

Accepted version of paper published in Journal of Attention Disorders
2015 DOI: 10.1177/1087054715573994

Non-pharmacological interventions for ADHD in school settings: An overarching synthesis of systematic reviews

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Acknowledgements

Preparation of this manuscript was supported in part by a grant from the National Institute for Health Research Health Technology Assessment (NIHR HTA) programme (project number 10/140/02) and the NIHR Collaboration for Leadership in Applied Health Research and Care South West Peninsula (PenCLAHRC). The views and opinions expressed therein are those of the authors and do not necessarily reflect those of the HTA programme, NIHR, NHS or the Department of Health.

We would like to thank various researchers who assisted the systematic reviews, in particular Rebecca Whear, Tamsin Newlove-Delgado, Obioha Ukoumunne, Chris Morris, Brahm Norwich, Paul Cooper, Eric Taylor, Rebecca Abbott, Daniel Racey, Jeni Reeve and Rosina Kyeremateng. We are also grateful to a range of parents and practitioners who either attended workshops or gave electronic feedback during the course of the project.

Abstract

Objective: This overarching synthesis brings together the findings of four systematic reviews including 138 studies focused on non-pharmacological interventions for ADHD used in school settings. These reviews considered the effectiveness of school-based interventions for ADHD, attitudes towards and experience of school-based interventions for ADHD, and the experience of ADHD in school settings. **Method:** We developed novel methods to compare the findings across these reviews inductively and deductively. **Results:** Key contextual issues that may influence the effectiveness and implementation of interventions include the relationships that pupils with ADHD have with their teachers and peers, the attributions individuals make about the etiology of ADHD, and stigma related to ADHD or intervention attendance. **Conclusion:** Although we found some positive effects for some outcomes and intervention categories, heterogeneity in effect size estimates and research evidence suggests a range of diverse contextual factors potentially moderate the implementation and effectiveness of school based interventions for ADHD.

Keywords: ADHD; intervention; school; non-pharmacological; overarching synthesis; systematic review

Non-pharmacological interventions for ADHD in school settings: An overarching synthesis of systematic reviews

The effectiveness of ADHD medication is well established (Faraone & Buitelaar, 2010); however, drug treatment may be declined or poorly tolerated, there is low long-term compliance and not all young people fully respond (Jensen, 2000). Non-pharmacological interventions are, therefore, an important part of any comprehensive treatment plan for ADHD (National Collaborating Centre for Mental Health, 2009). The core symptoms of ADHD affect a child's functioning in an educational environment and are associated with a number of adverse school outcomes including lower grades and exclusion (Loe & Feldman, 2007). The education system therefore plays a front line role in the identification and management of ADHD (Telford *et al.*, 2013).

Previous systematic reviews of non-pharmacological interventions for ADHD have reported beneficial effects of school-based interventions as part of broader reviews (e.g. Evans, Owens, & Bunford 2014; Fabiano *et al.*, 2009; Pelham & Fabiano, 2008), although more recently Hodgson, Hutchinson and Denson (2014) found no statistically significant benefit of treatments delivered in school settings. Few reviews have focused only on the effectiveness of school-based non-pharmacological interventions. Those that have, reported beneficial effects of a variety of school-based non-pharmacological interventions, including 'academic', 'contingency management' and 'cognitive behavioral' interventions (DuPaul, Eckert, & Vilaro, 2012), 'behavior modification techniques' (Miranda, Jarque, & Tarraga, 2006), 'peer tutoring', 'self-regulation' (Trout, Lienemann, Reid, & Epstein, 2007) and 'self-monitoring' (Reid, Trout, & Schartz, 2005) delivered in school settings for academic and behavioral outcomes.

Previous reviews have typically taken a narrow focus in terms of the interventions and outcomes included, for instance DuPaul *et al.* (2012) only included studies with interventions that fit three categories and academic or behavioral outcomes. None of the previous reviews have explored the attitudes and experiences of those using or affected by non-pharmacological interventions for

ADHD in school settings. We therefore conducted a series of systematic reviews to address these gaps, including the full range of non-pharmacological interventions studied in school settings and the outcomes used to measure their effectiveness. We conducted the first reviews of qualitative research relating to interventions for ADHD in school settings of which we are aware to explore contextual factors in school settings. Our research questions asked about the effectiveness and cost-effectiveness of ADHD interventions in schools, factors that enhance or limit the delivery of school interventions for ADHD, and the experience of ADHD in schools.

Four reviews were conducted (see Table 1). The findings of each separate review are summarized below and reported in full elsewhere (Richardson *et al.*, 2014). For the **Effectiveness Review**, 54 controlled trials met the inclusion criteria but none examined cost-effectiveness. For the meta-analyzed randomized controlled trials ($n = 36$) beneficial effects ($p < 0.05$) were observed for 'behavioral' interventions and 'neurofeedback' for some ADHD symptom and achievement outcomes, no beneficial effects were found for 'cognitive training'. Substantial heterogeneity in effect size estimates across studies was reported. Univariate moderator analyses were not able to clarify which intervention features were linked with effectiveness.

INSERT TABLE 1 AROUND HERE

For the **Quantitative Attitudes Review**, 28 included studies revealed variation in educators' attitudes towards interventions. Most interventions were rated positively or neutrally across different studies. Daily report cards were the only intervention for which educators consistently recorded positive attitudes.

For the **Qualitative Intervention Review**, 33 studies met the inclusion criteria. Key findings included tensions among teachers regarding the preferred format of interventions, particularly how structured interventions were and the extent to which they are tailored to the child. There were mixed views about the impact of interventions, but it was clear that there was a reciprocal influence

of the relationships of children who have ADHD with key adults and peers, and participants' attitudes towards school and ADHD on each other.

For the **Qualitative Experience Review**, 34 studies met the inclusion criteria. The beliefs that teachers, parents and pupils held about the origin of ADHD symptoms were found to influence self-perceptions of pupils with ADHD, and attitudes towards and decisions about treatment. The classroom environment and stigma were found to aggravate ADHD symptoms, and conflicts in relationships between pupils and teachers, parents and teachers, and pupils and peers in relation to ADHD were found to be common, to further exacerbate symptoms, and to pose significant barriers to treatment.

The aim of this paper is to bring together the findings from the four reviews in an overarching synthesis to generate key implications arising from this work. Whilst systematically synthesizing evidence with different foci and diverse methodologies poses a challenge, this overarching synthesis provides a more complete picture of the factors affecting the implementation of school interventions for ADHD, than each review can do alone.

Method

There are few established methods for integrating findings from quantitative and qualitative reviews. While some systematic reviews have included evidence from different methodologies (Hawker, Payne, Kerr, Hardey, & Powell, 2002; Roberts, Dixon-Woods, Fitzpatrick, Abrams, & Jones, 2002), Thomas *et al.* (2004) and Glenton *et al.* (2013) provide rare examples of syntheses bringing together a separate meta-analysis and synthesis of qualitative studies. Their methods differed, but both used qualitative review findings as a framework for conceptualizing a synthesis of controlled trials. Due to the disparate nature of the findings from our individual reviews and an objective to consider the findings of all the reviews in relation to each other, we have taken a dual approach of:

- 1) Inductively working with the qualitative review findings about the experience of ADHD interventions and of ADHD in schools more generally to summarize the important contextual factors that may influence the effectiveness of interventions;
- 2) Deductively working from the quantitative review findings about the effectiveness of and moderators for interventions for ADHD in schools to consider findings from the other reviews that may help provide further insight and explanation.

Approach 1 draws from complexity theory (Montuori, 2013), that assumes any intervention needs to be understood in terms of interconnected events, individuals, and relationships. Approach 2 draws upon assumptions from mixed methods research that the process of engaging with divergent results from different viewpoints can yield a more comprehensive and nuanced understanding of the situation under study (Fielding, 2009).

In approach 1), we began with the findings from the qualitative reviews in order to identify the contextual elements that might influence the effectiveness of interventions. Two authors (DM and RGJ) analyzed the qualitative review findings using NVivo v.9.2. This analysis led to the identification of a conceptual model that included four levels of context and key categories that might potentially influence the effectiveness of interventions for ADHD in schools. Finally, a narrative synthesis describing findings from the qualitative reviews about the relationships between these levels and key categories was written.

In approach 2), we started from the quantitative findings about the effectiveness of and moderators for interventions for ADHD in schools (the **Effectiveness Review**), in order to systematically identify relevant findings from the other reviews that might help explain these results. Authors (DM, MRi, RGJ) considered how review findings could inform, support or contradict findings from the **Effectiveness Review** regarding effectiveness, intervention type and other potential moderators, including delivery characteristics, participant characteristics and study design. This

comparison was used to generate hypotheses about the relationships between possible moderators and effectiveness.

Results

1) Inductive synthesis: Complexity of context

In this section we report the inductively synthesized qualitative review findings. We identified four levels of intervention context: pupil, classroom, school and socio-political, within and across each of which we defined key categories, depicted in Figure 1.

INSERT FIGURE 1 AROUND HERE

Both qualitative reviews identified beliefs about ADHD to be an important potential moderator that can act at all contextual levels. A central finding from both reviews is the tendency by educational staff to focus either on biological factors as an explanation for ADHD (Ljusberg, 2011a; McMahon, 2012;), or to reject the validity of the syndrome of ADHD and attribute ADHD symptoms to difficulties in the pupil's home such as 'poor parenting' (Arcia, Frank, Sanchez-LaCay, & Fernandez, 2000; Houghton, Carroll, Taylor, & O'Donoghue, 2006; Singh, 2011). Either attribution might neglect other potentially important factors that may be present at the pupil, classroom, school and socio-political levels that could aggravate ADHD symptoms. This can confine the focus of interventions to the individual with ADHD, and exclude consideration of change at school, such as teaching staff, peer relationships and the school environment.

Polarized beliefs about the etiology of ADHD can also negatively impact on pupil self-concept and perceptions of agency. Social trends, such as the increasing medicalization of ADHD (Rafalovich, 2005), also reinforce the concept of ADHD as a within-child, biological issue. Some studies linked school staff's biological beliefs to a focus on medication for treating ADHD to the exclusion of non-pharmacological intervention (Einarsdottir, 2008; Lee, 2008; McMahon, 2012). However, teachers in other studies believed that an ADHD diagnosis provided validation of these pupil's unique learning

needs, and therefore justified pedagogical change (Edwards, 2008; Ljusberg, 2011a; Mulligan, 2001; Rafalovich, 2004). The reviews identified attitudes regarding ADHD held by pupils with ADHD, their teachers, parents and peers to be important barriers and/or facilitators to non-pharmacological interventions in schools (Houghton *et al.*, 2006; Rafalovich, 2004).

Many studies highlight the significance of relationships, suggesting that relationships between the teacher and pupil (Hands, 2009; Houghton *et al.*, 2006; Ljusberg, 2011b;), and between pupils and peers (Hong, 2008; Houghton *et al.*, 2006; Ljusberg, 2011a; Ljusberg, 2011b; Rafalovich, 2004), are potential moderators to intervention effectiveness. The relationships between pupils displaying ADHD symptoms and their educators can frame how interventions are perceived (Partridge, 2009).

Stigma towards pupils who display symptoms of ADHD may be common in schools and findings suggest this is likely to influence how well interventions work (Cooper & Shea, 1998; Hjörne, 2006; Ljusberg, 2011b; Prosser, 2006). Stigma acts as a protective device for existing social practice (Thornicroft, 2006), and therefore may be a barrier to change in addition to marginalizing the pupil, and possibly the pupils' family (Carpenter & Austin, 2008). While educational structures and routines are broadly similar between schools, specific boundaries for accepted behavior are established locally by school and even classroom.

Local attitudes of educational staff also influence whether the response to behavior perceived as problematic is inclusive or stigmatizing. When stigmatized, a pupil displaying ADHD symptoms can first informally, then formally be marginalized and excluded on the basis of behavioral contraventions (Bailey & Thomson, 2009; Hughes, 2007; Rafalovich, 2005). The **Qualitative Intervention Review** found that interventions and support intended to help the pupil function in the normal classroom can actually further aggravate stigma and marginalization, because treating the pupil differently can make any perceived differences more explicit (Ljusberg, 2011b).

Lack of guidance and knowledge about ADHD are perceived as barriers by teachers across a number of studies reviewed (Arcia *et al.*, 2000; Hong, 2008; Jones, 2008; Mulligan, 2001; Rafalovich, 2004; Taylor Wilcoxson, 2006); this lack of guidance often leads teachers to use general teaching methods, which may be ineffective for pupils with ADHD (Hjörne, 2006; Hong, 2008; Partridge, 2009; Rafalovich, 2004). Unless teachers receive adequate training and resources to meet additional demands for pedagogy and behavior management, the result can be frustrated, stressed teachers and pupils with escalating behavioral difficulties (Hong, 2008). Many teachers in reviewed studies describe a tension between their responsibility to the whole class versus that for pupils with ADHD (Hong, 2008; Houghton *et al.*, 2006; Partridge, 2009; Rafalovich, 2004). Some studies in the **Qualitative Experience Review** reported that teachers had to expend additional personal effort to overcome school-level barriers in order to meet the needs of pupils diagnosed with or at risk of ADHD (Arcia *et al.*, 2000; Jones, 2008; Ljusberg, 2011a).

Although the dynamics of ADHD tend to play out in the classroom, the drivers for these dynamics can be located in expectations established at socio-political and school context levels (Koro-Ljungberg, Bussing, Wilder, & Gary, 2011). Power differences across the levels of context identified are evident, for instance schools are required to follow national policy and legislation that can work against inclusive practice. For example, national targets for improved academic outcomes and school exam results published in league tables place pressure on schools to increase attainment, which alongside financial constraints can influence resource allocation. The purchase of interventions, training for teachers about ADHD and time available for teachers to implement classroom interventions and/or collaborate with colleagues and parents may receive lower priority than academic considerations for the majority of pupils (Hong, 2008). Finally, studies suggested that pupils and parents often held the least amount of power in the school setting, as their treatment preferences were rarely acted upon (Hibbitts, 2010; Malacrida, 2001; Prosser, 2006; Watson, 2011).

In summary, the complexity of contextual issues related to ADHD in schools is demonstrated by multiple interactions within and between four levels of context. This complexity is increased by

the implicit nature of the role that educational structures can play in aggravating symptoms of ADHD, through the local character of school expectations and through stigma. Although difficult to address, this suggests that there are multiple ways to intervene to improve pupils' ADHD symptoms, and that a range of diverse factors potentially moderate the implementation and effectiveness of school based interventions for ADHD.

2) Deductive synthesis: Effectiveness

Table 2 cross-references the findings from the meta-analysis reported in the **Effectiveness Review** where there was relevant evidence identified in the qualitative reviews. Column one displays the outcome measured and the informant. Column two displays the weighted mean effect sizes reported in the **Effectiveness Review** and corresponding confidence intervals for symptom and school outcomes that showed weak to strong evidence of beneficial effect (*p-values* ranged from 0.08 to 0.001). Column three includes information identified in the qualitative reviews as potentially relevant to the findings from the **Effectiveness Review**. The aim here is to consider how the qualitative reviews may elaborate the findings from the **Effectiveness Review**.

INSERT TABLE 2 ABOUT HERE

The **Effectiveness Review** reported positive effectiveness of non-pharmacological interventions on inattention. However, the **Qualitative Experience Review** findings suggesting that teachers often considered symptoms of hyperactivity and impulsivity to be of greater concern than symptoms of inattention (Arcia *et al.*, 2000; Hong, 2008). The **Qualitative Experience Review** noted that pupils reported deficits in emotional self-regulation more than hyperactivity (Brice, 1998; Houghton *et al.*, 2006; Kendall, Hatton, Beckett, & Leo, 2003), which warrants consideration when developing and evaluating interventions.

Findings related to externalizing behavior, like aggression and disruption, point to the moderating effects of age on intervention effectiveness. While qualitative review findings suggest that externalizing symptoms might be of greater concern in later childhood, there was no

consideration of the impact of co-existing conditions, such as conduct disorder, in young people with ADHD's narratives of anger and lack of self-control in studies reviewed in the **Qualitative Experience Review**.

The **Effectiveness Review** found a small beneficial effect of non-pharmacological interventions on 'perceptions of school adjustment' assessed by teachers, but not by children. The qualitative reviews support the identification of school adjustment as an important outcome and highlight that the negative attitude towards school held by many pupils who display ADHD symptoms may be an important factor in underachievement at school (Edwards, 2008; Hands, 2009; Partridge, 2009). Teachers' responsibility to their class of pupils might suggest that teachers view school adjustment according to how a child fits mainstream teaching.

The **Effectiveness Review** found evidence of improvement for both curriculum achievement and standardized achievement tests. The **Qualitative Intervention Review** supports the identification of achievement as an important outcome, given that some teachers and pupils indicate that they prioritize achievement over other outcomes (Langberg *et al.*, 2011; McNeil, 2005). Finally, the qualitative reviews suggest that pupil outcomes rarely seen in the papers from the **Effectiveness Review** are important for pupils with ADHD, including self-concept, perceptions of agency, attributions for ADHD, and attitudes towards school and/or interventions.

Intervention categories. During further analysis for the **Effectiveness Review** we considered three main categories of non-pharmacological school based interventions used in a systematic review of non-pharmacological interventions for ADHD (Sonuga-Barke *et al.*, 2013): behavioral, neurofeedback and cognitive training. Behavioral interventions encompass a range of interventions based on social learning or operant conditioning principles to target ADHD-related behaviors. Neurofeedback involves using the visualization of brain activity to encourage children to increase attention and impulse control. Cognitive training interventions involve training and practice in the use of cognitive processes related to executive functioning (e.g., attention and working memory).

For behavioral interventions, beneficial effects were reported mainly for teacher reported outcomes (including inattention, externalizing symptoms and school adjustment) and were corroborated by child assessments of hyperactivity/impulsivity. For neurofeedback, beneficial effects were reported for child assessments (including inattention, hyperactivity/impulsivity and standardized achievement). No beneficial effects were found for cognitive training (Richardson *et al.* 2014b). The **Qualitative Intervention Review** did not include studies that focused on these three intervention categories; however, the qualitative reviews have some relevant findings.

All of the cognitive training programs included in the **Effectiveness Review** were computer-based. While teachers in the **Qualitative Intervention Review** believed using a computer was a useful accommodation for pupils with ADHD (Edwards, 2008), computer-based cognitive training may ignore some of the important issues for pupils with ADHD raised in the qualitative reviews. These issues include withdrawal from regular classroom work, stigmatization of using the intervention and that the focus on cognitive skills ignores wider issues like classroom behavior, relationships and self-concept.

Some of these potential explanations for the lack of effectiveness of cognitive training also apply to neurofeedback, where most often pupils with ADHD must leave the classroom to attend treatment. It is surprising, given the qualitative review findings, that this intervention showed some beneficial effects. The qualitative reviews also point to the contextual and resource barriers that would apply to schools implementing neurofeedback regardless of its efficacy (Guevara *et al.*, 2005).

Unlike neurofeedback, we found little evidence of effect for behavioral interventions on achievement. Thus, while the behavioral interventions appearing in reviewed studies may positively impact a range of ADHD symptoms and behaviors, they do not appear to improve achievement, which the **Qualitative Intervention Review** found was perceived to be an important outcome for teachers and pupils with ADHD (Langberg *et al.*, 2011; McNeil, 2005).

3) Deductive synthesis: Sources of heterogeneity – potential moderators identified in the Effectiveness Review.

Intervention packages. While the **Effectiveness Review** found some positive effects of non-pharmacological interventions, in particular behavioral and neurofeedback interventions, for a range of outcome measures, pooled effect sizes ranged from very small (< 0.2) to large (> 0.8), furthermore 95% confidence intervals were wide with substantial heterogeneity in effect size estimates across studies. We therefore included meta-regression analyses in the **Effectiveness Review** to investigate which variables may explain this heterogeneity.

Interventions included in studies in the **Effectiveness Review** often included multiple intervention packages. We identified 15 intervention packages seen across the reviewed papers, for instance contingency management, social skills training and physical activity. When the intervention package was considered as a moderating variable, the inclusion of particular packages rarely explained heterogeneity in effectiveness.

The intervention package that most frequently appeared in the **Effectiveness Review** papers was contingency management, but its inclusion was not found to increase effectiveness of interventions. Perceptions of its effectiveness (**Qualitative Intervention Review**) and educators' attitudes (**Quantitative Attitudes Review**) towards this type of intervention were varied. Daily report cards were the only intervention type towards which educators consistently reported positive attitudes in the **Quantitative Attitudes Review**. This is of interest as contingency management is usually an integral element of daily report cards (Fabiano *et al.*, 2010); however, inclusion of a daily report card was not found to moderate effectiveness relative to a combination of other types of non-pharmacological interventions in the **Effectiveness Review**. The **Qualitative Intervention Review** suggests that daily report cards may address some school-home relationship issues (Arcia *et al.*, 2000; Bos, Nahmias, & Urban, 1997; Jones, 2008; Langberg *et al.*, 2011; Mulligan, 2001; Ozdemir, 2006; Taylor Wilcoxson, 2006).

The **Effectiveness Review** did not find that inclusion of self-regulation training (typically programs where children are encouraged to monitor and record their own behavior) moderated effectiveness. The qualitative reviews, however, suggest that self-regulation training is relevant to the needs of pupils diagnosed with or at risk of ADHD. For instance, pupils sometimes describe a lack of awareness about why they lose control of their behavior (Brice, 1998; Houghton *et al.*, 2006; Kendall *et al.*, 2003), and one study suggested that by becoming aware of antecedents pupils were more able to retain behavioral control (Houghton *et al.*, 2006).

For perceptions of school adjustment, the **Effectiveness Review** reported weak evidence that inclusion of social skills training may negatively influence effectiveness relative to other types of interventions. This result has to be treated with caution as only three studies that included social skills training could be included in the meta-regression analyses. Nevertheless, this finding would not be predicted by the qualitative reviews, where relationships were considered to be critical to the experience of ADHD in school settings (Arcia *et al.*, 2000; Bos *et al.*, 1997; Houghton *et al.*, 2006; Ljusberg, 2011a). However, we do not know if social skills training would help improve relationships with teachers and peers.

The qualitative reviews found that psychoeducation about ADHD for teachers and pupils was valued (Bos *et al.*, 1997; Hong, 2008; Houghton *et al.*, 2006; McNeil, 2005). Psychoeducation for teachers was outside of the scope of the **Effectiveness Review**, thus the extent to which it is delivered alongside non-pharmacological interventions remains to be clarified. The polarized views about the etiology of ADHD held by educators in the **Qualitative Experience Review** also suggest that any content explaining the cause of ADHD needs to be carefully considered.

Study design, participant characteristics and intervention delivery

characteristics. The **Effectiveness Review** also examined whether there was evidence that symptom and school outcomes differed by study design, participant characteristics and intervention delivery characteristics. Again few intervention elements explained the heterogeneity in intervention effectiveness. The qualitative reviews suggest that medication for ADHD could positively moderate the effectiveness of non-pharmacological interventions (McNeil, 2005), although this was not supported by the moderator analysis in the **Effectiveness Review**. The **Qualitative Experience Review** found a consensus for the beneficial effects of medication in the reduction of restlessness and improved concentration in the classroom. However, negative side effects, perceptions of reduced agency and reduced quality of pupil life experience were also reported (Cooper & Shea, 1998; Exley, 2007; Kendall *et al.*, 2003). Although several studies in the qualitative reviews suggest that there are gender differences in the experience of ADHD, for instance teachers in one study were more likely to link ADHD symptoms in girls to learning difficulties (Hillman, 2011); there was a lack of analysis that focused on gender differences in both quantitative and qualitative reviewed papers.

The **Qualitative Intervention Review** points to age differences that influence the response of participants to interventions (Einarsdottir, 2008; Nowacek & Mamlin, 2007; Ozdemir, 2006; Rafalovich, 2004). For instance, behavior modification might be resisted by young people aged 11-18 (Partridge, 2009), while they were more positive about study skills interventions (Langberg *et al.*, 2011; Wong, 2005). Younger children, on the other hand, were considered to benefit from social skills training (Hjörne, 2006; Ljusberg, 2011a; Ozdemir, 2006). However, the **Qualitative Experience Review** suggested that social demands increased in secondary school (Prosser, 2006), suggesting a continuing but changing need for social skills training. There was insufficient variance in grade level (as a proxy for age) to assess this potential moderator in the **Effectiveness Review**. These findings

suggest that the development and delivery of interventions needs to be highly age-sensitive. The **Qualitative Experience Review** also suggests that differences in the structure of primary and secondary schooling could be predicted to influence the school experience of ADHD (Prosser, 2006). For example, greater academic and social demands in secondary schools with less pastoral support and more diffuse relationships with multiple teachers were cited as grounds for additional difficulties (Koro-Ljungberg *et al.*, 2011; Prosser, 2006).

Weak evidence from the **Effectiveness Review** suggested that shorter interventions were more effective for teacher 'perceptions of school adjustment' than longer interventions ($p = 0.04$), which conflicts with the **Qualitative Intervention Review's** findings, where educators in two studies said that their pupils needed more time using the intervention (Langberg *et al.*, 2011; Ozdemir, 2006). Length of intervention, however, does not provide information about the intensity of an intervention, the number of intervention packages employed or fidelity to the intervention, which all influence the relationship between intervention length and effectiveness. The impact of intervention length on effectiveness should therefore be explored whilst controlling for intervention intensity and fidelity in order to clarify these findings. In light of qualitative review findings about stress and limited resources among teachers providing interventions (Houghton *et al.*, 2006; Koro-Ljungberg *et al.*, 2011), it seems plausible that longer interventions may be experienced by teachers as more stressful, which in turn could lead them to struggle to implement with fidelity and/or rate outcomes less favorably.

The **Effectiveness Review** found that setting within school and time of delivery (i.e., during normal school hours vs. before/after school) did not moderate the effectiveness of interventions. The **Qualitative Intervention Review's** findings suggest that the intervention setting within school might be important, although there were mixed perceptions in terms of whether withdrawing a pupil from their classroom for an intervention was preferable (Einarsdottir, 2008; Hong, 2008; Hjörne, 2006). Before or after-school interventions may address issues identified in the **Qualitative Intervention Review**, about pupils missing work from mainstream classes if they are withdrawn for

intervention during school hours (Ducharme, 1997; Isaksson, Lindqvist, & Bergstrom, 2010). The findings from the **Qualitative Experience Review** suggest that multiple intervention packages would be preferable given the range of needs that relate to ADHD in the classroom (Prosser, 2006). There is a tension, however, between the need for highly complex intervention and the time and resource constraints also identified in the qualitative reviews (Hands, 2009; Ljusberg, 2011a; Ozdemir, 2006; Rafalovich, 2004).

Discussion

In this overarching synthesis we have drawn together findings from four systematic reviews of non-pharmacological interventions for ADHD in school settings. The initial inductive approach suggested that key contextual issues that may influence the implementation and effectiveness of interventions include the relationships of pupils with ADHD with their teachers and peers, and the stigma that may be experienced because of ADHD symptoms, diagnosis or attendance of an intervention.

The findings from the deductive approach indicate that participants' symptom priorities are not always reflected in intervention effectiveness. For instance, beneficial effects were found for inattentive symptoms even though teachers prioritize hyperactivity and impulsivity, and pupils focus on emotional self-regulation. Outcomes that did not often feature in the review of effectiveness were shown to be important by the reviews of qualitative research, such as attributions made by teachers and pupils about the etiology of ADHD, attitudes towards school and/or interventions and pupils' self-concept. The qualitative reviews could not explain the **Effectiveness Review's** finding of beneficial effects of neurofeedback. While the **Effectiveness Review** found few statistical moderators of intervention effectiveness, the qualitative reviews suggest that a range of variables could be seen to impact the experience of school-based interventions.

Strengths and limitations

We have conducted the first mixed methods review of ADHD interventions in school settings of which we are aware, incorporating both a broad effectiveness review and reviews of relevant qualitative literature. There are very few syntheses that bring together quantitative and qualitative reviews. Where such overarching reviews exist, they have typically been able to focus on explanations for unequivocal findings of effectiveness and considered a single quantitative and qualitative review of the same intervention (Thomas *et al.*, 2004). In the current overarching synthesis we have drawn together findings from four reviews considering a range of interventions, with a focus at least as much on moderators of effectiveness as effectiveness itself. We developed novel approaches that allowed comparison across all reviews and captured a breadth of evidence of relevance to the use of ADHD interventions in school settings. The inductive synthesis of findings from the qualitative reviews provided a model that demonstrates the complexity of the context in which interventions in school settings are implemented, with a range of factors at different levels identified as potential influences on the use of non-pharmacological interventions for ADHD.

The originality of the method used may represent a limitation; the quality of such a novel synthesis is hard to quantify. The main limitation of this work relates to the different research questions addressed by the four reviews that are brought together here. Quantitative and qualitative research have different aims, methods and research questions, and therefore, different markers of study quality and potential sources of bias. Because of this, the different reviews sometimes focused on different interventions, which presented a challenge to integration. Furthermore, educators and researchers seem to hold different perceptions of what an 'intervention' appropriate for a pupil with ADHD looks like. The examples of interventions that were evaluated in the **Effectiveness Review** and appeared in qualitative papers synthesized in the **Qualitative Intervention Review** often differed, with teachers in several qualitative papers referring to ad hoc strategies used with pupils with ADHD as interventions (Einarsdottir, 2008; Hands, 2009; Hong, 2008; Nowacek & Mamlin, 2007).

Most studies across all four reviews took place in the US, adding some consistency to the educational context, but also limiting the applicability of review findings to differing educational systems. The papers reviewed covered the whole age range for school attendance, but while many intervention studies focused on younger children, qualitative research typically focused on teenagers, further contributing to difficulties in comparison. Interventions may need to target different skills and behaviors for pupils with ADHD at different ages. For example, the reviewed self-management and study skills interventions appear to be more effective for older pupils (Langberg *et al.*, 2011; Wong, 2005), while social skills training interventions have been adapted for different age groups (Prosser, 2006). In each of the reviews we conducted and then here in this overarching synthesis, we have made assumptions about relationships and shared meaning between unconnected studies (Pigott & Shepperd, 2013). Therefore, we could only explore potential relationships between and explanations for review findings and any conclusions remain tentative, but raise many interesting questions for future research.

The focus on interventions for ADHD and the experience of pupils with ADHD within the research reviewed, means that this synthesis has neglected the impact of co-existing conditions and individual differences between ADHD subtypes. We know that as many as two-thirds of all children with ADHD in the general population are reported to have at least one other co-existing condition (Larson, Russ, Kahn, & Halfon, 2011). Often, these problems are at least as important as ADHD in contributing to the longer term outcome in the individual child (Gillberg *et al.*, 2004). We also know that nearly a third of children and adolescents with ADHD hold an inattentive subtype diagnosis (Willcutt, 2012), even though hyperactive and impulsive symptoms typically dominate teachers' narratives.

Key directions for practice and future research

In terms of implications for clinical practice in school settings, this review provides more nuanced recommendations regarding interventions for ADHD than previous research. Behavioral

interventions and neurofeedback showed some benefit on several symptom and school outcomes, whereas no beneficial effects were found for cognitive training. In contrast to some previous reviews (Miranda *et al.*, 2006; Trout *et al.*, 2007) inclusion of behavior modification and self-regulation in intervention packages was not found to increase effectiveness. However, rather than recommending an increase in the use of behavioral interventions and neurofeedback, the inclusion of qualitative research in this overarching synthesis suggests that prescriptive interventions implemented in the same manner for all pupils with ADHD are unlikely to remain effective for all children.

The inductive synthesis of the qualitative reviews examined the complex context in which interventions are used in school settings. The implication is that the particular situation for a pupil with ADHD, their classroom, school and issues at the socio-political level need to be actively considered. The findings suggest that teachers are interested not only in the effectiveness of interventions but also the time burden involved and the impact on their other pupils. Teachers' and pupils' previous experiences of interventions may frame their expectations of new interventions, so their preconceptions cannot be ignored. The qualitative reviews suggest that stigma and marginalization may actually be increased through intervention, which is an important consideration for those developing and delivering interventions. Research could explore whether receiving non-pharmacological interventions impacts stigma experienced and self-esteem.

Future interventions could consider an inclusive approach that does not single out pupils diagnosed with or at risk of ADHD, for example targeting the classroom rather than individual pupil. However, this necessitates policy and financial support at the socio-political level, and policy and support at the school level for teachers. The implication of these findings to intervention design is that adaptation at pupil level and classroom contexts without support at school and socio-political levels is likely to be less effective. Because ADHD symptoms are experienced to some extent by all pupils, interventions for ADHD that hold the potential to support all pupils may be appealing to general classroom teachers. However, an inclusive approach may only be appropriate for pupils with mild severity ADHD. The accommodations needed for ADHD with severe impairments or complex

coexisting conditions would be impractical to implement at the whole class level. Research could consider the fit of interventions with the different severity levels of ADHD identified in DSM-5 (APA, 2013).

The findings from the qualitative reviews suggest that psychoeducation about ADHD may usefully be provided to staff and pupils as an adjunct to any intervention that targets pupils diagnosed with or at risk of ADHD (Bos et al., 1997; Hong, 2008; Houghton et al., 2006; McNeil, 2005). Some reviewed studies suggested that educating teachers about ADHD and effective classroom strategies improved attitudes and confidence (Bos et al., 1997; Houghton et al., 2006; McNeil, 2005). The importance of attributions about ADHD revealed by the qualitative reviews suggest that psychoeducation should recognize ADHD as resulting from an interaction of factors, and that such education is important for staff, pupils with ADHD and their peers. Attitudes could be considered both in terms of beliefs regarding ADHD and attitudes towards particular interventions, as both may impact on effectiveness (Houghton et al., 2006; McNeil, 2005; Mulligan, 2001).

While the **Effectiveness Review** found inattention to improve across several raters for interventions reviewed, the **Qualitative Experience Review** noted that teachers showed greater concern over symptoms of hyperactivity/impulsivity than inattention. As such, psychoeducation regarding ADHD could stress the impact of inattention for pupils with ADHD on their academic work and the benefit of non-pharmacological treatments.

The **Effectiveness Review** found a possible reduced effectiveness of social skills training for pupils with ADHD. The specific social skills training used might suggest explanations for the discrepancy in findings across reviews. Firstly, if social skills training make pupils with ADHD more aware of their social difficulties and strained relationships, something highlighted as important in the qualitative reviews, this may negatively affect school adjustment. Second, social skills training is often delivered to small groups (e.g. Evans, Schultz, Demars, & Davis, 2011) and withdrawal from the regular classroom can be evaluated negatively and increase stigma (Isaksson *et al.*, 2010; Ljusberg,

2011b). Interventions that target the actual relationships with teachers and peers, as opposed to focusing only on the social skills of pupils with ADHD may be more effective but this needs to be tested empirically.

Teacher-parent collaboration was identified in the qualitative reviews as an important barrier and/or facilitator to intervention and the amelioration of ADHD symptoms (Jones, 2008; Ozdemir, 2006), so policy and support to guide these interactions may be particularly influential. Research should tease apart the influence of daily report cards on parent-teacher collaboration, given the importance of home-school collaboration and the positive attitudes towards daily report cards.

Attitudes to school and learning and emotional self-regulation were identified as important to pupils diagnosed with ADHD and therefore could be useful intervention targets. In line with current recommendations for intervention design and evaluation (Bartholomew, Parcel, Kok, Gottlieb, & Fernandez, 2011) the findings emphasize the importance of involving stakeholders in the planning of interventions and in conducting a process evaluation alongside interventions to help understand why effectiveness and implementation are, or are not, realized.

The choice of intervention provider(s) may be critical to effectiveness. The qualitative reviews suggest that the quality of the relationship between pupils and providers (typically teachers) as potentially critical to effectiveness (Hands, 2009; Houghton *et al.*, 2006; Ljusberg, 2011b). This echoes the finding that successful therapeutic outcomes are linked more to therapeutic alliance than the type of therapy (Wampold, 2001). Provider-pupil relationship could therefore be explored for ADHD interventions.

Findings suggest that a range of potential moderators are under-researched in intervention trials. These include gender and age, whose effect as a potential moderator of effectiveness appears on several occasions in the qualitative reviews. For instance older pupils in the **Qualitative Intervention Review** were more likely to be resistant or indifferent to contingency management

(Edwards, 2008; Isaksson *et al.*, 2010; Kreiss, 2004; Partridge, 2009). Research could also explore the impact of individual versus whole class interventions, given issues of stigma and withdrawal from mainstream teaching, as well as individual differences in the expression of ADHD (Mulligan, 2001). In the US, summer treatment programs for pupils with ADHD are common and have been shown to be effective (Chronis *et al.*, 2004). These programs may alleviate some issues of withdrawal and stigmatization, by offering education-oriented interventions outside of regular schooling. Finally, intervention length could be explored more thoroughly; for instance, whether time pressures on teachers imply that longer or shorter, less or more intense interventions would be preferred.

Conclusion

This novel and complex overarching synthesis reveals many issues for researchers and practitioners. Non-pharmacological interventions in schools have a critical role in the management of ADHD, and our findings provide hints that certain types of intervention may work, but we cannot yet untangle the complex contexts in which particular interventions are most effective. The challenge for cross-disciplinary research is to improve the evidence-base in order that practitioners, teachers and parents can support children with the most common neurodevelopmental disorder in the context in which they struggle the most.

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Table 1.

Systematic reviews undertaken

Review	Methodology	Synthesis	Focus
Effectiveness Review	Quantitative	Random effects meta-analysis and narrative	The effectiveness and the cost effectiveness of non- pharmacological interventions delivered in school settings for children with or at risk of ADHD
Quantitative Attitudes Review	Quantitative	Narrative	Attitudes towards school-based non- pharmacological interventions for pupils with ADHD
Qualitative Intervention Review	Qualitative	Meta- ethnography	Attitudes and experiences of pupils, teachers, parents and others using ADHD interventions in school settings
Qualitative Experience Review	Qualitative	Meta- ethnography	The experience of ADHD in school among pupils diagnosed with or at risk of ADHD, their, teachers , parents and peers

Table 2.

Effectiveness: Comparison across reviews

Outcome measures	Effectiveness Review outcomes^a	Qualitative review findings
Core symptoms		
Inattention (teacher reported)	$d_r=0.60$ [95%CI=0.14 to 1.06]	Teachers report that routine will help pupils feel secure and respond to issues of inattention.
Inattention (child reported)	$d_r=0.44$ [95%CI=0.18 to 0.70]	Young people with ADHD report issues regarding emotional self-regulation more than inattention.
Hyperactivity/ impulsivity (teacher reported)	$d_r=0.23$ [95%CI=-0.03 to 0.49]	Findings suggest that teachers often considered symptoms of hyperactivity and impulsivity to be of greater concern than symptoms of inattention.
Hyperactivity/ impulsivity (child reported)	$d_r=0.33$ [95%CI=0.13 to 0.53]	Young people with ADHD report issues regarding emotional self-regulation more than hyperactivity and impulsivity
ADHD-related symptoms		
Externalising symptoms (teacher reported)	$d_r=0.28$ [95% CI=0.04 to 0.53]	Externalising behaviour such as anger and defiant behaviour were described as escalating over the school career in a number of papers exploring ADHD pupil experience; suggests these symptoms could be highest during secondary school years
Scholastic behaviours and outcomes		
Perceptions of school adjustment (teacher reported)	$d_r=0.26$ [95%CI=0.05 to 0.47]	Teachers' primary responsibility was to the learning of the whole class and this may affect school adjustment of pupils with ADHD
Curriculum achievement (child reported)	$d_r=0.50$ [95%CI=-0.06 to 1.05]	Some studies revealed that teachers and pupils with ADHD might be more interested in achievement than other outcomes.
Standardised achievement	$d_r=0.19$	Some interventions were seen to be effective for specific

Outcome measures	<i>Effectiveness Review outcomes^a</i>	<i>Qualitative review findings</i>
(child reported)	[95%CI=0.04 to 0.35]	targeted skills, yet were not perceived to impact on achievement.
Other	<i>Not applicable</i>	Additional pupil outcome measures raised in qualitative studies: Mood, attitude, motivation, organisational skills, pupils' emotional self-regulation, pupil and teacher attributional beliefs and pupil self-perceptions (e.g., agency/self-efficacy).

^a d_+ = the pooled mean effect size estimate; CI = confidence interval

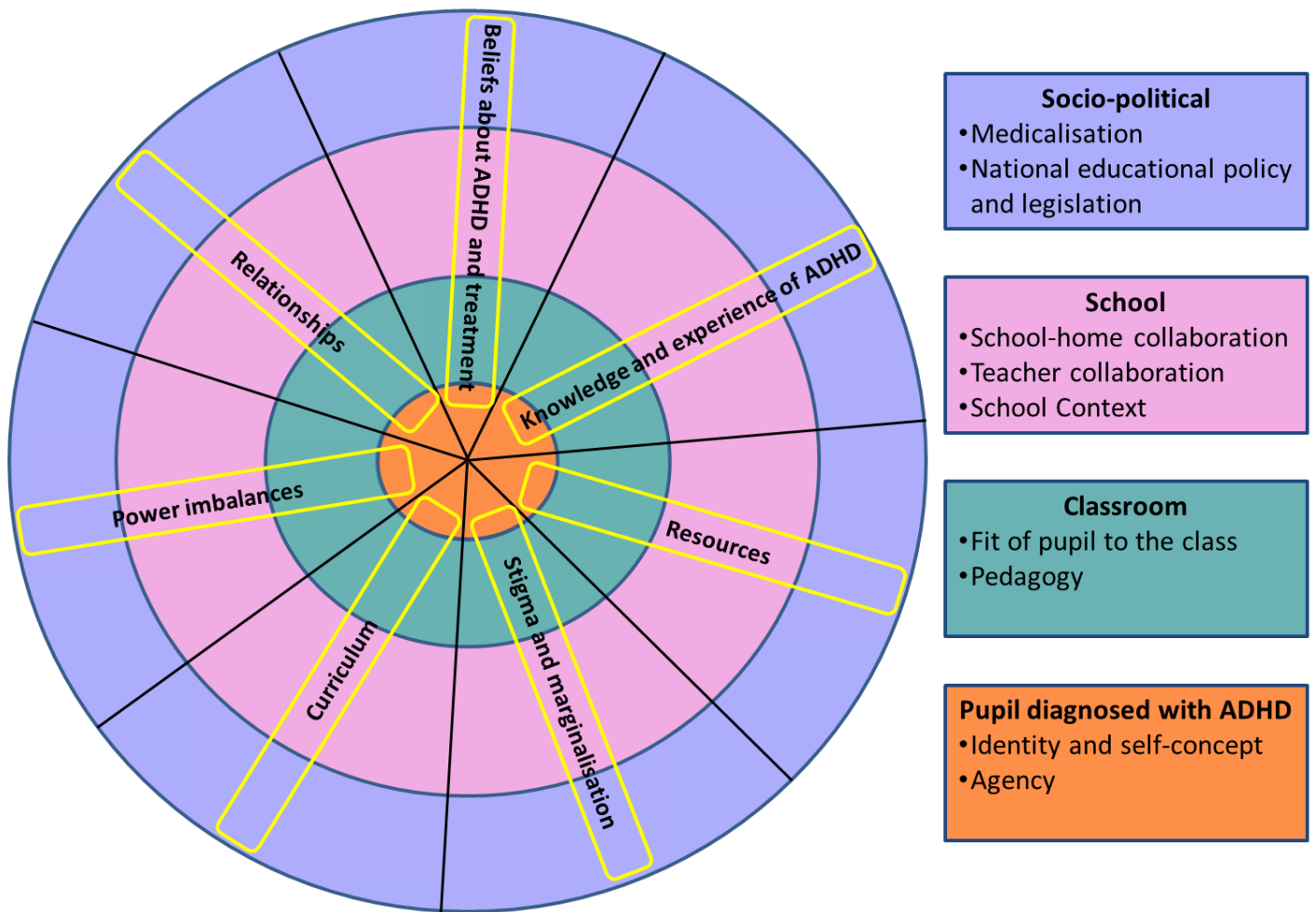


Figure 1. Contextual levels and key categories identified through synthesis of the qualitative reviews, categorised at pupil, classroom, school and socio-political levels of context.