Research in Developmental Disabilities 96 (2020) 103518

Contents lists available at ScienceDirect

Research in Developmental Disabilities

journal homepage: www.elsevier.com/locate/redevdis

The narrative coherence of witness transcripts in children on the autism spectrum

Lucy A. Henry[a,*], Laura Crane[b], Eva Fesser[a], Anna Harvey[a], Lucy Palmer[a], Rachel Wilcock[c]

[a] City, University of London, 10 Northampton Square, London, EC1V 0HB, UK
[b] University College London Institute of Education, 55-59 Gordon Square, London, WC1H 0NU, UK
[c] University of Winchester, Winchester, SO22 4NR, UK

ARTICLE INFO

Keywords:
Children
Autism
Eyewitness testimony
Narrative coherence
Story grammar

ABSTRACT

Background and Aims: Autistic children often recall fewer details about witnessed events than typically developing children (of comparable age and ability), although the information they recall is generally no less accurate. Previous research has not examined the narrative coherence of such accounts, despite higher quality narratives potentially being perceived more favourably by criminal justice professionals and juries. This study compared the narrative coherence of witness transcripts produced by autistic and typically developing (TD) children (ages 6–11 years, IQs 70+).

Methods and Procedures: Secondary analysis was carried out on interview transcripts from a subset of 104 participants (autism = 52, TD = 52) who had taken part in a larger study of eyewitness skills in autistic and TD children. Groups were matched on chronological age, IQ and receptive language ability. Coding frameworks were adopted from existing narrative research, featuring elements of 'story grammar'.

Outcomes and Results: Whilst fewer event details were reported by autistic children, there were no group differences in narrative coherence (number and diversity of 'story grammar' elements used), narrative length or semantic diversity.

Conclusions and Implications: These findings suggest that the narrative coherence of autistic children's witness accounts is equivalent to TD peers of comparable age and ability.

What this papers adds

Previous work examining witness skills in autistic children has focused on the volume and accuracy of their recall for a witnessed event. No previous studies have examined whether these accounts are organised logically for the listener in terms of key 'story grammar' elements: information about the setting and the initiating event; the intentions of people in the event; the emotions, cognitions and goals of the people in the event; the actions that took place during the event; and the consequences arising from, and resolution of, the event. Such information may help criminal justice professionals to better understand what happened. Using closely matched, relatively large samples of autistic and non-autistic children (all with IQs 70+), the present study found no differences in

* Corresponding author at: Division of Language and Communication Science, City, University of London, 10 Northampton Square, London, EC1V 0HB, UK.
E-mail addresses: Lucy.Henry.1@city.ac.uk (L.A. Henry), L.Crane@ucl.ac.uk (L. Crane), evafesser@gmail.com (E. Fesser), anna.harvey@nhs.net (A. Harvey), lucy.palmer@city.ac.uk (L. Palmer), rachel.wilcock@winchester.ac.uk (R. Wilcock).

https://doi.org/10.1016/j.ridd.2019.103518
Received 19 June 2019; Received in revised form 14 October 2019; Accepted 18 October 2019

the inclusion of story grammar elements between these two groups, despite the fact that autistic children reported fewer correct details about the witnessed event than non-autistic children. Similarly, the groups did not differ in terms of how long and semantically diverse their accounts were. The current findings are novel because they attest to the *comparability* of autistic and non-autistic child witnesses in terms of both narrative coherence and account length/semantic diversity (despite the autistic children reporting fewer details overall). The findings also support a growing body of literature attesting to the overall reliability of autistic child witnesses.

1. Introduction

Autistic[1] children and adults are more likely to encounter the criminal justice system than non-autistic individuals (Lindblad & Lainpelto, 2011; Turcotte, Shea, & Mandell, 2018; Woodbury-Smith & Dein, 2014). Further, because children and adults with developmental differences are at increased risk of violence, victimisation and abuse (Jones et al., 2012; Petersilia, 2001), it is vital to examine the quality of their evidence and encourage increased rates of reporting, investigation and prosecution. The current study examined the narrative coherence of information remembered by autistic children, comparing them to matched typically developing (TD) children. It extends a growing body of empirical research examining the accuracy and volume of recall for witnessed events in children and adults on the autism spectrum (largely those without intellectual disabilities).

Previous findings indicate that children on the autism spectrum often recall a lower *volume* of information than TD peers of comparable age and ability (IQ) when interviewed about witnessed events (Almeida, Lamb, & Weisblatt, 2019; Bruck, London, Landa, & Goodman, 2007; Henry, Messer et al., 2017; Mattison, Dando, & Ormerod, 2015; McCrory, Henry, & Happé, 2007); although findings for autistic adults are more complex (see review by Maras & Bowler, 2014). There is evidence that group differences in volume of recall (in child and adult samples) are less apparent in more structured interviews (Henry, Crane et al., 2017; Maras & Bowler, 2010), or when additional supports (more specific questioning, physical reinstatement of context, or concrete visual prompts) are provided at recall (Maras & Bowler, 2012a, 2014; Mattison, Dando, & Ormerod, 2018). Importantly, eyewitness information provided by autistic children can be as accurate as that of comparable peers (Almeida et al., 2019; Bruck et al., 2007; Henry, Messer et al., 2017; Henry, Crane et al., 2017; McCrory et al., 2007); although accuracy levels may vary with interview type (Mattison et al., 2018) and the findings are less consistent in autistic adults (Maras & Bowler, 2010, 2011, 2012b; Maras, Memon, Lambrechts, & Bowler, 2013). Critically, autistic people are not more suggestible than non-autistic people (Bruck et al., 2007; Maras & Bowler, 2011, 2012b; McCrory et al., 2007; North, Russell, & Gudjonsson, 2008), despite many legal professionals believing this to be true (see George, Crane, Bingham, Pophale, & Remington, 2018, for a survey on this topic in UK barristers). They may, however, be more compliant (Chandler, Russell, & Maras, 2019; North et al., 2008).

To our knowledge, there is no current literature assessing the *narrative coherence* of witness accounts provided by autistic children. Narrative coherence refers to 'a global representation of story meaning and connectedness' (Diehl, Bennetto, & Young, 2006) and is not the same as the amount of information recalled about an event, or its accuracy (Brown, Brown, Lewis, & Lamb, 2018; Feltis, Powell, & Roberts, 2011; Reese et al., 2011). A coherent account can be full or sparse in terms of evidential details, but will show a degree of organisation and structure relating to the context, content and characters associated with an event. Reese et al. (2011) suggest that a coherent narrative is 'one that *makes sense* to a naïve listener' (p.425, emphasis original), and describe developmental changes that occur during childhood in terms of increased complexity and number of narrative features (see also Berman & Slobin, 1994). Narrative coherence is often overlooked in research into witness recall, yet could substantially impact the degree to which a child's evidence can be easily understood by members of the criminal justice system. For example, coherent accounts may appear more meaningful and credible to jurors (Brown et al., 2018; Feltis et al., 2011; Feltis, Powell, Snow, & Hughes-Scholes, 2010; Gentle, Milne, Powell, & Sharman, 2013; Murfett, Powell, & Snow, 2008). Further, in England and Wales, narrative coherence is used by the police (to establish relevant 'points to prove') and the Crown Prosecution Service (when making decisions about whether or not to authorise charges).

Studies looking at narrative coherence in TD children's witness accounts have adopted a 'story grammar' approach (Stein & Glenn, 1979) to capture higher order hierarchical structure, organisation and coherence (often described as 'macrostructure' or 'global structure'). This approach looks for key elements that make accounts clear, organised and understandable for the listener via the inclusion of a number of logically ordered story elements. Seven elements are coded including: *setting* (contextual details about the event location to orient the listener); *initiating event* (how the event began); *internal response* (emotions, cognitions and goals of the people in the event); *plan* (the intentions of the people affected by the initiating event); *action/attempt* (the activities that constituted the event); *direct consequence* (the outcome/s of the event); and *resolution* (what happened at the end of the event). Many four- to eight-year-old children with TD can provide at least some elements of story grammar when recalling a witnessed event in an open-ended free recall interview (e.g., action/attempt, initiating event, and direct consequence details), although few children in this age range include *internal response*, *plan*, *setting* or *resolution* elements (Feltis et al., 2011). Using the story grammar framework, Westcott and Kynan (2004) conducted a secondary analysis of investigative interviews with children suspected of being sexually abused, finding that although children included basic story grammar components such as 'setting', their narratives were often "incomplete, ambiguous and disordered" (p.37). Several authors have used the story grammar approach successfully to assess narratives about witnessed events in children with intellectual disabilities (ID), finding that some children with ID include proportionately fewer story

[1] There is debate regarding the way autism is – and should be – described. In this article, we use both identity-first language (i.e., autistic children) as well as person-first language (i.e., children on the autism spectrum) to respect this diversity of views (see Kenny et al., 2016).

grammar elements than comparison groups (Brown et al., 2018; Gentle et al., 2013; Murfett et al., 2008).

The current study extended the story grammar approach to look at narrative coherence in witness transcripts produced by children on the autism spectrum. An interview comprising only open-ended questions was used, given that such methods are most likely to elicit story grammar elements (Feltis et al., 2010; Snow, Powell, & Murfett, 2009). Children between the ages of 6 and 11 years with and without an autism diagnosis were included, as at least some markers of story grammar are present in witness accounts throughout this age range (Brown et al., 2018; Westcott & Kynan, 2004). We did not look at developmental increases in the inclusion of story grammar elements as these are well-established (e.g., Brown et al., 2018; Feltis et al., 2011); the aim was to compare groups of autistic and TD children matched on age (as well as IQ and receptive language).

Previous literature on the broader narrative skills of autistic children and adults presents a conflicting picture, largely noting difficulties in some areas but not others (e.g., Banney, Harper-Hill, & Arnott, 2015; Capps, Losh, & Thurber, 2000; Diehl et al., 2006; King, Dockrell, & Stuart, 2013) or hardly any differences at all (e.g., Capps, Kehres, & Sigman, 1998; Norbury & Bishop, 2003; Tager-Flusberg & Sullivan, 1995; Young, Diehl, Morris, Hyman, & Bennetto, 2005). Studies generally compare autistic children or adults to age and language-matched (or verbal ability-matched) TD children or adults (or in some cases language-matched children with developmental delays). The areas of difficulty or difference identified are varied: less use of complex syntax; reduced use of evaluative devices; reduced use of causal explanations; greater numbers of ambiguous nouns and pronouns; shorter mean length of utterance; fewer different main body words and word roots; less complex 'high point' structure; more bizarre or idiosyncratic contributions; less complex episodic structure; and focus on details rather than gist (Banney et al., 2015; Barnes & Baron-Cohen, 2012; Capps et al., 1998, 2000; Goldman, 2008; King et al., 2013; Lee et al., 2018; Losh & Capps, 2003; McCabe, Hillier, & Shapiro, 2013; Norbury & Bishop, 2003; Pearlman-Avnion & Eviatar, 2002). Baixauli, Colomer, Rosello, and Miranda (2016) reflected this variability in their meta-analysis of narrative production tasks in autistic and non-autistic children, reporting small, moderate *and* large effect sizes over a range of narrative indices.

Importantly, this variability in results may depend on the tasks used. Open-ended tasks, such as describing personal narratives, recalling orally presented fairy tales, or making up a story to go with an emotionally ambiguous picture, tend to reveal greater difficulties for autistic children and adults than more structured and guided tasks such as narrating the story to a 'wordless picture book' (King et al., 2013; Lee et al., 2018; Losh & Capps, 2003; Losh & Gordon, 2014; Tager-Flusberg & Sullivan, 1995). Wordless picture book tasks often reveal almost no group differences at all (e.g., Losh & Capps, 2003; Norbury & Bishop, 2003), and may reduce the cognitive demands of storytelling by scaffolding memory, attention, story organisation and language production via providing temporally sequenced visual cues. Importantly, although in their meta-analysis Baixauli et al. (2016) reported no effects of narrative task, they could only assess two combined categories of narrative task given the limited number of available studies. Results also differ depending upon the nature of the comparison group. There are relatively few (or no) differences in narrative ability on some tasks between well-matched autistic and non-autistic children (e.g., Capps et al., 1998, 2000; Diehl et al., 2006; Losh & Capps, 2003; Norbury & Bishop, 2003; Tager-Flusberg & Sullivan, 1995; Young et al., 2005). Such matching, most commonly for verbal ability and age, ensures that group differences – if found – are not just a function of language skills or developmental level.

When looking at results for the inclusion of the global elements of story grammar, previous research also presents a mixed picture. Norbury and Bishop (2003), for example, compared autistic and non-autistic children matched for age and non-verbal ability, but who showed differences on language measures including receptive vocabulary and grammar. There were no group differences in the inclusion of key story grammar elements. Diehl et al. (2006) included samples of autistic and TD children who all had ability levels in the 80 + IQ range and who were matched on age, IQ *and* language ability. They found no group differences in the inclusion of gist elements or the proportion of basic story elements recalled (although there were group differences in causal connectivity). Similarly, Lee et al. (2018) found no group differences in the inclusion of story grammar elements between autistic and TD adults (the groups differed on verbal IQ so this variable was controlled in the analyses). Nonetheless, others have described differences in the inclusion of story elements between autistic and non-autistic groups (Banney et al., 2015; Goldman, 2008; Losh & Capps, 2003; see also Pearlman-Avnion & Eviatar, 2002, although groups in this study were not matched for language); found differences in the types of information produced (e.g., reductions in the preponderance or amount of 'gist' rather than 'detail' information: Barnes & Baron-Cohen, 2012; McCrory et al., 2007); or reported group differences in a combined meta-analysis of relevant studies (Baixauli et al., 2016).

In evaluating previous research into narrative coherence in individuals on the autism spectrum, several difficulties emerge. First, studies have used different elicitation methods, ranging from wordless picture books (Losh & Capps, 2003), to describing autobiographical memories (King et al., 2013), to recalling sections from television programmes (Barnes & Baron-Cohen, 2012) or making up a story to an ambiguous picture (Lee et al., 2018). Only one study assessing narrative coherence in autistic individuals has looked at eyewitness memory (Pearlman-Avnion & Eviatar, 2002, using a narrated slide show), which is a more realistic everyday remembering task. In the current study, a secondary analysis of the story grammar elements produced in witness transcripts collected in a previous study of autistic and non-autistic children (Henry, Messer et al., 2017) is presented. Second, the approach to matching has differed. Some studies have matched for chronological age, intelligence (IQ – usually verbal but sometimes non-verbal), and one or more aspects of language ability (e.g., Banney et al., 2015); others have used more than one comparison group (e.g., with matching for chronological age and IQ *and* language ability and IQ, King et al., 2013); and others have matched on some but not all of these variables (e.g., Capps et al., 1998, 2000; Norbury & Bishop, 2003; Tager-Flusberg & Sullivan, 1995; Young et al., 2005). It may be difficult to match on multiple indices, particularly if language ability is included, given the heterogeneity and variability of language skills found in autistic individuals (Kwok, Brown, Smyth, & Oram Cardy, 2015; Taylor, Maybery, & Whitehouse, 2012). Indeed, some studies do not attempt to do so (Goldman, 2008) or control key variables statistically (Lee et al., 2018). In the present study, all available participants were included from the larger study who could be matched on age, IQ and *one* aspect of language (receptive

vocabulary), although other aspects of language ability varied significantly between groups. This provided a test of narrative skill in autistic children who were similar in age, intellectual ability and receptive vocabulary to a comparison group of non-autistic children. Finally, there are few studies with larger sample sizes. The current sample size (52 autistic children, 52 TD children) was larger than in previous studies, and a conservative significance level was used to account for multiple group comparisons (see Banney et al., 2015).

We also measured the length of the transcripts in terms of total number of words, and their semantic diversity in terms of number of different words. This is important, as although many previous studies have found no significant differences between autistic and typical individuals in story length or semantic diversity, albeit using slightly varying measures (Banney et al., 2015; Diehl et al., 2006; Losh & Capps, 2003; McCabe et al., 2013; Norbury & Bishop, 2003; Tager-Flusberg & Sullivan, 1995; Young et al., 2005), there are some reports of differences (Baixauli et al., 2016; Capps et al., 2000; King et al., 2013; Lee et al., 2018). Finally, we included preliminary correlational analyses between story grammar measures and other cognitive and language variables, although few relationships were expected given limited findings in previous research (Banney et al., 2015).

Matching TD and autistic groups on several indices including age, IQ and receptive language level may minimise differences in narrative performance. Therefore, it was hypothesised that there would be no significant differences between the groups with regard to the number and diversity of 'story grammar' elements included in their accounts. We also tentatively predicted no significant differences in overall length or number of different words.

2. Method

2.1. Participants

The data used in this project were taken from interviews carried out as part of a larger study conducted by Henry, Messer et al. (2017), which compared eyewitness memory skills in children with and without autism diagnoses. The original study included 272 participants (162 boys and 110 girls, aged between 76 months and 142 months). Of these children, 71 had a formal diagnosis of autism, obtained independently of the research study by a suitably qualified professional. Children were recruited from mainstream primary schools or special educational needs schools in Greater London or South-East England.

Selecting a meaningful comparison group for studies of children on the autism spectrum is not straightforward when discrepant 'peaks and valleys' represent a common cognitive profile (Burack, Iarocci, Flanagan, & Bowler, 2004). We tried to avoid 'over-matching' where statistical bias is accidentally caused by matching for what is believed to be a confounding variable but is actually a core feature of the autism profile. Burack et al. (2004) advise matching on a subset of features, but caution against matching 'out' the key features of autism. In line with previous literature, matching was carried out for age, IQ and one measure of language (receptive vocabulary). Receptive vocabulary was selected following Goldman (2008), who reported non-significant differences in receptive vocabulary scores in their samples, together with substantial differences on two subtests from a broader language battery (the Clinical Evaluation of Language Fundamentals, CELF-4 UK, Semel, Wiig, & Secord, 2006). All children who recalled at least three items of correct information in their interview accounts of the witnessed event were eligible for inclusion (three children were excluded at this stage: two autistic, one TD). Individual matches within +/- 10 points for both IQ and receptive vocabulary and +/- 6 months for age were hand selected.

The resulting sub-sample comprised: 104 children (52 in the TD group, and 52 in the autism group) matched on age, IQ and receptive language ability. There were 83 boys and 21 girls (TD group: 38 boys and 14 girls; autism group: 45 boys and 7 girls). It was not possible to match the groups exactly on gender, as the autism group in the original sample included a high proportion of males (62 boys and 9 girls). The composition of the current sample reflects the wider autistic population, where males are estimated to outnumber females (Loomes, Hull, & Mandy, 2017). Table 1 provides mean scores on all background variables.

Mervis and Klein-Tasman (2004) suggest that for groups to be well-matched, the group distributions on the control variable in question should overlap, with a p-level of at least .50 on the test of mean differences. An independent samples t-test was used to compare the groups, as these data were normally distributed. On all three indices, age, IQ and receptive vocabulary, the groups were closely matched (see Table 1). Data are also reported on other measures of language, memory and attention (not matched between groups), as well as the total number of correct items of information recalled in the initial interview (see Table 1).

Mirroring the original study findings (Henry, Messer et al., 2017), the groups differed in the number of correct details recalled about the witnessed event (Table 1), with autistic children (M = 25.71, SD = 14.37) recalling fewer correct details than TD children (M = 33.42, SD = 14.24), $t(102) = -2.75$, p = .007. However, the analyses of story grammar elements and length/diversity of narratives did not focus solely on correct details, but included the full transcripts for all children.

2.2. Measures

Participants' intellectual abilities were assessed in the original study using the Wechsler Abbreviated Scale of Intelligence (WASI-II; Wechsler & Zhou, 2011). An estimate of full-scale IQ was obtained using 'Vocabulary' from the Verbal Comprehension Index and 'Matrix Reasoning' from the Perceptual Reasoning Index. As noted, following matching, the groups did not differ on this measure.

Language level of participants was measured using several tasks from the original study. Receptive vocabulary was assessed using the British Picture Vocabulary Scale - Third Edition (BPVS-3; Dunn, Dunn, & Styles, 2009), which requires children to select the correct picture from a choice of four upon hearing a word spoken. Two subtests from the Expressive Language Test - 2 (ELT-2; Bowers, Huisingh, Logiudice, & Orman, 2010) included: 'Sequencing', to test narrative ability, and 'Grammar and Syntax', to test

Table 1
Mean (SD) scores for age, cognitive, language, memory and attention variables for autism and typical development (TD) groups, with group differences.

Variable:	Autism group (n = 52, 45 boys)	TD group (n = 52, 38 boys)	Group differences (Cohen's *d*)
*Age (months)	108.96 (17.15)	108.19 (15.74)	$t(102) = .24$, $p = .81$ ($d = .05$)
*WASI-II IQ: (Vocabulary + Matrix Reasoning)[1]	101.08 (15.40)	102.00 (13.56)	$t(102) = -.32$, $p = .75$ ($d = .06$)
*BPVS-3[1]	86.79 (16.21)	87.85 (14.06)	$t(102) = -.36$, $p = .72$ ($d = .07$)
ELT-2: Sequencing[1]	104.50 (10.44)	108.10 (9.55)	$t(102) = -1.83$, $p = .07$ ($d = .36$)
ELT-2: Grammar and Syntax[1]	97.69 (12.98)	102.90 (12.08)	$t(102) = -2.12$, $p = .04$ ($d = .42$)
CELF-4-UK: Recalling Sentences[2]	7.44 (3.56)	9.90 (3.28)	$t(102) = -3.67$, $p < .001$ ($d = .72$)
CELF-4-UK: Formulated Sentences[2]	5.65 (3.10)	8.81 (3.18)	$t(102) = -5.04$, $p < .001$ ($d = 1.01$)
TOMAL-2: Verbal Memory Index[1]	105.5 (17.23)	102.9 (15.60)	$t(102) = .82$, $p = .41$ ($d = .16$)
TOMAL-2: Nonverbal[1] Memory Index	95.37 (18.37)	107.19 (18.59)	$t(102) = -3.26$, $p = .001$ ($d = .64$)
TOMAL-2: Composite Memory Index[1]	100.35 (16.52)	105.40 (15.64)	$t(102) = -1.60$, $p = .11$ ($d = .31$)
TEA-Ch: Focused Attention (Sky Search)[2]	8.67 (3.83)	8.94 (3.12)	$t(102) = -.39$, $p = .70$ ($d = .08$)
TEA-Ch: Sustained Attention (Score!)[2]	7.90 (4.15)	8.69 (3.36)	$t(102) = -1.07$, $p = .29$ ($d = .21$)
TEA-Ch: Dual Task performance[2]	4.58 (3.72)	5.79 (3.91)	$t(102) = -1.62$, $p = .11$ ($d = .32$)
Total correct details recalled in interview[3]	25.71 (14.37)	33.42 (14.24)	$t(102) = -2.75$, $p = .007$ ($d = .54$)

Key: WASI-II (Wechsler Abbreviated Scale of Intelligence 2nd Edition); BPVS-3 (British Picture Vocabulary Scale 3rd Edition); ELT-2 (Expressive Language Test 2nd Edition); CELF-4-UK (Clinical Evaluation of Language Fundamentals UK 4th Edition); TOMAL-2 (Test of Memory and Learning 2nd Edition); TEA-Ch (Test of Everyday Attention for Children).

* Groups were matched on these variables and, as expected, no significant group differences were observed.

[1] Standardised scores (mean 100 SD 15).

[2] scaled scores (mean 10 SD 3).

[3] non-standardised raw scores.

grammatical morphology. A further two subtests were taken from the Clinical Evaluation of Language Fundamentals - 4th edition (CELF-4 UK; Semel et al., 2006). 'Recalling Sentences' assesses the ability to accurately repeat sentences using internalised grammatical structure, and 'Formulated Sentences' assesses the ability to produce full, grammatically accurate, and meaningful sentences about picture stimuli.

When compared on the language measures, the two participant groups were well-matched on receptive vocabulary ability (BPVS), as expected (Table 1), with no significant difference between the autism and TD groups. However, significant group differences (or marginal differences) remained in scores on the other language measures (ELT-2 'Sequencing'; ELT-2 'Grammar and Syntax'; CELF-4 'Recalling Sentences'; CELF-4 'Formulated Sentences').

An assessment of general memory ability from the Test of Learning and Memory (2nd Edition, TOMAL-2, Reynolds & Voress, 2007) included: Memory for Stories; Paired Recall; Facial Memory; and Visual Sequential Memory. Table 1 includes composite scores for the Verbal Memory Index, on which groups did not differ, and the Nonverbal Memory Index, on which the autistic children obtained lower scores than the TD children (although no differences were present on the combined Composite Memory Index). Three assessments of focused, sustained and sustained-divided (dual task) attention completed the test battery (Sky Search; Score!; and Sky Search Dual Task from the Test of Everyday Attention for Children, TEA-Ch, Manly, Robertson, Anderson, & Nimmo-Smith, 1999). There were no group differences on the attention measures.

2.3. Materials and procedure

Ethical approval for the original study and the present secondary data analysis study was granted by the Research Ethics Committees of the universities at which the research took place. All parents or guardians provided informed written consent for their children to take part. The original research study involved data being collected from both TD and autism groups across several phases, in a manner intended to replicate the processes involved in gathering evidence from eyewitnesses in the criminal justice system (evidence gathering statements, investigative interviews, identification line-ups, cross-examinations). Only the first set of interview data (evidence gathering statements, or 'Brief Interviews') administered on the same day as the event was witnessed, are relevant to the current paper. These initial questions about the event were included to mimic a response officer's initial contact with a

witness. The procedure used in this phase of the study is summarised briefly below. For a more detailed description, please see Henry, Messer et al. (2017).

2.3.1. Experimental procedure

Participants were shown a staged event, featuring two actors who gave a short presentation about what school was like in Victorian times. For practical and logistical reasons, this was either viewed live during a school assembly, or a video of the performance was shown to the children. There were no recall differences between live and video presentation for autistic or TD children (Henry, Messer et al., 2017) so these data were combined. The talk consisted mainly of facts about Victorian schools, but involved a staged minor crime, where either a phone or a set of keys was 'stolen' by one of the actors (the 'theft' was later explained as a misunderstanding). Participants were randomly assigned to one of two versions of the talk, which were virtually identical but used different materials and gave alternative names to the actors. The rationale was to give some indication of the generalisability of the results. As there were no differences between versions, data were collapsed over this variable (Henry, Messer et al., 2017).

After viewing the staged event, participants were interviewed individually on the same day. Interviewers used a standard protocol with an initial question designed to elicit a free recall account ('Tell me what you remember about what you just saw'). This was followed by a series of open-ended questions that could be used to prompt further information depending on the child's response (e.g. 'Who was there?'; 'What did they do?'). Finally, participants were asked if they could remember anything else. This final prompt was repeated until the child could no longer provide any new items of information.

Interviews were audio-taped and transcribed, then coded by two independent coders according to the narrative frameworks described below. The coders were blind to group status.

2.4. Data analysis procedure

2.4.1. 'Story grammar' narrative analysis

The story grammar framework developed by Murfett et al. (2008) was used to analyse participants' accounts by tallying the number of narrative features included. 'Correctness' of information in the transcripts was not taken into account, as this would not be possible in a real case when jurors and legal professionals are unlikely to know what actually happened to a victim/witness. Further, story grammar is a 'framework' for organising event details and, as such, is scored independently of accuracy (Feltis et al., 2011).

Seven narrative elements were scored: Setting, Initiating event, Internal response, Plan, Action/attempt, Direct consequence, and Resolution (see Table 2). Elements were scored based on the number of times they appeared in the narrative, regardless of their accuracy (e.g., a point would be awarded for setting if the child mentioned the location of the event, even if this was incorrect). The total number of story grammar elements and the number of different story grammar elements (maximum 7) used were noted.

2.4.2. Additional structural measures

Two structural measures were hand coded: the total number of words in each account, and the total number of different words used (excluding non-word utterances such as 'um'), to obtain a broad comparison of the overall length and semantic diversity of the narratives produced by each group.

2.4.3. Reliability analyses

All transcripts were coded independently by two coders, following discussion to agree the coding rules. Intra-class correlation coefficients were calculated to assess the reliability of coding, and these indicated good to excellent reliability for all but one story grammar element (Direct consequence): *Setting*: ICC = .94; *Initiating event*: ICC = .83; *Internal response*: ICC = .81; *Plan*: ICC = .92; *Action/attempt*: ICC = .82; *Direct consequence*: ICC = .08; *Resolution*: ICC = .80. For the aggregated story grammar element scores,

Table 2
Examples of scored story grammar elements from the witness transcripts.

Story grammar element	Examples from the witness transcripts
Setting	"This morning at about quarter to ten…"
	"It happened straight after assembly when we was doing our test and we got called downstairs…"
Initiating event	"There was two men, who came to a school… they came to tell them about how it was like in the Victorian times a hundred years back."
	"This morning we had a talk…"
Internal response	"They were being quite funny so we sort of, we had to try and keep our laughter in…"
	"It was very quick…"
Plan	"They were videoing, uh, videoing, yeah, what they were doing to show other schools…"
	"Mark said, I'm going to leave my, my jumper on the floor and, um, my keys on the, on the chair…"
Action/attempt	"The other man, um, took a chalkboard out of the red bag…"
	"He turned it round and wrote the answer…"
Direct consequence	"One of them forget, um, forgot their, um, one of the bags so they had to come and pick it up…"
	"Then he said, where's those keys and we all, and we all, um, pointed at Alex…"
Resolution	"And then we just went back to music…"
	"And then they just said good-bye and they went…"

reliability was also good: *Total number of grammar elements*, ICC = .94; *Number of different grammar elements*, ICC = .93. Intercoder agreement for the word count measures was excellent: *Total number of words*, ICC = 1.00; *Number of different words*, ICC = 1.00. Given the poor agreement for *Direct consequence*, the first coder looked at the discrepancies in coding (coder 2 noted more instances of this element than coder 1) and recoded data based on commonalities in coding criteria. After recoding, agreement was much higher, ICC = .98. Nevertheless, given the initial discrepancies, we suggest caution in interpreting the results for *Direct consequence*. First coder ratings were used for all data analyses.

3. Results

Table 3 provides means, medians and ranges for each story grammar element and the structural measures (total number of words, number of different words). As group comparisons across several areas were conducted, a more stringent significance level ($p < .01$) was adopted to limit the chances of incorrectly rejecting the null hypothesis (recommended by Banney et al., 2015).

Data for the structural measures of total number of words and number of different words were normally distributed, so independent samples *t*-tests were performed to compare groups. 'Total number of words' showed no significant difference between groups [$t(102) = -1.17$, $p = .25$, $d = .23$]: TD group ($M = 234.46$, $SD = 111.08$); autism group ($M = 207.75$, $SD = 121.72$). There was no significant group difference for 'Number of different words' [$t(102) = -1.53$, $p = .13$, $d = .30$]: TD group ($M = 97.52$, $SD = 31.16$); autism group ($M = 87.15$, $SD = 37.67$). Given the groups did not differ on overall length or diversity of their narratives, data on story grammar elements were analysed using raw scores.

Table 3 shows that means and medians for many story grammar elements were low, with medians of zero in one or both groups for initiating event, internal response, plan, direct consequence, and resolution. Kolmogorov-Smirnov normality tests indicated that scores for the story grammar elements and their totals violated the parameters of normality (either for both groups or one group) on every measure, therefore, non-parametric tests were used (Mann-Whitney U).

There were no significant differences in the distributions for any of the story grammar elements, or for the total scores [*Setting*, $U = 1651.5$, $z = 2.02$, $p = .04$, $d = .39$; *Initiating event*, $U = 1364$, $z = .09$, $p = .93$, $d = .02$; *Internal response*, $U = 1235$, $z = -0.88$, $p = .38$, $d = .15$; *Plan*, $U = 1591$, $z = 1.88$, $p = .06$, $d = .31$; *Action/attempt*, $U = 1340$, $z = -0.08$, $p = .94$, $d = .02$; *Direct consequence*, $U = 1382$, $z = .21$, $p = .83$, $d = .04$; *Resolution*, $U = 1587.5$, $z = 2.19$, $p = .03$, $d = .30$; *Total number of story grammar elements*, $U = 1421$, $z = .50$, $p = .65$, $d = .09$, *Number of different story grammar elements*, $U = 1537.5$, $z = 1.23$, $p = .22$, $d = .24$]. In many cases, medians across the two groups were identical (see Table 3).

To investigate whether any background variables related to Total number of story grammar elements or to Number of different story grammar elements, preliminary Spearman non-parametric correlations were carried out. For the TD and autism groups, Total number of story grammar elements correlated with Total correct details recalled in the interview: Autism group $r = .71$; TD group $r = .79$ ($ps < .001$). Number of different story grammar elements also correlated with Total correct details recalled in the interview: Autism group $r = .76$; TD group $r = .64$ ($ps < .001$). There were correlations between Total number of story grammar elements and age in the TD group, which failed to reach significance in the autism group: Autism group $r = .25$, $p = .07$; TD group $r = .41$, $p = .003$, and between Number of different story grammar elements and age in the TD group, which again failed to reach significance in the autism group: Autism group $r = .27$, $p = .055$; TD group $r = .41$, $p = .003$. No other correlations were significant.

Table 3
Mean scores (SDs), medians and ranges for each story grammar element for the autism and typical development (TD) groups.

Measure of story grammar	Autism group (n = 52, 45 boys)	TD group (n = 52, 38 boys)
Setting	1.90 (1.36) (median = 2, range 0-8)	2.27 (1.05) (median = 2, range 0-5)
Initiating event	.48 (.54) (median = 0, range 0-2)	.50 (.58) (median = 0, range 0-2)
Internal response	.65 (.97) (median = 0, range 0-4)	.48 (.80) (median = 0, range 0-4)
Plan	.29 (.54) (median = 0, range 0-2)	.52 (.70) (median = 0, range 0-3)
Action / attempt	6.65 (5.10) (median = 5.5, range 0-19)	6.48 (4.82) (median = 6, range 0-20)
Direct consequence	1.33 (1.82) (median = 0, range 0-6)	1.46 (2.07) (median = 0.5, range 0-9)
Resolution	.13 (.40) (median = 0, range 0-2)	.35 (.59) (median = 0, range 0-2)
Total number of story grammar elements	10.21 (6.39) (median = 8.5, range 1-26)	10.71 (6.17) (median = 10, range 1-25)
Number of different story grammar elements (max = 7)	3.15 (1.18) (median = 3, range 1-6)	3.5 (1.35) (median = 3, range 1-6)
Total number of words	207.75 (121.82) (median = 184, range 22-583)	234.46 (111.08) (median = 238, range 56-578)
Number of different words	87.15 (37.68) (median = 85, range 10-178)	97.52 (31.16) (median = 100.5, range 37-159)

4. Discussion

This study investigated the narrative coherence of eyewitness accounts in autistic and non-autistic children (6–11 years) matched on age, IQ and receptive language ability. We replicated a previous finding that autistic children recalled fewer correct items of information than non-autistic children in a brief interview about a staged event involving a minor crime, witnessed earlier that day (Henry, Messer et al., 2017). Despite this difference in volume of correct recall, no significant group differences emerged when a 'story grammar' framework was used to assess the presence and number of key story elements in participants' accounts (incorporating all information mentioned, whether correct or not). The findings confirm the utility of previous work using the story grammar framework to evaluate eyewitness accounts of children with developmental differences (Brown et al., 2018; Gentle et al., 2013; Murfett et al., 2008), and provide support for claims that there are relatively few (or no) differences in narrative ability on some tasks between well-matched groups of autistic and non-autistic children (e.g., Capps et al., 1998, 2000; Diehl et al., 2006; Losh & Capps, 2003; Norbury & Bishop, 2003; Tager-Flusberg & Sullivan, 1995; Young et al., 2005).

On metrics assessing the length in words and semantic diversity (number of different words) of the accounts, there were also no group differences in performance. This supports much previous literature (e.g., Banney et al., 2015; Diehl et al., 2006; Losh & Capps, 2003; McCabe et al., 2013; Norbury & Bishop, 2003; Tager-Flusberg & Sullivan, 1995; Young et al., 2005). The present findings also suggest that, although children on the autism spectrum may recall fewer items of *correct* information about an event, their overall narrative accounts are not shorter or less semantically diverse, nor are they less coherent in terms of narrative structure. Taken together with findings that eyewitness accuracy in autistic children is generally as high as in comparable non-autistic children (2017b, Almeida et al., 2019; Bruck et al., 2007; Henry, Messer et al., 2017; McCrory et al., 2007; although accuracy levels may vary with interview type – see Mattison et al., 2018), the present results provide further evidence for the overall reliability of autistic child witnesses. Narrative coherence adds important information, because it may affect the degree to which members of the criminal justice system understand a child's evidence. This could be via impacting on how meaningful and credible the child appears to jurors (2011, Brown et al., 2018; Feltis et al., 2010; Gentle et al., 2013; Murfett et al., 2008), helping the police to establish relevant 'points to prove', and/or contributing to decisions by the Crown Prosecution Service about whether or not to authorise charges.

The most commonly included story grammar element in children's narratives related to descriptions of what happened in the event (i.e., *Action/attempt* details, *Mdn* = 5.5 autism group; *Mdn* = 6.0 TD group). This confirms previous observations that *Action/attempt* details are the most commonly elicited story grammar element. Feltis et al. (2011) found about 50 % of story grammar elements in immediate recall were *Action/attempt* details, close to the 60–65 % recorded in the current study. Nearly all other story grammar elements had median scores at or close to zero, indicating that children in the current age range (6–11 years) often omitted several story grammar elements. For *Setting* details, the median score of 2 items in both groups indicated that many children included information about where and when the event took place (see also Westcott & Kynan, 2004). However, the median number of types of story grammar elements included was only 3 out of a possible 7, underlining the fact that maturation in narrative coherence was not complete in the current sample of 6–11 year old children. Further research should assess narrative coherence in witness accounts of older children who include more story grammar elements, to negate the possibility that low scores on some measures reduced our ability to detect group differences. Nevertheless, group differences on story grammar measures with *higher* scores (e.g. total scores, action/attempt) were still absent, increasing confidence in the findings.

Although autistic (relative to matched non-autistic) children produced narratives of similar coherence (based on an analysis of story grammar elements), length (based on number of words) and semantic diversity (based on number of different words), the type of narrative task is important. Losh and Capps (2003) noted that experimental findings may not reflect children's narrative competence "within the less structured and more socially demanding contexts of daily life" (p.248). In the same way that wordless picture book tasks may reduce cognitive demands of storytelling by scaffolding memory, attention, story organisation and language production using temporally sequenced visual cues, adult-led interviews are structured interactions in which specific narrative features may be prompted through direct questions (e.g., 'Where did this happen?'). This is not necessarily typical of how children's narratives are produced in real conversational exchanges, although it does reflect how forensic interviews might proceed (although note that we did not use full investigative interviews, which would usually occur later than the 'same-day' brief evidence gathering statements used in the current study). Further, since autistic children often experience difficulties with emotional regulation (Samson et al., 2014), they might perform less well when describing a 'real' witnessed event, particularly if it induced heightened emotions or distress. Therefore, caution is required when generalising the current findings to more emotionally charged situations such as are likely to be encountered in criminal investigations. Finally, as the current groups were matched on age, general ability and one aspect of language (receptive vocabulary), it is important to note that the findings could be different in less closely matched samples.

Preliminary correlational analyses assessed whether background age and cognitive measures related to the number or diversity of story grammar elements included in children's accounts. Correlations between both of these measures and the number of correct details recalled in the interview suggested that *volume of correct recall* is a good indicator of the extent to which both autistic and TD children include key story elements. Higher volume of recall, better structure and greater narrative coherence could all have an impact on the credibility of a witness before jurors (see also Henry, Ridley, Perry, & Crane, 2011). The relationships between number and diversity of story grammar elements and age (significant only in the TD group) confirmed the known developmental improvements in the use of story grammar elements (Feltis et al., 2011).

4.1. Summary

This study investigated the narrative skills of 52 autistic children aged 6–11 years (IQs 70 +), comparing them to 52 TD peers

matched on age, IQ and receptive language ability. Participants had been interviewed using open-ended prompts shortly after viewing a staged mock crime event, and interview transcripts were coded using existing analytical frameworks for narrative features (story grammar elements; narrative length; semantic diversity). There were no significant differences between the autism and TD groups in terms of narrative skills on any of these measures. The findings add to, and extend, previous reports that when children on the autism spectrum are well-matched to peers with TD on cognitive and some language measures, they exhibit a similar level of narrative skill. The current findings also attest to the comparability of autistic and non-autistic child witnesses in terms of accuracy, account length and narrative coherence, if not in volume of correct information recalled.

Declaration of Competing Interest

None.

Acknowledgements

We would like to thank the schools, teachers, parents and children who kindly assisted with the original research project. Funding: The original project was supported by the Economic and Social Research Council [grant number: ES/J020893/2]. The funder had no involvement in study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the article for publication.

References

Almeida, T., Lamb, M. E., & Weisblatt, E. J. (2019). Effects of delay, question type, and socioemotional support on episodic memory retrieval by children with autism Spectrum disorder. *Journal of Autism and Developmental Disorders, 49*(3), 1111–1130. https://doi.org/10.1007/s10803-018-3815-3.

Banney, R. M., Harper-Hill, K., & Arnott, W. L. (2015). The Autism Diagnostic Observation Schedule and narrative assessment: Evidence for specific narrative impairments in autism spectrum disorders. *International Journal of Speech-language Pathology, 17*(2), 159–171. https://doi.org/10.3109/17549507.2014.977348.

Baixauli, I., Colomer, C., Rosello, B., & Miranda, A. (2016). Narratives of children with high-functioning autism spectrum disorder: A meta-analysis. *Research in Developmental Disabilities, 59*, 234–254. https://doi.org/10.1016/j.ridd.2016.09.007.

Barnes, J. L., & Baron-Cohen, S. (2012). The big picture: Storytelling ability in adults with autism spectrum conditions. *Journal of Autism and Developmental Disorders, 42*(8), 1557–1565. https://doi.org/10.1007/s10803-011-1388-5.

Berman, R., & Slobin, D. (1994). *Relating events in narrative: A cross-linguistic developmental study*. Hillsdale, NJ: Lawrence Erlbaum.

Bowers, L., Huisingh, R., Logiudice, C., & Orman, J. (2010). The expressive language test 2. *East Moline, IL: Linguisystems.*.

Brown, D. A., Brown, E.-J., Lewis, C. N., & Lamb, M. E. (2018). Narrative skill and testimonial accuracy in typically developing children and those with intellectual disabilities. *Applied Cognitive Psychology, 32*(5), 550–560. https://doi.org/10.1002/acp.3427.

Bruck, M., London, K., Landa, R., & Goodman, J. (2007). Autobiographical memory and suggestibility in children with autism spectrum disorder. *Development and Psychopathology, 19*, 73–95 doi: 10.10170S0954579407070058.

Burack, J. A., Iarocci, G., Flanagan, T. D., & Bowler, D. M. (2004). On mosaics and melting pots: Conceptual considerations of comparison and matching strategies. *Journal of Autism and Developmental Disorders, 34*(1), 65–73. https://doi.org/10.1023/B:JADD.0000018076.90715.00.

Capps, L., Kehres, J., & Sigman, M. (1998). Conversational abilities among children with autism and developmental delay. *Autism, 2*(4), 325–344. https://doi.org/10.1177/1362361398024002.

Capps, L., Losh, M., & Thurber, C. (2000). "The frog ate the bug and made his mouth sad": Narrative competence in children with autism. *Journal of Abnormal Child Psychology, 28*(2), 193–204. https://doi.org/10.1023/A:1005126915631.

Chandler, R. J., Russell, A., & Maras, K. L. (2019). Compliance in autism: Self-report in action. *Autism, 23*(4), 1005–1017. https://doi.org/10.1177/1362361318795479.

Diehl, J. J., Bennetto, L., & Young, E. C. (2006). Story recall and narrative coherence of high-functioning children with autism spectrum disorders. *Journal of Abnormal Child Psychology, 34*(1), 87–102. https://doi.org/10.1007/s10802-005-9003-x.

Dunn, L. M., Dunn, D. M., & Styles, B. (2009). *British picture vocabulary scale* - (3rd edition). London, UK: GL Assessment.

Feltis, B. B., Powell, M. B., & Roberts, K. P. (2011). The effect of event repetition on the production of story grammar in children's event narratives. *Child Abuse & Neglect, 35*(3), 180–187. https://doi.org/10.1016/j.chiabu.2010.11.004.

Feltis, B. B., Powell, M. B., Snow, P. C., & Hughes-Scholes, C. H. (2010). An examination of the association between interviewer question type and story-grammar detail in child witness interviews about abuse. *Child Abuse & Neglect, 34*(6), 407–413. https://doi.org/10.1016/j.chiabu.2009.09.019.

Gentle, M., Milne, R., Powell, M. B., & Sharman, S. J. (2013). Does the cognitive interview promote the coherence of narrative accounts in children with and without an intellectual disability? *International Journal of Disability, Development, and Education, 60*(1), 30–43. https://doi.org/10.1080/1034912X.2013.757138.

George, R., Crane, L., Bingham, A., Pophale, C., & Remington, A. (2018). Legal professionals' knowledge and experience of autistic adults in the family justice system. *The Journal of Social Welfare & Family Law, 40*(1), 78–97. https://doi.org/10.1080/09649069.2018.1414381.

Goldman, S. (2008). Narratives of personal events in children with autism and developmental language disorders: Unshared memories. *Journal of Autism and Developmental Disorders, 38*(10), 1982–1988. https://doi.org/10.1007/s10803-008-0588-0.

Henry, L. A., Messer, D. J., Wilcock, R., Nash, G., Kirke-Smith, M., Hobson, Z., et al. (2017). Do measures of memory, language and attention predict eyewitness memory in children with and without autism? *Autism & Developmental Language Impairments, 2*, 1–17. https://doi.org/10.1177/2396941517722139.

Henry, L. A., Crane, L., Nash, G., Hobson, Z., Kirke-Smith, M., & Wilcock, R. (2017). Verbal, visual and intermediary support for child witnesses with autism during investigative interviews. *Journal of Autism and Developmental Disorders, 47*(8), 2348–2362. https://doi.org/10.1007/s10803-017-3142-0.

Henry, L. A., Ridley, A. M., Perry, J., & Crane, L. (2011). Perceived credibility and eyewitness testimony of children with intellectual disabilities. *Journal of Intellectual Disability Research, 55*(4), 385–391. https://doi.org/10.1111/j.1365-2788.2011.01383.x.

Jones, L., Bellis, M. A., Wood, W., Hughes, K., McCoy, E., Eckley, L., et al. (2012). Prevalence and risk of violence against children with disabilities: A systematic review and meta-analysis of observational studies. *Lancet, 380*(September 8), 899–907. https://doi.org/10.1016/S0140-6736(12)60692-8.

Kenny, L., Hattersley, C., Molins, B., Buckley, C., Povey, C., & Pellicano, E. (2016). Which terms should be used to describe autism? Perspectives from the UK autism community. *Autism, 20*(4), 442–462. https://doi.org/10.1177/1362361315588200.

King, D., Dockrell, J. E., & Stuart, M. (2013). Event narratives in 11-14 year olds with autistic spectrum disorder. *International Journal of Language & Communication Disorders, 48*(5), 522–533. https://doi.org/10.1111/1460-6984.12025.

Kwok, E. Y. L., Brown, H. M., Smyth, R. E., & Oram Cardy, J. (2015). Meta-analysis of receptive and expressive language skills in autism spectrum disorder. *Research in Autism Spectrum Disorders, 9*, 202–222.

Lee, M., Martin, G. E., Hogan, A., Hano, D., Gordon, P. C., & Losh, M. (2018). What's the story? A computational analysis of narrative competence in autism. *Autism, 22*(3), 335–344. https://doi.org/10.1177/1362361316677957.

Lindblad, F., & Lainpelto, K. (2011). Sexual abuse allegations by children with neuropsychiatric disorders. *Journal of Child Sexual Abuse, 20*(2), 182–195. https://doi.

org/10.1080/10538712.2011.554339.
Loomes, R., Hull, L., & Mandy, W. P. L. (2017). What is the male-to-Female ratio in autism Spectrum disorder? A systematic review and meta-analysis. *Journal of the American Academy of Child and Adolescent Psychiatry, 56*(6), 466–474. https://doi.org/10.1016/j.jaac.2017.03.013.
Losh, M., & Capps, L. (2003). Narrative ability in high-functioning children with autism or Asperger's syndrome. *Journal of Autism and Developmental Disorders, 33*(3), 239–251.
Losh, M., & Gordon, P. C. (2014). Quantifying narrative ability in autism spectrum disorder: A computational linguistic analysis of narrative coherence. *Journal of Autism and Developmental Disorders, 44*, 3016–3025. https://doi.org/10.10007/s10803-014-2158-y.
Manly, T., Robertson, I. H., Anderson, V., & Nimmo-Smith, I. (1999). *The test of everyday attention for children.* London, UK: Pearson.
Maras, K. L., & Bowler, D. M. (2010). The cognitive interview for eyewitnesses with autism spectrum disorder. *Journal of Autism and Developmental Disorders, 40*(11), 1350–1360. https://doi.org/10.1007/s10803-010-0997-8.
Maras, K. L., & Bowler, D. M. (2011). Schema consistent misinformation effects in eyewitness with autism spectrum disorder. *Journal of Autism and Developmental Disorders, 41*(6), 815–820 doi: 10.1007/s10803-010-1089-5.
Maras, K. L., & Bowler, D. M. (2012a). Context reinstatement effects on eyewitness memory in autism spectrum disorder. *British Journal of Psychology, 103*(3), 330–342. https://doi.org/10.1111/j.2044-8295.2011.02077.x.
Maras, K. L., & Bowler, D. M. (2012b). Suggestibility, compliance and psychological traits in high-functioning adults with autism spectrum disorder. *Research in Autism Spectrum Disorders, 6*(3), 1168–1175. https://doi.org/10.1016/j.rasd.2012.03.013.
Maras, K. L., Memon, A., Lambrechts, A., & Bowler, D. M. (2013). Recall of a live and personally experienced eyewitness event by adults with autism spectrum disorder. *Journal of Autism and Developmental Disorders, 43*(8), 1798–1810. https://doi.org/10.1007/s10803-012-1729-z.
Maras, K. L., & Bowler, D. M. (2014). Eyewitness testimony in autism Spectrum disorder: A review. *Journal of Autism and Developmental Disabilities, 44*(11), 2682–2697. https://doi.org/10.1007/s10803-012-1502-3.
Mattison, M. L. A., Dando, C. J., & Ormerod, T. (2015). Sketching to remember: Episodic free recall task support for child witnesses and victims with autism spectrum disorder. *Journal of Autism and Developmental Disorders, 45*(6), 1751–1765. https://doi.org/10.1007/s10803-014-2335-z.
Mattison, M., Dando, C. J., & Ormerod, T. (2018). Drawing the answers: Sketching to support free and probed recall by child witnesses and victims with autism spectrum disorder. *Autism, 22*(2), 181–194. https://doi.org/10.1177/1362361316669088.
McCabe, A., Hillier, A., & Shapiro, C. (2013). Structure of personal narratives of adults with autism spectrum disorder. *Journal of Autism and Developmental Disorders, 43*(3), 733–738. https://doi.org/10.1007/s10803-012-1585-x.
McCrory, E., Henry, L. A., & Happé, F. (2007). Eyewitness memory and suggestibility in children with Asperger syndrome. *Journal of Child Psychology and Psychiatry, and Allied Disciplines, 48*(5), 482–489. https://doi.org/10.1111/j.1469-7610.2006.01715.x.
Mervis, C. B., & Klein-Tasman, B. P. (2004). Methodological issues in group-matching designs: α levels for control variable comparisons and measurement characteristics of control and target variables. *Journal of Autism and Developmental Disorders, 34*(1), 7–17.
Murfett, R., Powell, M. B., & Snow, P. C. (2008). The effect of intellectual disability on the adherence of child witnesses to a "story grammar" framework. *Journal of Intellectual & Developmental Disability, 33*(1), 2–11. https://doi.org/10.1080/13668250701829811.
Norbury, C., & Bishop, D. V. M. (2003). Narrative skills of children with communication impairments. *International Journal of Language & Communication Disorders, 38*(3), 287–313.
North, A. S., Russell, A. J., & Gudjonsson, G. H. (2008). High functioning autism spectrum disorders: An investigation of psychological vulnerabilities during interrogative interview. *The Journal of Forensic Psychiatry & Psychology, 19*(3), 323–334. https://doi.org/10.1080/14789940701871621.
Pearlman-Avnion, S., & Eviatar, Z. (2002). Narrative analysis in developmental social and linguistic pathologies: Dissociation between emotional and informational language use. *Brain and Cognition, 48*(2-3), 494–499. https://doi.org/10.1006/brcg.2001.1405.
Petersilia, J. R. (2001). Crime victims with developmental disabilities: A review essay. *Criminal Justice and Behavior, 28*(6), 655–694. https://doi.org/10.1177/009385480102800601.
Reese, E., Haden, C. A., Baker-Ward, L., Bauer, P., Fivush, R., & Ornstein, P. A. (2011). Coherence of personal narratives across the lifespan: A multidimensional model and coding method. *Journal of Cognition and Development, 12*(4), 424–462. https://doi.org/10.1080/15248372.2011.587854.
Reynolds, C., & Voress, J. K. (2007). *Test of memory and learning* (2nd ed.). Austin, TX: Pro-Ed.
Samson, A., Phillips, J., Parker, K., Shah, S., Gross, J., & Hardan, A. (2014). Emotion dysregulation and the core features of autism Spectrum disorder. *Journal of Autism and Developmental Disorders, 44*(7), 1766–1772. https://doi.org/10.1007/s10803-013-2022-5.
Semel, E., Wiig, E. H., & Secord, W. A. (2006). *Clinical evaluation of language fundamentals* (4th uk ed.). London: Harcourt Assessment.
Stein, N., & Glenn, C. (1979). An analysis of story comprehension in elementary school children. In R. O. Freedle (Ed.). *New directions in discourse processing* (pp. 53–120). Norwood, NJ: Ablex Publishing.
Snow, P. C., Powell, M. B., & Murfett, R. (2009). Getting the story from child witnesses: Exploring the application of a story grammar framework. *Psychology Crime and Law, 15*(6), 555–568. https://doi.org/10.1080/10683160802409347.
Tager-Flusberg, H., & Sullivan, K. (1995). Attributing mental states to story characters: A comparison of narratives produced by autistic and mentally retarded individuals. *Applied Psycholinguistics, 16*(3), 241–256. https://doi.org/10.1017/S0142716400007281.
Taylor, L. J., Maybery, M. T., & Whitehouse, A. J. O. (2012). Do children with specific language impairment have a cognitive profile reminiscent of autism? A review of the literature. *Journal of Autism and Developmental Disorders, 42*(10), 2067–2083. https://doi.org/10.1007/s10803-012-1456-5.
Turcotte, P., Shea, L. L., & Mandell, D. (2018). School discipline, hospitalization, and police contact overlap among individuals with autism Spectrum disorder. *Journal of Autism and Developmental Disorders, 48*(3), 883–891. https://doi.org/10.1007/s10803-017-3359-y.
Wechsler, D., & Zhou, X. (2011). *Wechsler abbreviated scale of intelligence* (2nd ed.). Bloomington, MN: Pearson.
Westcott, H. L., & Kynan, S. (2004). The application of a 'story-telling' framework to investigative interviews for suspected child sexual abuse. *Legal and Criminological Psychology, 9*(1), 37–56. https://doi.org/10.1348/135532504322776843.
Woodbury-Smith, M., & Dein, K. (2014). Autism spectrum disorder (ASD) and unlawful behaviour: where do we go from here? *Journal of Autism and Developmental Disorders, 44*(11), 2734–2741. https://doi.org/10.1007/s10803-014-2216-5.
Young, E. C., Diehl, J. J., Morris, D., Hyman, S. L., & Bennetto, L. (2005). The use of two language tests to identify pragmatic language problems in children with autism spectrum disorders. *Language, Speech, and Hearing Services in Schools, 36*(1), 62–72 doi: 0161-1461/05/3601-0062.