral coordination, speed and agility (Jelsma et al., 2014). However, technological intervention has also been used as a potential task driven intervention, that increases opportunities to practice motor skills and thereby influence overall movement outcomes as opposed to centring specifically on balance (Straker et al., 2015). In these trials participants were encouraged to play a number of motion-based games that involved both upper and lower limb movements, in addition to both fine and gross motor skills. Results demonstrated that despite perceived differences in motor skills from the participants, no significant gains were achieved. A similar study demonstrated that motion based video games did not improve objectively measured physical activity and sedentary time in these children (Howie et al., 2016).

As parents and educators often have a limited understanding of identifying and supporting a child's specific coordination needs, many interventions involve input from professionals who can help children achieve a purposeful activity or functional outcome (Watemberg, 2007). A scoping review by Camden et al (2015) discusses the need to organise these services efficiently to increase awareness, define the graduated approach and work collaboratively with parents and educators to offer evidence based interventions, as best practice. Further studies have demonstrated that the teaching principles associated with physical and occupational therapy underpin motor skill acquisition, such as being able to give clues to adjusting body position in order to perform a task or sharing knowledge about executing movement in a certain way. Such knowledge transfer further supports the aforementioned cognitive approaches, such as CO-OP, where therapist knowledge is considered a pre-requisite for the use of the cognitive strategies involved (Niemeijer et al., 2006). However, time constraints and funding can make such collaboration ambitious and so exploring knowledge transfer systems and partnerships that are both effective and economical is vital when considering value for money. Online training has been trialled in Canada, where a self-

help tool was designed to give parents information on coordination difficulties in different environments, in addition to strategies to support their children to improve skills, and then transfer these skills to those involved in their care. Understanding, changing attitudes and trialling strategies were the main outcomes of the self-help tool (Camden et al., 2016). However, such systems to disseminate and impart knowledge are known to have high attrition rates, in addition to perhaps generating resentment between educators and parents (who are sometimes not recognised or regarded as the professionals). Three way partnerships, between parent, educator and therapist have been identified in a Partnering for Change (P4C) Model (Missiuna et al., 2012). In this model, the child remains the centre of focus, however as opposed to the therapist becoming directly involved, the emphasis is on coaching teachers to increase their awareness of and ability to support children with coordination impairment. Thus, the model is based around the imparting of knowledge and research about the needs of the child.

Support for students with sensory processing difficulties

Atypical sensory reactivity has a widespread impact on daily life skills and has a high prevalence rate in a number of childhood conditions, including ASC, ADHD, developmental coordination disorder and sensory processing disorder. While atypical sensory processing can be hard to identify for an inexpert, a number of books are rich in examples of how to recognise symptoms and make reasonably straightforward adaptations to help reduce sensory reactivity in the classroom, such as chewellery, diffuser necklaces, textured materials and ear plugs. Furthermore, a number of National Health Service Occupational Therapy guidelines are also available and are often divided into the type of sensory processing difficulty present.

Sensory interventions to address such difficulties fall into two broad categories: *Ayres Sensory Integration* (ASI) and *Sensory-Based interventions* (SBI), where ASI targets neuropsychological mechanisms that process sensation and SBI uses a number of strategies that use sensory input to effect behaviour change (Watling & Hauer, 2015). Literature to support these as evidence-based programmes is still in its infancy and more classroom based studies are needed. However, a recent review by Watling & Hauer (2015) found moderate evidence that intensive and individualised *Ayres Sensory Integration* improves functional outcomes. Moreover, as with coordination, if the individualised programmes are tailored around a specific goal, the impact is greater still (Schaaf et al., 2014; Case-Smith et al., 2015).

A pre-and post-test study in Iran, targeted at thirty-four children aged 4-8 years of age, demonstrated that sound therapy could reduce symptoms for children who display atypical auditory sensitivity such as poor registration, hyperacusis or tinnitus, (AbediKoupaei et al., 2013). *Sound therapy* has also been shown to enhance spatial-temporal performance (Jenkins, 2001), visual-motor integration (Hall & Case-Smith,

2007) and reduce postural sway (Ross & Balasubramaniam, 2015), although the latter study was carried out on adults without sensory processing difficulties. Sound therapy involves listening to some filtered sounds, such as sounds of the mother of the child, Mozart's music or white noise (Ross & Balasubramaniam, 2015). A study based in Hong Kong, has also demonstrated that visually, ambient prism lenses, which have a pair of wedge prisms as opposed to refractive lenses, can support posture and have a positive impact on behaviour in children (Carmody et al., 2001).

As mentioned previously, a number of books and guidelines from professionals are available that can help teachers support children with sensory processing needs. However, a child's sensory profile is specific to the individual, consequently, a 'one size fits all' approach is not possible. Recognising how specific aspects of a child's sensory reactivity impacts on their education, social awareness and daily life can channel precise support where it is necessary. Therefore, further evidence based studies on interventions focussing on some of the common overriding everyday themes of children with sensory processing disorders, are essential in order to help integrate these children into classroom life and alleviate the many demands on the child as they sit in a lesson, even before they begin to learn.

Supporting students with visual impairment

Teaching a child or young person who has impaired vision can bring with it new challenges for teachers within a mainstream school, however with training and an understanding of the difficulties these students face, it is possible for inclusive practice to occur and for these children to progress through the education system alongside their peers. Adaptations, such as Braille, have an immediately obvious impact on how these children and young people can access the curriculum. However, as with all types of SEND, it is also important to consider the child's social and emotional wellbeing as part of their package of support.

The classroom environment

The Royal National Institute for the Blind (RNIB) provides useful guidance on supporting children and young people with visual difficulties within the classroom. This guidance is divided by age (including students accessing Further Education) and national curriculum subject.

For example, the lighting, windows and wall displays in a classroom can have a significant effect on how well a pupil with visual impairment can move around the space. When communicating with pupils, using their name first allows the visually impaired child to be aware when you are talking to them. It is important to recognise that a visually

impaired child might not have access to non-verbal communication such as eye contact, which can make it more difficult to communicate effectively.

Unfortunately, while high quality ‘best practice’ guides exist, as described above, there is relatively little direct research evidence about high quality classroom teaching to support pupils with visual impairments. Nonetheless, evidence based best practice includes teaching pupils with VI within the mainstream classroom and not as a parallel lesson alongside and adapting the curriculum to encourage social participation of the student, helping to develop their social skills (Davis & Hopwood, 2002). An example of such teaching could be to include trained peer tutors who are able to provide instruction, feedback, support and monitor their tutees’ behaviour. Such peer mentoring has been shown to increase the scores and confidence of children with vision difficulties (Wiskochil et al., 2007). However, perhaps the most important pre-requisite of teaching a child with vision impairment is for the teacher to work with professionals with specialist knowledge, which can be filtered down to those who work with the child (Douglas et al., 2011; Davis & Hopwood, 2002).

Adaptations

Often assistive technology is utilised to help children and young people with vision impairment. Examples include screen-reading or text-to-speech software, scanners with OCR (Optical Character Recognition) and refreshable braille displays, large font size and filtered backgrounds. However, a number of studies have demonstrated that the impact of such software is often associated with the knowledge level of those who use it, with teachers highlighting the importance of adequate training (Wong & Cohen, 2016). Also, updating information and communication technologies regularly is essential as technology changes rapidly (Fichten et al., 2009).

Although adjustments within the classroom are crucial (such as adjusting light, considering furniture placement, having large print) / Braille and talking books) to enable access to the curriculum, Douglas et al (2011) noted that teachers educating children with visual impairment should also ensure that the children themselves are suitably equipped to independently access resources.

Supporting students with hearing impairment

In recent years, recognition and support for children with hearing impairment has improved considerably, with newborn hearing screening picking up many children with hearing loss at birth, and hearing aids and cochlear implants becoming much more widespread. Hence, many children who might previously have been unable to access spoken language can now perceive and produce speech well. These children might have been educated in specialist schools in the past, but now typically access a mainstream

curriculum. However, that is not to say these children do not face difficulties in the classroom. Children with all types of hearing loss (whether mild, moderate, severe, profound or transient) are at increased risk of having speech, language and communication needs (Dalton, 2011), and these needs should be supported as necessary.

The National Deaf Children's Society (NCDS) provides useful information on supporting children with hearing loss within the classroom, including a series of commissioned research reports.

High Quality Teaching

It is important to remember that while children and young people with hearing loss may be able to perceive speech well in quiet, one to one settings, hearing and understanding in a classroom setting can be much more demanding. This is true for students with mild and moderate hearing impairment, or transient hearing impairment due to glue ear, as well as for students with severe or profound hearing impairment (Archbold et al., 2015). As with visual impairments, schools should work closely with specialist teachers of the deaf to ensure the support provided is of the best quality.

The classroom environment

There is evidence that creating good listening conditions in the classroom will have wide benefits, improving the learning of children and young people with all types of hearing loss, including mild and moderate hearing loss and transient hearing loss due to glue ear. It is also likely to help children who have difficulty focusing their attention (Dockrell & Shield, 2006). A National Deaf Children's Society report described measures that are most likely to be effective. These include reducing reverberation in classrooms by using carpeting and fabric wall displays, using soft pads on chair and table legs. There is also evidence that using a sound field classroom amplification system can improve academic performance across the class (Taub et al., 2003).

Students with hearing impairment in Further Education

The majority of deaf school leavers go on to further education in the UK, but statistics suggest that they often do not progress well in this environment, with many students dropping out or gaining no qualifications. A recent research report (Young et al., 2015) suggests that it is important that students with hearing impairments should be given *student-centred support*: in other words, the student is given whatever tools are needed to communicate effectively and is aware of all the possible options and support available to them, and is given structured support for both educational and emotional development.

Adaptations

There are some straightforward things that teachers can do to support children and young people with hearing loss. For example, ensure that the teacher is well lit and facing the student to maximise the chances of successful lip-reading, and ensure that they can use any hearing loops or similar equipment easily. It is also useful to ensure children with hearing difficulties are seated at the front of the class and away from environmental noise sources (e.g. ventilation systems, traffic noise).

Cued speech

Cued speech is a system of hand gestures used to disambiguate speech sounds for individuals who are speech reading (lip-reading). There is a body of good quality research in France and elsewhere (Bouton et al., 2011; Leybaert, 2003) suggesting that cued speech is a useful way to improve spoken language and phonological awareness, though at present this is not widely used in the UK. LeBlanc (2004) describes the successful use of cued speech in an American school.

Interventions

Literacy interventions

Children and young people with hearing loss typically have difficulties with a range of oral and written language skills, even if they are using hearing aids or cochlear implants (Vermeulen et al., 2012). Nonetheless, they are able to learn spoken language, and this is beneficial for learning to read (Bergeron et al., 2009). There is evidence that young children with moderate to severe hearing loss, but some speech perception skills, can benefit from an intervention that combines phonics and vocabulary tuition with dialogic storybook reading (Lederberg et al., 2014). Children with hearing loss can also benefit from input from specialist speech and language therapists (Herman et al., 2015).

However, it remains the case that many deaf adolescents show low literacy attainments (Harris & Terlektsi, 2011), even those who have had cochlear implants in the first few years of life. It seems that even children who have made good early progress start to fall further behind their peers in secondary school (Geers et al., 2008). There is an evidence gap in terms of understanding how to best support adolescents with hearing impairment.

Language interventions

It is established that the levels of English vocabulary a child with hearing impairment shows is a key predictor in their academic progress (Maybery et al., 2011). Messier & Wood (2015) show that e-books with embedded word definitions can be an effective tool in increasing vocabulary in children with cochlear implants.

The Nuffield Foundation (2009) describe an approach to reading and language for deaf children that focuses on increasing morphological knowledge. It is well established that teaching morphology is a useful approach to teaching literacy for hearing children, and as learning morphological spelling patterns does not depend on phonology to the extent that learning phonics does, one might expect this would be an effective approach, but unfortunately research on this programme has not yet been published in a peer-reviewed journal.

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Any enquiries regarding this publication should be sent to us at: gemma.coleman@education.gov.uk or www.education.gov.uk/contactus

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