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Evidence Based Practice in autism educational research: can we bridge the research and practice gap?

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Introduction

Debates around Evidence-Based Practice (EBP) in education highlight that teachers should be focusing on 'what works,' that research favours certain teaching methods for maximising pupil learning outcomes (Hattie, 2008), and that further work is needed to address how to best apply research to practice (DfE, 2014). Thus the Department for Education (DfE) in the UK allocated £135 million to improve quantitative data in education as well as adopting a framework for conceptualising EBP focusing on the use and application of research evidence in schools (DfE, 2014). Meanwhile, the US institute of Education Sciences takes a clear stand that education researchers need to develop interventions that are effective in raising student achievement and to validate the effectiveness of those interventions using rigorous methods (Lundahl, 2013). The 'Individuals with Disabilities Education Act' (IDEA, 2008), ensures that services to children with disabilities require teachers to use EBPs by mandating the scientifically based research concept in education through the No Child Left Behind Act (NCLB) Act of 2001. This is now enshrined in law, with the NCLB addressing the need for standards and measurable goals with reliance on scientifically based research for interventions and teaching methods.

Within this context, autism educational research is dominated by experimental research designs that should inform decisions teachers make on the ground. When the US National Research Council (NRC) conducted a rigorous

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assessment of intervention research studies in the field of autism, for example, studies needed to employ particular methodologies in order to be considered an EBP and these included randomised, quasi-experimental or single-subject design studies. In a relatively recent National Professional Development Centre (NPDC) review of autism intervention research, 40% of studies used multiple baseline design, with 8% based on RCTs (Wong et al., 2014). Current research in autism is largely Single Subject Experimental Designs (SSED) with group designs becoming more common (Kasari & Smith, 2013) and there is a clear dominance of empirical and technical instrumental research that is modeled on the natural sciences (see Dingfelder & Mandell, 2011; Odom et al., 2005).

The above hegemony of experimental designs has led to heated debate over the last few years about the way in which EBP is perceived, and the relationship between research and practice in autism educational research (de Bruin, 2015), with much discussion focusing on how to generate a positive relationship between educational research and teaching knowledge and practice (Tatto & Furlong, 2015; Pampaka et al., 2016) whilst recognising that there is a persistent gap between research and practice in autism education (Parsons & Kasari, 2013).

In this paper, I focus on the particular form the gap between research and practice takes in the autism field, and I identify the methodological re-adjustments that are needed, recognising that broader discussions around 'what works' have been problematic in both practice and theory, as well as in

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methodology (Smeyers & Depaepe, 2010). I focus on the need to broaden the range of methodologies used so the field can draw on a wider knowledge base, as practice needs a much wider knowledge base than policy. By addressing the need for a plurality of methodologies, and for further dialogue about what kind of knowledge we value in the field of learning disabilities (Gallagher, Connor & Ferri, 2011), autism educational research exemplifies the methodological reorientation that is needed in educational research more generally.

I discuss the fact that whilst the 'what works' debate is designed to find rigorous ways of using evidence to improve practice, the dominance of experimental designs in autism education contribute to a schism between research and practice in this field (Parsons & Kaskari, 2013; Parsons et al. 2015). This substantial gap between research and practice in autism educational research is problematic (Damschroder et al., 2011; Parsons & Kasari, 2013) because long-term outcomes for individuals with autism remain poor (Magiati, Tay & Howlin, 2012), leading to a need for practical solutions for education and life skills (Pellicano, Dinsmore & Charman, 2014).

My paper therefore discusses the preconditions for developing better frameworks and tools for understanding variation across different contextual factors (Klingner & Boardman, 2011), and it underscores the need for a more balanced range of studies and research designs. It highlights that the field needs to become better at recognising that evidence applicable to education will occur in diverse forms and therefore needs to be gathered through diverse means. This includes objective measures obtained from controlled trials, *and*

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subjective perspectives that are grounded in professional understanding, experiences and interpretations of teachers, in conjunction with approaches that focus on methodologies and methods that respect and value both researchers and practitioners (BERA-RSA, 2014).

The aims are therefore to i) highlight how the dominance of experimental designs leads to a schism between research and practice in this field; ii) discuss how to develop better frameworks and tools for understanding variation across different contextual factors and iii) put the case for recognising that evidence applicable to education needs to take different forms and therefore needs to be gathered through different means. In taking the reader through this argument, I start by highlighting the range of interventions that are present in the autism field and examine current attempts to address the gap between research and practice, before putting the case for a paradigm shift in autism education.

A broad range of interventions with different theoretical underpinnings

A quick online search for 'autism interventions' gives over 38 million links so there are clearly many strategies, approaches, therapies and interventions for improving the lives of autistic people. 'Research Autism', a website dedicated to researching the wide range of 'treatments' and 'interventions' in autism, currently lists over a thousand of those in the field of autism along with indications of the evidence base (Milton, 2014). These have a number of different underlying theoretical perspectives. In autism, as in broader disability studies, there are three main theoretical approaches (Arduin, 2015): the

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medical model through which autism is viewed through the lens of a pathological or flawed existence (Hughes, 2000); the social model, which posits that concepts of disability are culturally relative and the consequence of particular cultural conditions (Corker & Shakespeare, 2002) and the interactionist, human rights or transactional model which focuses on human rights, and disability as being part of diversity, with difficulties arising from an interaction between the individual and the environment (Prizant, 2015).

Within these theoretical traditions, much of the emphasis on experimental designs and quantitative studies around EBP in autism education tend to emanate from a deficit based medical model, in which disability is defined as 'a physical or mental impairment' (DfE, 2014), with a high proportion of intervention studies focusing on intensive behavioural interventions (Howlin, 2010) that are based on a normative focus on 'correcting deficits' (Milton, 2014).

The above theoretical perspectives have a bearing not only on views about how pupils learn, but also on how to conduct research, as they lead to different foci in terms of the developmental areas they focus on, which in turn affect how progress is measured (Howlin, 2010). Researchers with varying theoretical perspectives will see the world differently and will therefore differ in the questions they ask, what they examine in research as well as the methodologies they consider valid for measuring pupil progress (Poplin, 2011). Hence, behaviourists will tend to define the behavior that is considered desirable, then count the behavior, and reinforce it; cognitive theorists shift

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this to strategic academic behaviours they believe underpin academic performance whilst constructivist focus the lens on the process of facilitating an individuals construction of meaning (Poplin, 2011).

Methodological critiques of current intervention research

Although a number of studies have provided some reliable knowledge about which interventions 'work' and have helped practitioners make decisions in selecting suitable interventions, reviews have highlighted that there is not enough evidence to promote a specific form of intervention given the lack of robust evidence coupled with the wide range of interventions in the field of autism (Parsons et al. 2011; Odom et al., 2005; Howlin, 2010). Furthermore, as well as intervention research involving many different strategies, there is often a limited range of outcomes measured (Pasons et al., 2011). Effects of interventions often impact on a narrow range of skills so a programme to improve non-verbal communication will narrowly focus on that without examining its effect on broader cognitive functioning, for example (Howlin, 2010).

Furthermore, whilst current intervention research clearly represents a desire to apply a rigorous and systematic approach to produce knowledge that can in turn enable generalisation (de Bruin, 2015), the underlying assumption that these designs infer causality and should be able to support professionals to make decisions about 'what works' are problematic as there are clear methodological challenges. Although many reviews and meta-reviews have been undertaken in the field, the groups define different literature, use

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different definitions of EBP, lump or split interventions at different levels of specificity and come to different conclusions (see Mesibov & Shea, 2010 and Parsons et al., 2011). Furthermore, sample sizes tend to be limited, most examine relatively short-term gains and there are problems sorting out intervention effects compared to other variables (Horner et al., 2005). In addition, most pupils receive more than one intervention at any one point in time, making it difficult to separate out a particular element or type of approach (Parsons et al., 2011).

The perceived weaknesses of current intervention research have therefore led to calls for more methodologically rigorous research (Parsons et al.; 2011; Charman et al., 2011) with attempts to counter the narrow focus on specific research designs as the only legitimate way of conducting research in the field and with proposals for assessing the quality of a variety of research designs (see Horner, et al., 2005 and Reichow et al. 2008).

The problem with applying experimental designs to school settings

The field is currently dominated by efficacy studies that report the success or failure of interventions in 'ideal' conditions that are carefully controlled. As a result, arguments have been put forward for countering the narrow focus on specific research designs as the only legitimate way of conducting research in the field (see Horner, et al., 2005 and Reichow et al. 2008). This stems from the recognition that it can be quite a challenge to gather efficacy for particular methods as there are so many variables that can be difficult to pin down and measure. Efficacy studies also tend to lack the flexibility that would allow one

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to capture and to understand what happens naturally or to predict all of the many and varied consequences of a particular course of action due to the context specific nature of education, as much of what happens depends upon chance and dynamic combinations of different starting points, teacher skills and understanding, the school context, and learning objectives (Biesta, et al., 2014).

Although efficacy studies contribute important new knowledge to the autism field, we therefore need to stay mindful of the fact that even when there is evidence for specific interventions in the highly controlled contexts in which they were studied (Kasari & Smith, 2013), these might not be applicable to educational contexts where individual teachers make judgements based on available evidence. If intervention research is to have both scientific validity in design and implementation as well as social validity within the broader community, the field needs to find better ways of ensuring interventions are evaluated in the area in which children are based, such as mainstream primary schools (NAC, 2009). This has led to calls for conducting more effectiveness studies, which focus on the sustainability of the intervention and the importance of it to those participating in it in everyday conditions (Weisz & Jensen, 1999; Kasari & Smith, 2013).

The question is then whether this will go far enough in changing the fact that University based autism intervention research is not evident in the child's school in most schools in the UK and US, or if it is, it is changed so much that it is different from the original intervention (Kasari & Smith, 2013).

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Practitioners rarely alter their practice by drawing on the evidence base from research (Lather, 2004) despite schools being under increasing pressure to implement EBPs in order to meet the diverse needs of pupils with autism, with many continuing to use practices that are unsupported by such research (Burns & Ysseldyke 2009; Carter et al., 2011). Teachers have reported that they view researchers as being out of touch with the realities of today's classroom contexts (Greenwood & Abbott, 2001), whilst being less concerned about EBPs and more interested in how the given solutions might fit with the needs of individual children (Guldberg et al., 2011).

Researchers have therefore begun exploring the barriers to implementing studies in schools (Locke et al., 2014). These barriers have been seen as relating to 'incompletely developed interventions, limited evidence of their utility in promoting long term and meaningful change and poor fit with school environments' (Kasari and Smith, 2013, p1). More specifically, barriers have been linked with lack of training of teachers (Dingfelder & Mandell, 2012), the competing priorities of staff, policies surrounding break times, lack of school support, and difficulty findings resources and time for implementing interventions in the school day (Locke et al., 2014). Whilst a focus on barriers to implementation is important, I go on to argue that a more fundamental paradigm shift is needed than current debates indicate.

The knowledge transfer model orthodoxy

The debates around efficacy, effectiveness and implementation problems in schools highlight that there is an assumption that effective practices have

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been produced, but that the issue is that teachers are not implementing these EBPs. This narrative sees the problem as a 'translational one' in which research dissemination is perceived as a linear, top-down transmission model from which practitioners should draw knowledge. Research should then flow from the journal to classroom practice without any real and sustained engagement with teachers or pupils (Greenwood & Abbott, 2001). This model posits the researcher as the "expert" and the teacher as simply the vehicle for delivering the intervention (Trent, Artiles, & Englert, 1998).

This 'knowledge transfer' model in autism education research can be illustrated by the National Autism Centre's (2009) systematic review of both SSED and group designs, identifying eleven 'treatments' for which they claim there is evidence of effective practice, and moving from this to producing a manual for EBP in schools and recommending a specific set of best practices such as visual schedules and self management techniques (NAC, 2009). Meanwhile, the National Professional Development Centre identified a larger set of practices and made steps to operationalise these by producing step-by-step reviews (Wong et al., 2014), focusing on the necessity of translating scientific results into intervention practices or practitioner friendly summaries so that users can be informed by those (Reichow, 2008), whilst also providing 'professional development and support for implementing the practices with fidelity' (Wong et al., 2014, p. 34).

The need to take onboard different ways of knowing

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The above solutions do not take account of the fact that a teacher's choice of educational programmes tends to derive from a combination of educational, behavioural and developmental research and theory (Howlin, 2010) resulting in them employing an eclectic mix of strategies (Guldberg, 2010). Whilst the science behind research-based instruction and intervention studies requires fidelity of implementation, teachers tend to view good teaching as involving innovation and an eclectic sampling from a variety of instructional or teaching models (Greenwood & Abbott, 2001).

Unfortunately the prevailing research culture of knowledge transfer in evidence-based research diminishes the potential contributions of teachers and pupils by prioritising particular ways of knowing. It ignores important aspects of professional knowledge (Rynes, Bartunek & Daft, 2001) and the situated nature of the experiences and expectations of teachers and children in schools (Parsons et al., 2013), as well as the complex nature of schools where it is often difficult to implement more rigid, experimental research designs requiring strict adherence to planned protocols (Kasari & Smith, 2013).

As far back as 1996, Guba noted that stakeholders should inform an integral part of knowledge and that they would feel no obligation to abide by knowledge if they do not have ownership of it (Guba, 1996). Yet the prevailing culture of knowledge transfer puts agency in the hands of policy or the intervention whilst there is actually a need to allow variation and mediation between teachers, thus giving more agency of the whole process to the

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schools, pupils and their families (Gallagher et al., 2011). The issue of agency is a crucial one in that it highlights the need to introduce methodologies that position not only teachers, but also individuals with autism and their families at the center of inquiry and knowledge. This can enable research to be both practical in terms of day-to-day practice and modifiable to meet diverse pupil needs.

In order to identify the goals that are important for the autism community, for families and for practitioners, meaning therefore needs to be found in lived experiences, and research needs to invest in working *with* those stakeholders rather than *on* them (Freire, 1972), with a concomitant reorientation towards human subjectivity (Allan, 2011). It is difficult to see how a practice can be effective at generating improvement if we do not also gain an understanding of the way that the world is viewed and experienced by the individuals whose outcomes we are aiming to improve. This is particularly pertinent as autistic adults feel that 'research fails to speak to the reality of their lives in the here-and-now' (Pellicano et al., 2014, p. 5). Individuals with autism have simply not been involved in setting the agenda of working out what is important to focus on (Pellicano et al. 2014) and this has led to a large mismatch between what individuals with autism say they need in terms of what constitutes positive outcomes, and what research tends to focus on.

Wittemeyer et al., (2011) found that a good adult outcome needs to be considered within the context of individual needs and aspirations; enabling a person to make choices and giving them access to the right support when

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needed was seen as crucial. Milton (2014), an autistic sociologist, has echoed this through advocating that care must be taken to ensure that structures are put in place to encourage the learner's autonomy and reduce their stress. Evidence Based Practice therefore needs to take into account what it should work for and who should have a say in determining the latter (Biesta, 2013).

Given that findings from studies indicate that autistic individuals place importance on outcomes that support choice and autonomy (Wittemeyer et al., 2011; Pellicano et al., 2014; Milton, 2014), it is troubling that outcomes such as these, which can seem loose and fuzzy, are seldom focused on in autism research, with the consequence that interventions are limited to those whose goals can be measured. We know very little about how changes in standardised measures reflect changes in everyday life though and variables that lend themselves to measurement and statistical analysis may not be important for some of the long-term goals and outcomes of people with autism such as life satisfaction, community participation and personal relationships (Wittemeyer et al., 2011). A further a limitation of current research methods is that we do not have objective measures that enable successful identification and research on outcomes that support choice and autonomy.

Many studies involving Early Intensive Behavioural Intervention, for example, have used IQ as a principal outcome measure, yet even statistically significant increases in IQ do not necessarily lead to improvement in other, more practical day to day skills (Howlin, 2010). Neither does statistical significance in controlled trials necessarily mean that pupils have improved in ways that

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are reflected in their everyday functioning (Mesibov and Shea, 2011). The dangers of this approach are summed up by Poplin, who argues that 'when the human sciences use only quantitative data, we end up with a narrow, piecemeal view of reality' (Poplin, 2011, p150). She goes on to argue that both inductive and deductive research is vital to understanding educational contexts (Poplin, 2011) and it is this question I turn to next.

The argument for both inductive and deductive research

Although much of the current autism research into interventions has come up with information that is of general value, it has often been of little help in deciding on a particular case (Jordan, 2005) as the classroom is very different from an experimental or therapeutic setting. In classrooms that educate pupils with autism, interventions need to be individualised according to pupil characteristics, include real life outcome measures and be generalisable to complex real-life conditions and multiple cultures and settings (Mesibov and Shea, 2010). This means focusing the lens on the individual child, young person or adult, rather than the 'model' or 'intervention' (Guldberg, 2010). The teacher working with a child with autism needs to understand the child and how autism impacts on the child and the family, before deciding which strategies or interventions might work and how she might implement those in the particular context in which she works (Jordan, 2005).

Implementation often relies on a number of factors, including choice of educational approach, attending to the responses of the child or children whilst approaches are being implemented, gauging how children are

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responding to them, observing, reflecting and then possibly changing how an approach is used depending on how the child responds (Guldberg et al., 2011). This relies on knowledge and understanding of autism, values, tacit judgements, experience, local knowledge, and skills (Parsons et al., 2015). Furthermore, the ways teachers and pupils behave are strongly influenced by one another and participants interpret and make sense of their world in different ways (Biesta, 2013), with learning being situated and context dependent (Wenger, 1998).

This highlights that professional practice needs to move beyond the notion of simply relying on 'what works', to ensuring that research can make a positive contribution to each aspect of teachers' professional knowledge. This professional knowledge embodies practical wisdom and critical reflection as well as technical knowledge (Winch et al., 2015). Thus it is not enough to purely focus on addressing how schools and teachers can become better informed by data and robust evidence so they can access and interpret different kinds of evidence and adapt it to their own settings and contexts (Tatto & Furlong, 2015). Nor should discussion about the gap between research and practice be too narrowly focused on the need for teachers to develop research related skills and knowledge or to become better equipped to engage with and become consumers of research.

Rather, there needs to be acknowledgement of the fact that the knowledge of educators is rooted in immersion and reflection, resulting in cumulative knowledge arising from an accumulation of understandings rather than an

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accumulation of facts (Thomas, 2012b). This knowledge is practical and tacit, based upon personal experience and learning from the experience of others. Teachers deal with more than the simple application of strategies or techniques to bring about predetermined ends (Biesta et al., 2014), and their work is not necessarily open to objective assessment, neither is it technical (Biesta et al., 2014). Our focus therefore needs to shift more towards ensuring that the field gets a better understanding about what good teaching is and how it leads to learning (Sahlberg, 2010), and therefore to notions of 'good autism practice' in education. This means recognizing the importance of focusing on what Sahlberg and Hasak describe as 'small data'- 'the diversity and beauty that exists in every classroom, and the causation they reveal in the present'. Thus a teacher will need to be able to draw upon both the evidence base for research, such as the fact that many pupils with autism need visual augmentative strategies, whilst also being able to reflect on how those strategies are being implemented and responded to in the interactions and relationships that are developing in the classroom.

The proposed core principles flowing from this then need to become that EBPs should have a cogent rationale for educational strategies. As Mesibov and Shea (2010) argue, this latter focus is productive because it encourages the use of diverse sources of information for developing and evaluating educational approaches and encourages a focus on how to respond to the varying needs of different pupils and what is feasible. This does not negate the importance of drawing upon research evidence to shape and enhance practice. Rather, it is about, as Pring and Thomas (2004) argue, questioning

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the nature of evidence and the potency assigned to particular types of evidence.

What we therefore need more of in the field of autism intervention research, is a 'move from a narrowly defined epistemic science to one that articulates a social science that integrates context-dependency with practical deliberation' (Lather, 2004). This is essential given that autism represents a complex spectrum of different abilities and difficulties that cannot be narrowly defined. It highlights the need for methodologies that stay close to the complexities and contradictions of existence, with the goal of also fostering understanding, reflection and action as well as translation of research into practice. This has in turn led to several scholars articulating the need to value qualitative methodologies on a par with the quantitative experimental designs that currently dominate the field (Poplin, 2011) calling for the use of a broader range of methods that allow us to look at phenomena in ways that reveal many facets of human experience (Kazdin, 2008). This can include in-depth evaluation, subjective views and how individuals react to their situations and contexts whilst looking for genuine change in functioning, meaning, experience and perception. It can include a whole range of methodologies that enable this kind of study, from case studies to action research, phenomenology or narrative research (Gallagher et al., 2011).

Furthermore, the field would benefit from codifying experiences of teachers in practice and ensuring that accumulated data can be analysed in partnership with researchers (Kazdin, 2008), moving towards closer collaboration

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between researchers and practitioners, one in which the role of judgement, expertise and context ought to be studied directly. Nastasi et al. (2000) argued for participatory action research approaches that involve stakeholders in intervention efforts in order to focus on interventions that consumers find acceptable and to move towards a broad conception of integrity and effectiveness. Participatory approaches to developing interventions should include competencies that are relevant to the targeted culture, valuing naturalistic enquiry, real-life contexts, and understanding, as well as the importance of describing phenomena from the population, thus facilitating culturally specific theory and intervention (Nastasi et al. 2000).

The case for rapprochement and change in emphasis

In discussing the divide between research and practice, Kazdin (2008) therefore argued for rapprochement and changes in emphasis, highlighting that both research and practice should contribute to our knowledge base. This is aligned with the conception of 'Evidence Based Treatment' (EBT) that was put forward by the American Psychological Association in 2006 and defined as 'the integration of the best available research and clinical expertise within the context of patient characteristics, cultures, values and preferences' (APA, 2006, p 273). Kazdin (2008) highlighted that it is very unfortunate to take a narrow view of knowledge transfer in which research is seen as contributing to the knowledge base and practice as an application of research. This way of seeing the contributions of each of the domains, does in fact heighten the research-practice gap as it negates the contribution that clinical, or educational practice can contribute to the scientific knowledge base. As well

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as focusing on the expectation that educational practice should be the application of research findings to practice, there is therefore clearly a need for more rigorous examination of how educational practice can contribute to the scientific knowledge base, promoting research designs that enable teachers to both inform the research community and be informed by it.

Conclusions

This paper has argued that there is a key danger in privileging a certain kind of research evidence over evidence from other sources. There is a need to move towards research designs that enable stakeholders to participate in identifying the outcomes to focus on and to contribute data from the classroom, including participatory approaches that are situated in the contexts in which people live and work (Biesta, 2013) and that take into account the concerns and experiences of individuals with autism, their families and the practitioners who work with them.

The autism field needs to move towards a double transformation of both educational research and educational practice (Biesta et al., 2014), as factual knowledge is never a sufficient determinant of good practice in education. The problem with 'excessive quantification' and a focus solely on scientific approaches is that it can push the field away from closer interactions with policy and practice (Lagemann, 2000); it holds within it the danger of over-simplifying the relationship of research to practice (Hammersley, 2005) and negates the fact that multiple research designs are needed to address different types of questions (APA, 2006; Mesibov & Shea, 2010). Research

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questions need to be more firmly focused on what constitutes a good outcome for a person with autism. Autistic people, their families and the practitioners who work with them, need to be involved in identifying those questions, including a re-framing of which outcomes measures are important to focus on.

The argument is not that different forms of evidence are incompatible, but rather that both need to be taken into account and combined to offer a more balanced insight into best educational practices. Thus, calls for a need for educational sciences to be rooted at the practical level (Thomas & Pring, 2014) do not negate the need for controlled experimental approaches but recognise the need to broaden the concept of EBP beyond the knowledge transfer model. What is argued for is a broader conceptualisation of EBP that is informed by experimental evidence, as well as by the perspectives and needs of individuals with autism, their families and the practitioners who work with them (Kazdin, 2006).

Ultimately, to achieve this requires methodologies that ensure that teachers' craft and tacit knowledge are both captured adequately and taken into account *together with* the systematic knowledge generated by research (Hammersley, 2005). To that end, scientific research and practice both have in common that they need to be flexible, interpretative and reflective (Thomas, 2014).

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Title: Evidence Based Practice in autism educational research: can we bridge the research and practice gap?

Minor revisions are outlined in the attached Table and changes are highlighted in the text using Track Changes.

Reviewer Comment	Change
Page 1: The first sentence is not clear - the two 'strongly contested opinions' need to be reworded to ensure clarify from the start of the paper	This sentence has now been re-worded.
The abbreviation for EBP is not always used - suggest consistency in writing	This has been addressed in the main text throughout.
Page 2: 'I argue that the gap between research and practice takes a particular form in the autism field, and there are lessons to be learnt from this field for educational research more broadly' – I am not convinced this is argued effectively in the main text of the paper, and would suggest further clarity on this point	I have adjusted this sentence to ensure it is more in line with what is effectively argued in the main text.
Page 8 line 38 missing word: 'If intervention research is to have both scientific validity in design and implementation as well AS social validity within the broader community…'	Corrected and the word 'as' has been added
Page 13 paragraph 2: it would be worth noting here that we don't have objective measures to enable successful identification and research on outcomes that support choice and autonomy – and that this is a limitation of current research methods	I have added this point to the relevant paragraph using Track Changes
Page 17: 'move from a narrowly defined epistemic science to one that articulates a social science that integrates context-dependency with practical deliberation' – to further highlight this point, it should be	I have added this important point using Track Changes.

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related to the fact that autism is, by definition, a spectrum of disorders and therefore this complexity cannot currently be narrowly defined	
Page 17 – you could go a step further and state how the qualitative and quantitative research can be combined in practical ways	This has been highlighted through the examples of participatory research

Introduction

Debates around Evidence-Based Practice (EBP) in education highlight ~~is a hotly contested subject at the moment, and has been for a while, with strong messages~~ that teachers should be focusing on 'what works,' ~~and~~that research favours certain teaching methods for maximising pupil learning outcomes (Hattie, 2008), and that further work is needed to address how to best apply research to practice (DfE, 2014). ~~with researchers and government departments claiming that research favours certain teaching methods for maximising pupil learning outcomes (Hattie, 2008).~~ Thus the Department for Education (DfE) in the UK allocated £135 million to improve quantitative data in education as well as adopting a framework for conceptualising EBP ~~evidence based teaching~~ focusing on the use and application of research evidence in schools (DfE, 2014). Meanwhile, the US institute of Education Sciences takes a clear stand that education researchers need to develop interventions that are effective in raising student achievement and to validate the effectiveness of those interventions using rigorous methods (Lundahl, 2013). The 'Individuals with Disabilities Education Act' (IDEA, 2008), ensures

that services to children with disabilities require teachers to use EBPs by mandating the scientifically based research concept in education through the No Child Left Behind Act (NCLB) Act of 2001. This is now enshrined in law, with the NCLB addressing the need for standards and measurable goals with reliance on scientifically based research for interventions and teaching methods.

Within this context, autism educational research is dominated by experimental research designs that should inform decisions teachers make on the ground. When the US National Research Council (NRC) conducted a rigorous assessment of intervention research studies in the field of autism, for example, studies needed to employ particular methodologies in order to be considered an EBP and these included randomised, quasi-experimental or single-subject design studies. In a relatively recent National Professional Development Centre (NPDC) review of autism intervention research, 40% of studies used multiple baseline design, with 8% based on RCTs (Wong et al., 2014). Current research in autism is largely Single Subject Experimental Designs (SSED) with group designs becoming more common (Kasari & Smith, 2013) and there is a clear dominance of empirical and technical instrumental research that is modeled on the natural sciences (see Dingfelder & Mandell, 2011; Odom et al., 2005).

The above hegemony of experimental designs has led to heated debate over the last few years about the way in which EBP ~~Evidence Based Practice~~ is perceived, and the relationship between research and practice in autism

educational research (de Bruin, 2015), with much discussion focusing on how to generate a positive relationship between educational research and teaching knowledge and practice (Tatto & Furlong, 2015; Pampaka et al., 2016) whilst recognising that there is a persistent gap between research and practice in autism education (Parsons & Kasari, 2013).

In this paper, I focus on ~~argue that~~ the particular form the gap between research and practice takes ~~a particular form~~ in the autism field, and- I identify the methodological re-adjustments that are needed~~there are lessons to be learnt from this field for educational research more broadly~~, recognising~~given~~ that broader discussions around 'what works' have been problematic in both practice and theory, as well as in methodology (Smeyers & Depaepe, 2010). I focus on the need to broaden the range of methodologies used so the field can draw on a wider knowledge base, as practice needs a much wider knowledge base than policy. By addressing the need for a plurality of methodologies, and for further dialogue about what kind of knowledge we value in the field of learning disabilities (Gallagher, Connor & Ferri, 2011), autism educational research exemplifies the methodological reorientation that is needed in educational research more generally.

I discuss the fact that whilst the 'what works' debate is designed to find rigorous ways of using evidence to improve practice, the dominance of experimental designs in autism education contribute to a schism between research and practice in this field (Parsons & Kaskari, 2013; Parsons et al. 2015). This substantial gap between research and practice in autism educational research is problematic (Damschroder et al., 2011; Parsons &

Kasari, 2013) because long-term outcomes for individuals with autism remain poor (Magiati, Tay & Howlin, 2012), leading to a need for practical solutions for education and life skills (Pellicano, Dinsmore & Charman, 2014).

My paper therefore discusses the preconditions for developing better frameworks and tools for understanding variation across different contextual factors (Klingner & Boardman, 2011), and it underscores the need for a more balanced range of studies and research designs. It highlights that the field needs to become better at recognising that evidence applicable to education will occur in diverse forms and therefore needs to be gathered through diverse means. This includes objective measures obtained from controlled trials, *and* subjective perspectives that are grounded in professional understanding, experiences and interpretations of teachers, in conjunction with approaches that focus on methodologies and methods that respect and value both researchers and practitioners (BERA-RSA, 2014).

The aims are therefore to i) highlight how the dominance of experimental designs leads to a schism between research and practice in this field; ii) discuss how to develop better frameworks and tools for understanding variation across different contextual factors and iii) put the case for recognising that evidence applicable to education needs to take different forms and therefore needs to be gathered through different means. In taking the reader through this argument, I start by highlighting the range of interventions that are present in the autism field and examine current attempts to address the gap between research and practice, before putting the case for

a paradigm shift in autism education.

A broad range of interventions with different theoretical underpinnings

A quick online search for 'autism interventions' gives over 38 million links so there are clearly many strategies, approaches, therapies and interventions for improving the lives of autistic people. 'Research Autism', a website dedicated to researching the wide range of 'treatments' and 'interventions' in autism, currently lists over a thousand of those in the field of autism along with indications of the evidence base (Milton, 2014). These have a number of different underlying theoretical perspectives. In autism, as in broader disability studies, there are three main theoretical approaches (Arduin, 2015): the medical model through which autism is viewed through the lens of a pathological or flawed existence (Hughes, 2000); the social model, which posits that concepts of disability are culturally relative and the consequence of particular cultural conditions (Corker & Shakespeare, 2002) and the interactionist, human rights or transactional model which focuses on human rights, and disability as being part of diversity, with difficulties arising from an interaction between the individual and the environment (Prizant, 2015).

Within these theoretical traditions, much of the emphasis on experimental designs and quantitative studies around EBP in autism education tend to emanate from a deficit based medical model, in which disability is defined as 'a physical or mental impairment' (DfE, 2014), with a high proportion of intervention studies focusing on intensive behavioural interventions (Howlin,

2010) that are based on a normative focus on 'correcting deficits' (Milton, 2014).

The above theoretical perspectives have a bearing not only on views about how pupils learn, but also on how to conduct research, as they lead to different foci in terms of the developmental areas they focus on, which in turn affect how progress is measured (Howlin, 2010). Researchers with varying theoretical perspectives will see the world differently and will therefore differ in the questions they ask, what they examine in research as well as the methodologies they consider valid for measuring pupil progress (Poplin, 2011). Hence, behaviourists will tend to define the behavior that is considered desirable, then count the behavior, and reinforce it; cognitive theorists shift this to strategic academic behaviours they believe underpin academic performance whilst constructivist focus the lens on the process of facilitating an individuals construction of meaning (Poplin, 2011).

Methodological critiques of current intervention research

Although a number of studies have provided some reliable knowledge about which interventions 'work' and have helped practitioners make decisions in selecting suitable interventions, reviews have highlighted that there is not enough evidence to promote a specific form of intervention given the lack of robust evidence coupled with the wide range of interventions in the field of autism (Parsons et al. 2011; Odom et al., 2005; Howlin, 2010). Furthermore, as well as intervention research involving many different strategies, there is often a limited range of outcomes measured (Pasons et al., 2011). Effects of

interventions often impact on a narrow range of skills so a programme to improve non-verbal communication will narrowly focus on that without examining its effect on broader cognitive functioning, for example (Howlin, 2010).

Furthermore, whilst current intervention research clearly represents a desire to apply a rigorous and systematic approach to produce knowledge that can in turn enable generalisation (de Bruin, 2015), the underlying assumption that these designs infer causality and should be able to support professionals to make decisions about 'what works' are problematic as there are clear methodological challenges. Although many reviews and meta-reviews have been undertaken in the field, the groups define different literature, use different definitions of EBP, lump or split interventions at different levels of specificity and come to different conclusions (see Mesibov & Shea, 2010 and Parsons et al., 2011). Furthermore, sample sizes tend to be limited, most examine relatively short-term gains and there are problems sorting out intervention effects compared to other variables (Horner et al., 2005). In addition, most pupils receive more than one intervention at any one point in time, making it difficult to separate out a particular element or type of approach (Parsons et al., 2011).

The perceived weaknesses of current intervention research have therefore led to calls for more methodologically rigorous research (Parsons et al.; 2011; Charman et al., 2011) with attempts to counter the narrow focus on specific research designs as the only legitimate way of conducting research in the field

and with proposals for assessing the quality of a variety of research designs (see Horner, et al., 2005 and Reichow et al. 2008).

The problem with applying experimental designs to school settings

The field is currently dominated by efficacy studies that report the success or failure of interventions in 'ideal' conditions that are carefully controlled. As a result, arguments have been put forward for countering the narrow focus on specific research designs as the only legitimate way of conducting research in the field (see Horner, et al., 2005 and Reichow et al. 2008). This stems from the recognition that it can be quite a challenge to gather efficacy for particular methods as there are so many variables that can be difficult to pin down and measure. Efficacy studies also tend to lack the flexibility that would allow one to capture and to understand what happens naturally or to predict all of the many and varied consequences of a particular course of action due to the context specific nature of education, as much of what happens depends upon chance and dynamic combinations of different starting points, teacher skills and understanding, the school context, and learning objectives (Biesta, et al., 2014).

Although efficacy studies contribute important new knowledge to the autism field, we therefore need to stay mindful of the fact that even when there is evidence for specific interventions in the highly controlled contexts in which they were studied (Kasari & Smith, 2013), these might not be applicable to educational contexts where individual teachers make judgements based on available evidence. If intervention research is to have both scientific validity in

design and implementation as well as social validity within the broader community, the field needs to find better ways of ensuring interventions are evaluated in the area in which children are based, such as mainstream primary schools (NAC, 2009). This has led to calls for conducting more effectiveness studies, which focus on the sustainability of the intervention and the importance of it to those participating in it in everyday conditions (Weisz & Jensen, 1999; Kasari & Smith, 2013).

The question is then whether this will go far enough in changing the fact that University based autism intervention research is not evident in the child's school in most schools in the UK and US, or if it is, it is changed so much that it is different from the original intervention (Kasari & Smith, 2013). Practitioners rarely alter their practice by drawing on the evidence base from research (Lather, 2004) despite schools being under increasing pressure to implement EBPs in order to meet the diverse needs of pupils with autism, with many continuing to use practices that are unsupported by such research (Burns & Ysseldyke 2009; Carter et al., 2011). Teachers have reported that they view researchers as being out of touch with the realities of today's classroom contexts (Greenwood & Abbott, 2001), whilst being less concerned about EBPs and more interested in how the given solutions might fit with the needs of individual children (Guldberg et al., 2011).

Researchers have therefore begun exploring the barriers to implementing studies in schools (Locke et al., 2014). These barriers have been seen as relating to 'incompletely developed interventions, limited evidence of their

utility in promoting long term and meaningful change and poor fit with school environments' (Kasari and Smith, 2013, p1). More specifically, barriers have been linked with lack of training of teachers (Dingfelder & Mandell, 2012), the competing priorities of staff, policies surrounding break times, lack of school support, and difficulty findings resources and time for implementing interventions in the school day (Locke et al., 2014). Whilst a focus on barriers to implementation is important, I go on to argue that a more fundamental paradigm shift is needed than current debates indicate.

The knowledge transfer model orthodoxy

The debates around efficacy, effectiveness and implementation problems in schools highlight that there is an assumption that effective practices~~'treatments'~~ have been produced, but that the issue is that teachers are not implementing these ~~-EBPs evidence based treatments~~. This narrative sees the problem as a 'translational one' in which research dissemination is perceived as a linear, top-down transmission model from which practitioners should draw knowledge. Research should then flow from the journal to classroom practice without any real and sustained engagement with teachers or pupils (Greenwood & Abbott, 2001). This model posits the researcher as the "expert" and the teacher as simply the vehicle for delivering the intervention (Trent, Artiles, & Englert, 1998).

This 'knowledge transfer' model in autism education research can be illustrated by the National Autism Centre's (2009) systematic review of both SSED and group designs, identifying eleven 'treatments' for which they claim

there is evidence of effective practice, and moving from this to producing a manual for EBP in schools and recommending a specific set of best practices such as visual schedules and self management techniques (NAC, 2009). Meanwhile, the National Professional Development Centre identified a larger set of practices and made steps to operationalise these by producing step-by-step reviews (Wong et al., 2014), focusing on the necessity of translating scientific results into intervention practices or practitioner friendly summaries so that users can be informed by those (Reichow, 2008), whilst also providing 'professional development and support for implementing the practices with fidelity' (Wong et al., 2014, p. 34).

The need to take onboard different ways of knowing

The above solutions do not take account of the fact that a teacher's choice of educational programmes tends to derive from a combination of educational, behavioural and developmental research and theory (Howlin, 2010) resulting in them employing an eclectic mix of strategies (Guldberg, 2010). Whilst the science behind research-based instruction and intervention studies requires fidelity of implementation, teachers tend to view good teaching as involving innovation and an eclectic sampling from a variety of instructional or teaching models (Greenwood & Abbott, 2001).

Unfortunately the prevailing research culture of knowledge transfer in evidence-based research diminishes the potential contributions of teachers and pupils by prioritising particular ways of knowing. It ignores important aspects of professional knowledge (Rynes, Bartunek & Daft, 2001) and the

situated nature of the experiences and expectations of teachers and children in schools (Parsons et al., 2013), as well as the complex nature of schools where it is often difficult to implement more rigid, experimental research designs requiring strict adherence to planned protocols (Kasari & Smith, 2013).

As far back as 1996, Guba noted that stakeholders should inform an integral part of knowledge and that they would feel no obligation to abide by knowledge if they do not have ownership of it (Guba, 1996). Yet the prevailing culture of knowledge transfer puts agency in the hands of policy or the intervention whilst there is actually a need to allow variation and mediation between teachers, thus giving more agency of the whole process to the schools, pupils and their families (Gallagher et al., 2011). The issue of agency is a crucial one in that it highlights the need to introduce methodologies that position not only teachers, but also individuals with autism and their families at the center of inquiry and knowledge. This can enable research to be both practical in terms of day-to-day practice and modifiable to meet diverse pupil needs.

In order to identify the goals that are important for the autism community, for families and for practitioners, meaning therefore needs to be found in lived experiences, and research needs to invest in working *with* those stakeholders rather than *on* them (Freire, 1972), with a concomitant reorientation towards human subjectivity (Allan, 2011). It is difficult to see how a practice can be effective at generating improvement if we do not also gain an understanding

of the way that the world is viewed and experienced by the individuals whose outcomes we are aiming to improve. This is particularly pertinent as autistic adults feel that 'research fails to speak to the reality of their lives in the here-and-now' (Pellicano et al., 2014, p. 5). Individuals with autism have simply not been involved in setting the agenda of working out what is important to focus on (Pellicano et al. 2014) and this has led to a large mismatch between what individuals with autism say they need in terms of what constitutes positive outcomes, and what research tends to focus on.

Wittemeyer et al., (2011) found that a good adult outcome needs to be considered within the context of individual needs and aspirations; enabling a person to make choices and giving them access to the right support when needed was seen as crucial. Milton (2014), an autistic sociologist, has echoed this through advocating that care must be taken to ensure that structures are put in place to encourage the learner's autonomy and reduce their stress. Evidence Based Practice therefore needs to take into account what it should work for and who should have a say in determining the latter (Biesta, 2013).

Given that findings from studies indicate that autistic individuals place importance on outcomes that support choice and autonomy (Wittemeyer et al., 2011; Pellicano et al., 2014; Milton, 2014), it is troubling that outcomes such as these, which can seem loose and fuzzy, are seldom focused on in autism research, with the consequence that interventions are limited to those whose goals can be measured. We know very little about how changes in standardised measures reflect changes in everyday life though and variables

that lend themselves to measurement and statistical analysis may not be important for some of the long-term goals and outcomes of people with autism such as life satisfaction, community participation and personal relationships (Wittemeyer et al., 2011). A further a limitation of current research methods is that we do not have objective measures that enable successful identification and research on outcomes that support choice and autonomy.

Many studies involving Early Intensive Behavioural Intervention, for example, have used IQ as a principal outcome measure, yet even statistically significant increases in IQ do not necessarily lead to improvement in other, more practical day to day skills (Howlin, 2010). Neither does statistical significance in controlled trials necessarily mean that pupils have improved in ways that are reflected in their everyday functioning (Mesibov and Shea, 2011). The dangers of this approach are summed up by Poplin, who argues that 'when the human sciences use only quantitative data, we end up with a narrow, piecemeal view of reality' (Poplin, 2011, p150). She goes on to argue that both inductive and deductive research is vital to understanding educational contexts (Poplin, 2011) and it is this question I turn to next.

The argument for both inductive and deductive research

Although much of the current autism research into interventions has come up with information that is of general value, it has often been of little help in deciding on a particular case (Jordan, 2005) as the classroom is very different from an experimental or therapeutic setting. In classrooms that educate pupils with autism, interventions need to be individualised according to pupil

characteristics, include real life outcome measures and be generalisable to complex real-life conditions and multiple cultures and settings (Mesibov and Shea, 2010). This means focusing the lens on the individual child, young person or adult, rather than the 'model' or 'intervention' (Guldberg, 2010). The teacher working with a child with autism needs to understand the child and how autism impacts on the child and the family, before deciding which strategies or interventions might work and how she might implement those in the particular context in which she works (Jordan, 2005).

Implementation often relies on a number of factors, including choice of educational approach, attending to the responses of the child or children whilst approaches are being implemented, gauging how children are responding to them, observing, reflecting and then possibly changing how an approach is used depending on how the child responds (Guldberg et al., 2011). This relies on knowledge and understanding of autism, values, tacit judgements, experience, local knowledge, and skills (Parsons et al., 2015). Furthermore, the ways teachers and pupils behave are strongly influenced by one another and participants interpret and make sense of their world in different ways (Biesta, 2013), with learning being situated and context dependent (Wenger, 1998).

This highlights that professional practice needs to move beyond the notion of simply relying on 'what works', to ensuring that research can make a positive contribution to each aspect of teachers' professional knowledge. This professional knowledge embodies practical wisdom and critical reflection as

well as technical knowledge (Winch et al., 2015). Thus it is not enough to purely focus on addressing how schools and teachers can become better informed by data and robust evidence so they can access and interpret different kinds of evidence and adapt it to their own settings and contexts (Tatto & Furlong, 2015). Nor should discussion about the gap between research and practice be too narrowly focused on the need for teachers to develop research related skills and knowledge or to become better equipped to engage with and become consumers of research.

Rather, there needs to be acknowledgement of the fact that the knowledge of educators is rooted in immersion and reflection, resulting in cumulative knowledge arising from an accumulation of understandings rather than an accumulation of facts (Thomas, 2012b). This knowledge is practical and tacit, based upon~~using~~ personal experience and learning from the experience of others. Teachers deal with more than the simple application of strategies or techniques to bring about predetermined ends (Biesta et al., 2014), and their work is not necessarily open to objective assessment, neither is it technical (Biesta et al., 2014). Our focus therefore needs to shift more towards ensuring that the field gets a better understanding about what good teaching is and how it leads to learning (Sahlberg, 2010), and therefore to notions of 'good autism practice' in education. This means recognizing the importance of focusing on what Sahlberg and Hasak describe as 'small data'- 'the diversity and beauty that exists in every classroom, and the causation they reveal in the present'. Thus a teacher will need to be able to draw upon both the evidence base for research, such as the fact that many pupils with autism

need visual augmentative strategies, whilst also being able to reflect on how those strategies are being implemented and responded to in the interactions and relationships that are developing in the classroom.

The proposed core principles flowing from this then need to become that EBPs should have a cogent rationale for educational strategies. As Mesibov and Shea (2010) argue, this latter focus is productive because it encourages the use of diverse sources of information for developing and evaluating educational approaches and encourages a focus on how to respond to the varying needs of different pupils and what is feasible. This does not negate the importance of drawing upon research evidence to shape and enhance practice. Rather, it is about, as Pring and Thomas (2004) argue, questioning the nature of evidence and the potency assigned to particular types of evidence.

What we therefore need more of in the field of autism intervention research, is a 'move from a narrowly defined epistemic science to one that articulates a social science that integrates context-dependency with practical deliberation' (Lather, 2004). This is essential given that autism represents a complex spectrum of different abilities and difficulties that cannot be narrowly defined. It highlights the need for methodologies that ~~means~~ stay~~ing~~ close to the complexities and contradictions of existence, with the goal of also fostering understanding, reflection and action as well as translation of research into practice. This has in turn led to several scholars articulating the need to value qualitative methodologies on a par with the quantitative experimental designs

that currently dominate the field (Poplin, 2011) calling for the use of a broader range of methods that allow us to look at phenomena in ways that reveal many facets of human experience (Kazdin, 2008). This can include in-depth evaluation, subjective views and how individuals react to their situations and contexts whilst looking for genuine change in functioning, meaning, experience and perception. It can include a whole range of methodologies that enable this kind of study, from case studies to action research, phenomenology or narrative research (Gallagher et al., 2011).

Furthermore, the field would benefit from codifying experiences of teachers in practice and ensuring that accumulated data can be analysed in partnership with researchers (Kazdin, 2008), moving towards closer collaboration between researchers and practitioners, one in which the role of judgement, expertise and context ought to be studied directly. Nastasi et al. (2000) argued for participatory action research approaches that involve stakeholders in intervention efforts in order to focus on interventions that consumers find acceptable and to move towards a broad conception of integrity and effectiveness. Participatory approaches to developing interventions should include competencies that are relevant to the targeted culture, valuing naturalistic enquiry, real-life contexts, and understanding, as well as the importance of describing phenomena from the population, thus facilitating culturally specific theory and intervention (Nastasi et al. 2000).

The case for rapprochement and change in emphasis

In discussing the divide between research and practice, Kazdin (2008) therefore argued for rapprochement and changes in emphasis, highlighting that both research and practice should contribute to our knowledge base. This is aligned with the conception of 'Evidence Based Treatment' (EBT) that was put forward by the American Psychological Association in 2006 and defined as 'the integration of the best available research and clinical expertise within the context of patient characteristics, cultures, values and preferences' (APA, 2006, p 273). Kazdin (2008) highlighted that it is very unfortunate to take a narrow view of knowledge transfer in which research is seen as contributing to the knowledge base and practice as an application of research. This way of seeing the contributions of each of the domains, does in fact heighten the research-practice gap as it negates the contribution that clinical, or educational practice can contribute to the scientific knowledge base. As well as focusing on the expectation that educational practice should be the application of research findings to practice, there is therefore clearly a need for more rigorous examination of how educational practice can contribute to the scientific knowledge base, promoting research designs that enable teachers to both inform the research community and be informed by it.

Conclusions

This paper has argued that there is a key danger in privileging a certain kind of research evidence over evidence from other sources. There is a need to move towards research designs that enable stakeholders to participate in identifying the outcomes to focus on and to contribute data from the classroom, including participatory approaches that are situated in the contexts

in which people live and work (Biesta, 2013) and that take into account the concerns and experiences of individuals with autism, their families and the practitioners who work with them.

The autism field needs to move towards a double transformation of both educational research and educational practice (Biesta et al., 2014), as factual knowledge is never a sufficient determinant of good practice in education. The problem with 'excessive quantification' and a focus solely on scientific approaches is that it can push the field away from closer interactions with policy and practice (Lagemann, 2000); it holds within it the danger of over-simplifying the relationship of research to practice (Hammersley, 2005) and negates the fact that multiple research designs are needed to address different types of questions (APA, 2006; Mesibov & Shea, 2010). Research questions need to be more firmly focused on what constitutes a good outcome for a person with autism. Autistic people, their families and the practitioners who work with them, need to be involved in identifying those questions, including a re-framing of which outcomes measures are important to focus on.

The argument is not that different forms of evidence are incompatible, but rather that both need to be taken into account and combined to offer a more balanced insight into best educational practices. Thus, calls for a need for educational sciences to be rooted at the practical level (Thomas & Pring, 2014) do not negate the need for controlled experimental approaches but recognise the need to broaden the concept of EBP beyond the knowledge transfer model. What is argued for is a broader conceptualisation of EBP that

is informed by experimental evidence, as well as by the perspectives and needs of individuals with autism, their families and the practitioners who work with them (Kazdin, 2006).

Ultimately, to achieve this requires methodologies that ensure that teachers' craft and tacit knowledge are both captured adequately and taken into account *together with* the systematic knowledge generated by research (Hammersley, 2005). To that end, scientific research and practice both have in common that they need to be flexible, interpretative and reflective (Thomas, 2014).

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