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Attention Autism for children and young people on the autistic spectrum: A critique of the current evidence-base.

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Within UK mainstream schools, Autism Spectrum Condition (ASC) has been identified as the most common and rapidly expanding type of primary need for pupils with an EHCP (Department of Education [DfE], 2018). ASC is often characterised as difficulties with social communication and interaction, and restrictive or repetitive behaviours and attention which can impact on a young person's ability to access their learning and the social aspects of school (National Autistic Society, 2003; British Psychological Society, 2016). Therefore, it is important to find ways of supporting young people on the autism spectrum, which are evidence-based, positive, and feasible for schools to implement.

Attention Autism (AA) is an approach developed by Gina Davies (specialist speech and language therapist), which provides a framework and set of strategies that can be used by school staff to build the communication, interaction and attentional skills of children with ASC (Watson, Davies & Winterton, 2017). The key principle of AA is that children are offered an 'irresistible invitation to learn' by using highly motivating and engaging activities, which are worth paying attention to and communicating about (Davies, 2017). This allows the child to opt in spontaneously, rather than being pressured to communicate and learn. The programme involves four stages:

- *Stage 1:* focusing attention; an adult has a bucket full of exciting toys, which they take out one at a time and model excitement and engagement.
- *Stage 2:* sustaining attention; a set structure or activity that goes on for a longer period and the children are invited to participate.
- *Stage 3:* shifting attention; a longer activity, in which the child is encouraged to engage in turn taking with their peers.
- *Stage 4:* focusing, sustaining and shifting attention with a transition to independent working, before returning to the group. For example, they watch a demonstration in the group and then complete the same activity independently.

These stages are considered to help the child develop their shared and joint attention skills through activities with others. Other important skills, such as turn taking, communication and language are then believed to follow (Watson et al., 2017). Throughout the sessions, facilitating adults encourage engagement and reciprocal communication, and as the sessions become more established, the child's independence and engagement is aimed to be extended.

Currently, there is little peer-reviewed research to indicate the effectiveness of the AA approach. This critique aims to explore the psychological theory underpinning AA before reviewing the current evidence base. Conclusions and implications for Educational Psychologists (EPs) will then be drawn.

Psychological underpinnings

The psychological underpinnings of AA are not immediately clear from Gina Davies' website. On direct contact with the author, she explained that AA is an eclectic approach, which draws on a wide range of autism research, theory and practice. In particular, she highlighted AA uses good autism practices, such as visual cues, structured routines and intensive interaction strategies. Such practices have been highlighted for their effectiveness by a range of authors (e.g. Caldwell & Horwood, 2008; Autism Education Trust, 2015). The improvement of 'joint attention' is frequently highlighted as a key aim of the AA approach (e.g. Watson et al., 2017; Morgan, 2011). Consequently, this critique will focus on the psychological theory and research underpinning joint attention and its relationship with ASC.

Joint attention (JA) involves a triadic interaction, in which a child shares their attention with another person towards an object or event (Bottema-Beutel, 2016). JA can be seen through two main types of behaviour: 'responding to joint attention' (RJA), where the child follows the direction of another's attention (e.g. through eye gaze), and 'initiating joint attention' (IJA), where the child seeks to share their interest through directing another's attention (e.g. by pointing or showing) (Mundy, 2018). JA typically emerges between 6-12 months (Beuker, Rommelse, Donders & Buitelaar, 2013) and is considered to play a pivotal role in the development of language, social communication skills and learning (e.g. Mundy, 2018; Adamson, Deckner & Bakeman, 2009; Tomasello, 1995).

Reduced or 'impaired' JA is frequently theorised as being a key feature of children with ASC (Franchini et al., 2018; Korhonen, Karna, & Raty, 2014). Research studies indicate that children with ASC show significantly lower levels of JA behaviours, such as eye contact, pointing and showing, compared to typically developing (TD) children (Neimy, Pelaez, Carrow & Monlux, 2017). Evidence for the role of JA in ASC is primarily drawn from studies using retrospective parental reports or home videos, eye tracking, JA interventions and longitudinal studies. These studies show mixed results for JA abilities of children with ASC and several have key limitations in their methodology. This will be explored further in the following subsections.

Retrospective studies

Retrospective studies are often drawn on as evidence for impaired JA in children with ASC.

Such studies have either used parental recollection (via interview) or early childhood video recordings. For example, Osterling and Dawson (1994) coded home video recordings to assess the IJA skills of 22 children at 12 months of age. They found children who were later diagnosed with ASC, showed fewer JA behaviours (including showing, pointing and failing to orient towards their name) than their TD peers. Similar findings from other studies, have led researchers to suggest JA can actually be used as a predictor of ASC (e.g. Charman, 2003; Whalen, Schreibman & Ingersoll, 2006). However, these studies are limited by their small sample sizes, reliance on parental memories of events, and restricted selection of video recordings. Although these studies highlight the importance of JA behaviours in child development, their limitations make it difficult to draw firm conclusions about the role of JA in ASC development.

Longitudinal studies

Longitudinal studies have been carried out to explore the development of individuals who have or are at a high risk of developing ASC compared to TD children (Franchini et al., 2018; Korhonen et al., 2014). For example, Charman (2003) explored the language ability of a small group of infants (n = 18) with ASC, who had been found to produce fewer JA behaviours (e.g. gaze switching) at 20 months compared to their TD peers. He found a significant association between one measure of JA (gaze switching between a toy and adult) and language ability at 42 months. However, given the small sample of children in this study and heterogeneity of ASC, it may be difficult to generalise such findings. More recent longitudinal studies have also shown mixed findings in the emergence of JA skills and its relationship with language outcomes (e.g. Weismer & Kover, 2015; Dereu, Roeyers, Raymaekers & Warreyn, 2012). As is the case with all association studies, we are unable to say whether children's JA skills definitely cause these developmental outcomes.

Eye tracking studies

These studies have been used to explore the visual behaviours involved in JA between children with TD or ASC. These non-invasive studies have provided researchers with the opportunity to include children who are non-verbal or have severe learning difficulties (Cilia, Garry, Brisson & Vandromme, 2018). Recently, Cilia et al. (2018) carried out a systematic literature review of 12 eye tracking studies to investigate the JA skills of children with TD and ASC (aged 7 months – 10 years). They found children with ASC did show some eye tracking difficulties, such as paying less attention and responding more slowly to a referent compared to their TD peers. However, children with ASC were able to follow a person's gaze towards a referent, which was further improved when their partner oriented their head or pointed towards the referent. Although these studies do not indicate whether the child actually understands JA and have widely varying protocols, they do suggest that children with ASC can develop JA skills equivalent to their TD peers, with the right support.

JA intervention studies

Researchers have developed a wide range of interventions to improve the JA skills of children

with ASC (Meindl & Cannella-Malone, 2011; Murza, Schwartz, Hahs-Vaughn & Nye, 2016). These interventions vary widely in their approach (developmental vs behavioural), type of JA skill targeted (IJA vs RJA), and procedure (structured vs unstructured). Recently, Murza et al. (2016) carried out a review of 12 studies, to explore the efficacy of JA interventions for children with ASC (aged 11 months – 12 years). They found significant positive effects of JA interventions compared to control ($p < .001$) and symbolic play ($p = .02$) groups. This was found regardless of whom it was delivered by (e.g. parent or professional) and maintained at follow up. However, due to inconsistent reporting and follow up, it is difficult to identify which type of intervention is best for particular children. It is also important to note that where studies have used tangible reinforcers, this may have led to the child's increased skills (to obtain the reward) rather improving JA itself (Meindl & Cannella-Malone, 2011). Future studies should fade out tangible rewards to ensure JA behaviours are maintained only by positive social interactions. However, these reviews and several others (e.g. Morgan et al., 2014; Clark & Schlabach, 2013) indicate that JA interventions can make significant and positive differences for children with ASC.

Researchers have also investigated whether JA interventions can be effectively carried out in schools (e.g. Wong, 2013; Lawton & Kasari, 2012). Most studies have investigated the efficacy of 'JASPER'; an approach which aims to improve JA, play, engagement and regulation skills of children with ASC. These studies have found promising, preliminary evidence for this approach when delivered by graduate students or teachers in schools for children aged three to six (e.g. Wong, 2013; Shire et al., 2019). For example, the children in JASPER groups showed improved JA (IJA and RJA), play, language and social communication (e.g. Chang et al, 2016; Kaale, Smith & Sponheim, 2012). The teachers also showed high fidelity and enjoyment in delivering JASPER (Shire et al., 2019). Although these studies do have limitations (e.g. small sample sizes and lack of follow up), they all show positive initial results for this approach. It will now be useful to see whether these results can be replicated with larger and more diverse sample groups.

Overall, there is mixed evidence to suggest that children with ASC have impaired JA compared to their TD peers. The methodologies used to provide evidence for this theory have key limitations, such as widely varying protocols (such as the type of JA skill targeted, or the type of reinforcer given for JA behaviours), small sample sizes and failure to acknowledge the child's individual differences or interests (Korhonen et al., 2014). However, recent evidence has shown that JA interventions can have positive effects for autistic children's JA skills, with long-term implications (e.g. Shire et al., 2019). With this in mind, I will now critique the evidence base for the AA approach.

Attention Autism

Evidence for the AA approach is mainly drawn from masters-level and action research carried out by school staff who have received AA training from Gina Davies. For example, in her thesis, Buckingham (2012) explored whether a 6-week AA intervention could improve the JA skills of eight pupils (aged 6-7 years) with complex learning difficulties (seven with ASC). Using mixed methods (e.g. developmental checklist and observation) she found that all pupils' JA skills improved and started to generalise after 6 weeks, with greatest progress in orientation and

shifting attention. Similarly, in a study with three preschool children with ASC (aged 3-4 years), Morgan (2011) found that a 9-week AA intervention led to improved JA skills for all children, but mixed evidence for their independence and communication. Positive findings have also been found for older children. For example, using a mixed methods design, Courtman (2018) found that a 6-week AA intervention improved the JA skills, engagement and attention of six pupils (aged 8-9) with moderate learning difficulties (four with ASC). The children were also reported to produce more vocalisations, smiles and laughter, indicating they enjoyed the intervention.

These projects show a number of strengths, such as their use of mixed methods to capture the attentional skills of children at several time points. Morgan (2011) also carried out a follow up, which enabled her to show that most skills (e.g. independence and communication) acquired through AA were maintained. However, all the studies were limited by their small sample size and lack of control group. They also showed issues with uncontrolled bias, as the researchers all led the intervention and completed the measures. Despite positive outcomes, these limitations make it difficult to identify conclusively whether the AA intervention is effective for children with ASC.

More recently, two peer-reviewed studies have evaluated the efficacy of the AA approach in UK schools. McKeown (2015) investigated the effects of a social skills programme based on the AA approach for six adolescents with ASC (aged 11-14 years). The Post Primary Social Skills Programme (PPSSP) was carried out over a 6-month period, in which staff were trained how to gain and maintain their pupils' attention, as well as teach their pupils how to turn take and problem solve using motivating activities. Although the implementation of PPSSP is unclear from McKeown's report, it does appear to have very similar underlying principles as AA (e.g. use of motivating activities to spark communication), but with more of a focus on developing social skills. McKeown found that the programme led to improvements in social skills (especially responsibility and self-control) and pupil behaviour (e.g. reductions in hyperactivity and inattention). Staff evaluations also indicated the pupils showed greater confidence and less self-awareness, whilst staff became more aware of their pupils' difficulties. Blatchford (2014) also evaluated the AA approach for 25 children with ASC and their teaching assistants (TAs) across 23 mainstream primary schools. She found that pupils of TAs who received individual visits from an SLT and training in AA showed significantly more eye contact and improved relatedness to their TA (e.g. more in tune, higher levels of motivating engagement), compared to children whose TAs received minimal input. Again, these studies have key limitations, such as inadequate sample sizes, lack of control group and follow up. McKeown's study also does not evaluate AA directly and it is unclear the extent to which the PPSSP actually reflects AA. However, they do provide promising preliminary evidence for the AA approach improving the outcomes of young people with ASC, as well as their relationships with school staff.

Several action research projects have also been carried out, which may be regarded as 'practice-based evidence' for the AA approach. For example, a published action research project by Watson et al. (2017) explored the effects of a multi-disciplinary (including EPs, OTs,

SLTs) one-week AA intervention for 12 children with ASC (< 5 years). The intervention also involved the children's usual forest school curriculum, several parent workshops and yoga-based sessions. Using a range of outcome measures (e.g. AA profile and observations), it was found that nearly all the children made gains in their JA and social communication skills (in varying degrees). The children's parents also became more engaged and reported improvements in several areas, such as play and communication. However, although positive, the authors do not report the magnitude of effects for these findings and it is unclear whether AA alone could have led to these improvements. This intervention may not be feasible for mainstream schools, who do not have regular access to a Multi-disciplinary Team (MDT), resources and funding.

The action research projects sent by Gina Davies (in communication related to this academic critique) vary in their quality, and explore a variety of topics, such as how AA can be embedded in the curriculum or used to improve the communication and engagement of pupils. There was some evidence (mostly in the form of evaluations) for children gaining benefit from the AA interventions, however these projects are very difficult to generalise any further than their specific school setting. Nevertheless, several important themes did occur from the projects. The school staff, children and parents all appeared to enjoy AA, which was seen from the researchers' evaluation measures and reflections. It was also highlighted that staff needed to have a good understanding of the AA principles, through attending training and ongoing reflective/problem-solving sessions, to ensure the programme was having a positive impact for their pupils.

Despite positive findings, it is clear that rigorous research is required to identify if AA alone can lead to improvements in attention, social communication, language and social skills for children and young people with ASC. To achieve this, the research would need to be carried out independently of the author (or with blinding procedures in place), with larger and more diverse sample sizes, and a control group.

Conclusions and implications for Educational Psychologists

In summary, AA presents as a fun and engaging approach for developing the attention, social communication and language of children with ASC. The psychological basis for AA is less clear, although this may be because it is an eclectic approach, which draws on good autism practice and various developmental models of attention (especially JA). There has been growing evidence for the use of JA interventions with autistic children and young people. The evidence for AA itself is more limited, drawing mainly from masters and action research projects. These projects indicate positive, preliminary findings for AA, such as improved JA, social skills and teacher-student relationships. Consequently, AA may be best regarded as an 'evidence supported' approach, as it draws on evidence-based strategies, but has not yet undergone rigorous efficacy testing (Robinson, Bond & Oldfield, 2018).

Amongst EPs, the AA approach is already being frequently mentioned for use with autistic pupils (Robinson et al., 2018). However, EPs should take care when suggesting AA to staff who have not been appropriately trained, as this could impact on the approach's fidelity. This is

especially important, as findings from the action research projects indicate that AA is most effective when staff have a good understanding of the key principles and are confident to deliver AA. EPs could also encourage several of the key strategies used in AA, which are applicable for high-quality teaching, such as using the child's interests, making learning fun and modelling skills. Finally, EPs have a key role to play in helping schools to change the discourse around autism, which typically focuses on 'impairments' or 'deficits'. Instead, practitioners should be encouraged to use interventions or approaches (such as AA) which focus on a child's capabilities and interests, as a way of increasing their motivation to learn and participate at school.

Given the increase of pupils with ASC in UK mainstream schools (DfE, 2018), it is important we are finding positive and effective ways to support their learning and development. AA appears to be an enjoyable and suitable approach for use in schools. The current evidence-base for AA is limited but has shown promising results so far. Future research should focus on investigating the efficacy of AA and how it may be best implemented in schools to support children and young people with ASC.

References

Adamson, L, Deckner, D, Bakeman, R. (2009). Early Interests and Joint Engagement in Typical Development, Autism and Downs Syndrome. *Journal of Autism and Developmental Disorders*. 40 (6), 665-676.

Autism Education Trust (2015). *A progression framework for pupils on the autistic spectrum: notes, guidance and instructions for use*. Retrieved from: http://www.aettraininghubs.org.uk/wp-content/uploads/2016/02/PROGRESSION-FRAMEWORK-NOTES-AND-GUIDANCE-170216.pdf

Beuker, K. T., Rommelse, N. N. J., Donders, R., & Buitelaar, J. K. (2013). Development of early communication skills in the first two years of life. *Infant Behavior & Development, 36*(1), 71-83. doi:10.1016/j.infbeh.2012.11.001

Blatchford, H. (2014). Can we ever see eye to eye? An investigation into the impact of eye contact on relatedness between children with autism in mainstream reception classes and their teaching assistant. *Good autism practice, 15* (2), 24-39.

Bottema-Beutel, K. (2016). Associations between joint attention and language in autism spectrum disorder and typical development: A systematic review and meta-regression analysis. *Autism Research, 9*(10), 1021-1035. doi:10.1002/aur.1624

British Psychological Society (2016). *Autistic Spectrum Disorders: Guidance for psychologists.* Retrieved from: file:///C:/Users/flmar/OneDrive/Educational%20Psychology%20Doctorate/SSRP/Literature/ASD.%20Guidance%20for%20psychologists.pdf

Buckingham, K. (2012). The impact of an Attention Autism approach on joint attention skills in a Key Stage one class in a special school. Dissertation. Accessed from: https://www.southamptoninclusion.net/wp-content/uploads/2016/02/Research-Kate-Buckingham.pdf

Caldwell, P., & Horwood, J. (2008). *Using intensive interaction and sensory integration*.

London: Jessica Kingsley

Chang, Y.-C., Shire, S. Y., Shih, W., Gelfand, C., & Kasari, C. (2016). Preschool deployment of evidence-based social communication intervention: Jasper in the classroom. *Journal of Autism and Developmental Disorders, 46*(6), 2211-2223. doi:10.1007/s10803-016-2752-2

Charman, T. (2003) *Why is joint attention a pivotal skill in autism?* Philosophical Transactions of the Royal Society of London Series B – Biological Sciences, 358, pp. 315-324.

Cilia, F., Garry, C., Brisson, J., & Vandromme, L. (2018). Attention conjointe et exploration visuelle des enfants au développement typique et avec tsa: Synthèse des études en oculométrie = joint attention and visual exploration of children with typical development and with asd: Review of eye-tracking studies. *Neuropsychiatrie de l'Enfance et de l'Adolescence, 66*(5), 304-314. doi:10.1016/j.neurenf.2018.06.002

Clark, G. J. F., & Schlabach, T. L. (2013). Systematic review of occupational therapy interventions to improve cognitive development in children ages birth-5 years. *American Journal of Occupational Therapy, 67*(4), 425-430. doi:10.5014/ajot.2013.006163

Courtman, S.J. (2018). *An evaluation of the effectiveness of using the Attention Autism programme as an intervention for increasing the level of attention during an adult led activity in pupils with Autism Spectrum Condition*. Retrieved from: https://www.researchgate.net/publication/322939097_An_evaluation_of_the_effectiveness_of_using_the_Attention_Autism_programme_as_an_intervention_for_increasing_the_level_of_attention_during_an_adult_led_activity_in_pupils_with_Autism_Spectrum_Condition

Davies (2017). *Practical help with autism – Gina Davies Autism Centre*. Retrieved from: http://ginadavies.co.uk/

Department of Education (2018). *Special educational needs in England: January 2018*. Retrieved from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/729208/SEN_2018_Text.pdf

Dereu, M., Roeyers, H., Raymaekers, R., & Warreyn, P. (2012). Exploring individual trajectories of social communicative development in toddlers at risk for autism spectrum disorders. *Research in Autism Spectrum Disorders*, *6*(3), 1038–1052. doi:10.1016/j.rasd.2011.12.003.

Kaale, A., Smith, L., & Sponheim, E. (2012). A randomized controlled trial of preschool-based joint attention intervention for children with autism. *Journal of Child Psychology and Psychiatry, 53*(1), 97-105. doi:10.1111/j.1469-7610.2011.02450.x

Korhonen, V., Kärnä, E., & Räty, H. (2014). Autism spectrum disorder and impaired joint attention: A review of joint attention research from the past decade. *Nordic Psychology, 66*(2), 94-107. doi:10.1080/19012276.2014.921577

Lawton, K., & Kasari, C. (2012). Teacher-implemented joint attention intervention: Pilot randomized controlled study for pre-schoolers with autism. *Journal of Consulting and Clinical Psychology, 80*(4), 687-693. doi:10.1037/a0028506

McKeown, L. (2015). An evaluation of the Attention Autism programme for secondary aged children with autism in a mainstream setting. *Good Practice Autism*, 16:1, 12-17.

Meindl, J. N., & Cannella-Malone, H. I. (2011). Initiating and responding to joint attention bids in children with autism: A review of the literature. *Research in Developmental*

Disabilities, 32(5), 1441-1454. doi:10.1016/j.ridd.2011.02.013

Morgan, H. (2011) *Evaluation of Attention Hillingdon: a social communication intervention for pre-schoolers with autism spectrum disorder.* Institute of Education, University of London.

Morgan, L. J., Rubin, E., Coleman, J. J., Frymark, T., Wang, B. P., & Cannon, L. J. (2014). Impact of social communication interventions on infants and toddlers with or at-risk for autism: A systematic review. *Focus on Autism and Other Developmental Disabilities, 29*(4), 246-256. doi:10.1177/1088357614539835

Mundy, P. (2018). A review of joint attention and social-cognitive brain systems in typical development and autism spectrum disorder. *European Journal of Neuroscience, 47*(6), 497-514. doi:10.1111/ejn.13720

Murza, K. A., Schwartz, J. B., Hahs-Vaughn, D. L., & Nye, C. (2016). Joint attention interventions for children with autism spectrum disorder: A systematic review and meta-analysis. *International Journal of Language & Communication Disorders, 51*(3), 236-251. doi:10.1111/1460-6984.12212

National Autistic Society (2003). *Autism and education: The ongoing battle*. London: National Autistic Society.

Neimy, H., Pelaez, M., Carrow, J., Monlux, K., & Tarbox, J. (2017). Infants at risk of autism and developmental disorders: Establishing early social skills. *Behavioral Development Bulletin, 22*(1), 6-22. doi:10.1037/bdb0000046

Osterling, J., & Dawson, G. (1994). Early recognition of children with autism: A study of first birthday home videotapes. *Journal of Autism and Developmental Disorders, 24*(3), 247-257. doi:10.1007/BF02172225

Robinson, L., Bond, C., & Oldfield, J. (2018). A UK and Ireland survey of educational psychologists' intervention practices for students with autism spectrum disorder. *Educational Psychology in Practice*, 34:1, 58-72, DOI: 10.1080/02667363.2017.1391066

Shire, S. Y., Shih, W., Chang, Y.-C., Bracaglia, S., Kodjoe, M., & Kasari, C. (2019). Sustained community implementation of jasper intervention with toddlers with autism. *Journal of Autism and Developmental Disorders*. doi:10.1007/s10803-018-03875-0

Tomasello, M. (1995). Joint attention as social cognition. In C. Moore & P. J. Dunham (Eds.), *Joint attention: Its origins and role in development.* (pp. 103-130). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Watson, J., Davies, G., Winterton, A. (2017). An evaluation of the Attention Autism approach with young children with autism. *Good Practice Autism,* 18(2), 79-93.

Weismer, E.S., & Kover, S. T. (2015). Preschool language variation, growth, and predictors in children on the autism spectrum. *Journal of Child Psychology and Psychiatry, 56*(12), 1327-1337. doi:10.1111/jcpp.12406

Whalen, C., Schreibman, L., & Ingersoll, B. (2006). The collateral effects of joint attention training on social initiations, positive affect, imitation, and spontaneous speech for young children with autism. *Journal of Autism and Developmental Disorders, 36*(5), 655-664. doi:10.1007/s10803-006-0108-z

Wong, C. (2013). A play and joint attention intervention for teachers of children with autism: A randomized controlled pilot study. *Autism*. 17 (3), 340-357.

Appendix A

Systematic search criteria

Due to my previous interest in Attention Autism, I knew Gina Davies (author) had a website and decided this would be a good starting point to gain overall picture of AA. However, as the approach's procedure and theoretical underpinnings were unclear from the website, I decided to contact Gina Davies directly. I also carried out initial searches on Google scholar and Psychinfo which led to five relevant results.

Gina Davies responded with several published research articles and action research projects carried out in local schools, which gave me a better understanding of what the approach involved, as well as its theoretical underpinnings and evidence-base.

From further reading, I noticed that AA was frequently referred to as a 'joint attention approach/intervention', and so decided to gain further knowledge about joint attention and its links with autism and child development. This was gained by carrying out a search on Psychinfo for recent reviews and following up key references cited within the articles.

I also carried out an additional search for reviews of joint attention interventions, in order to explore their effectiveness for helping children and young people with autism. Specifically, I focused on school/classroom-based JA interventions, as I felt this would be most applicable for educational psychology.

Table 1. *Systematic search criteria*

Date accessed	Database used	Search keywords	Limits	Results	Most relevant results
03/01/19	Google scholar	'Attention Autism' 'Attention Autism program*' 'Attention Autism approach' 'Gina Davies'	Boolean Full text links	13 (including 3 citations)	**5** Robinson et al. (2018) McKeown (2015) Watson et al. (2017) McCaffrey et al. (2013) Buckingham, K. (2012)
	Psychinfo	Using the same keyword search terms.		0	

15/01/19	Email response from Gina Davies			6	**6** Courtman (2018) Blatchford (2014) Morgan (2011) 3 Action research projects (unnamed)
01/02/19	Psychinfo	'joint attention' 'adolescen*', 'youth*', 'young people', teen*, child* 'Autism spectrum disorder', 'Autis*', 'ASD', 'ASC' 'Review', 'Analysis'	Boolean Peer reviewed Year 2009-19	107	**10** Federica et al (2018) Franchini et al (2018) Mundy (2018) Neimy et al (2017) Bottema-Beutel (2016) Murza et al (2016) Weismer et al (2015) Gaulmyn et al (2015) Korhonen et al (2014) Meindl & Cannella-Malone (2011)
11/02/19	Psychinfo	'joint attention' 'joint attention intervention*' 'adolescen*', 'youth*', 'young people', teen*, child* 'Autism spectrum disorder', 'Autis*', 'ASD' 'ASC' 'Review*'	Boolean Year 2009-19	44	**5** Boucenna et al (2014) Morgan et al (2014) Clark et al (2013) Schertz et al (2012) White et al (2011) (after excluding irrelevant results or articles which had already been identified in the previous search)
19/02/19	Psychinfo	'joint attention' 'joint attention intervention*' 'adolescen*', 'youth*', 'young people', teen*, child* 'Autism spectrum disorder', 'Autis*', 'ASD' 'ASC' 'school*'	Boolean Year 2009-19	96	**7** Shire et al (2017; 2019) Chang et al (2016) Wong (2013) Goods, Ishijima, Chang & Kasari (2013) Lawton & Kasari (2012) Kaale, Smith & Sponheim (2012)