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A systematic review of the comparative pragmatic differences in conversational skills of individuals with autism

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Abstract

Background and aims: Given that problems with social interaction and communication are defining features of autism spectrum disorder, it stands to reason that individuals with autism spectrum disorder have difficulties in conversation. There is a growing body of research on the conversation skills of individuals with autism spectrum disorder, including research conducted to compare these skills to those of typically developing individuals and those with other disabilities. Such comparisons may offer insight into the extent to which conversational skills may be deficient and whether deficits are unique to a particular diagnostic group.

Main contribution: This review provides an examination of comparative studies of pragmatic aspects of conversation that included individuals with autism spectrum disorder. Only a small number of consistent findings emerged from the analysis. Groups with autism spectrum disorder find it difficult to stay on topic and provide novel, relevant information. They also tend to perseverate more and initiate and respond less during conversation but, contrary to expectation, similar numbers of turns were offered to partners, and there was little difference in the way communication breakdowns were repaired or clarified. There was a contradictory finding on the use of eye gaze.

Conclusions and implications: Some consistent findings were reported but overall, fewer than expected between group differences were found. The fragmented nature of the research and inconsistent operational definitions of variables measured made analysis problematic. Further research and replication of studies is recommended before definitive conclusions can be drawn.

Keywords

Autism spectrum disorder, autism, conversation, social communication, review

Deficits in communication and social interaction of people with autism spectrum disorder (ASD) are well documented in the literature and form part of the diagnostic criteria (American Psychiatric Association, 2013; Lord & Risi, 1998; Nazeer & Ghaziuddin, 2012; Stella, Mundy, & Tuchman, 1999). A large part of social interaction consists of conversation. Typical conversations are effortless as interlocutors manage multiple verbal and non-verbal cues and align their behavior and aims (Garrod & Pickering, 2004; Hari, Henriksson, Malinen, & Parkkonen, 2015). People with ASD are reported to have difficulties initiating and attending to the numerous cues presented to be fluent during a conversation (Carpenter & Tomasello, 2000; Klinger & Williams, 2009). Parents and teachers of children with ASD have also reported that conversation skills were of particular concern (Bishop & Baird, 2001; Knott, Dunlop, & Mackay, 2006).

Much research has been conducted on the verbal abilities of individuals with autism particularly in the area of requesting and rejecting (Wert & Neisworth, 2003). These more instrumental forms of communication are not of a primarily social nature and are therefore not a prominent feature of a typical conversation (Sigman, Mundy, Sherman, & Ungerer, 1986; Stefanatos & Baron, 2011; Wetherby &

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Prutting, 1984). Communication to achieve a social end (i.e., showing off, commenting and requesting a social routine) usually develops at a later stage than communication to achieve an environmental purpose (Stone & Caro-Martinez, 1990). It has been widely reported that people with autism tend to engage in developmentally naïve responses during conversations despite possessing language capabilities that would allow more sophisticated exchanges (Capps, Kehres, & Sigman, 1998; Shriberg, Paul, McSweeny, Klin, & Cohen, 2001; Tager-Flusberg & Anderson, 1991).

Four interconnected components, semantics, syntax, pragmatics and phonology, may impact on conversational interactions. Semantics, syntax and phonology pertain primarily to the structure or form of language or speech and difficulties have been identified in people diagnosed with ASD. Examples include the reversal of pronouns (e.g., "he/she" for "me" or "I" for "you" (Riches, Loucas, Baird, Charman, & Simonoff, 2012), the problematic use of sentence structure (Surian & Siegal, 2008), semantic organization (Eigsti, de Marchena, Schuh, & Kelley, 2011) and more atypical speech and vocal errors (Shriberg, Paul, Black, & van Santen, 2011; Shriberg et al., 2001).

Pragmatics refers to the social use of language and includes the way the reciprocal nature of conversation is managed through speech and paralinguistics (L. K. Koegel, Park, & Koegel, 2013). Although pragmatics represents one domain in measuring language competence, it is crucial to expressing communicative intent (Landa, 2000). Conversational exchanges usually consist of an exchange of social information, for instance, asking after a common acquaintance, commenting or exchanging ideas on a shared topic (Doggett, Krasno, Koegel, & Koegel, 2013). Difficulties in social communication that are relevant to conversational exchanges experienced by those on the autism spectrum have been widely reported (Church, Alisanski, & Amanullah, 2000; Paul, Orlovski, Marcinko, & Volkmar, 2009; Rapin & Dunn, 2003). Reports include deficits in making and maintaining eye contact (McConnell, 2002), initiating and sustaining interactions through to limited comment making (Jones & Schwartz, 2009), acknowledging others' responses (Carpenter & Tomasello, 2000; Jones & Schwartz, 2009; Wetherby & Prutting, 1984), the use of stereotypic and repetitive language (Eales, 1993; Volden & Lord, 1991) and difficulties in conversational repair when a message is not understood by the intended recipient (Volden, 2004). If areas of deficit are clearly identified, programs that teach social communication can be tailored to give individuals with autism a greater chance of experiencing positive social interactions.

Conversation involves a complex range of capacities and skills. Key elements that have been identified include openings or greetings, maintaining a topic, topic shift, turn taking, repairing breakdowns and checking for understanding and interruptions (see Dörnyei & Thurrell, 1994; Levinson, 1983; Lund & Duchan, 1993; Owens, 2014). Thornbury and Slade (2006) identify turn-taking, responding to previous turns and the introduction and development of topics as essential conversation skills. Many of these conversational skills have been targeted in interventions aiming to enhance or remediate the conversational performance of individuals with ASD (Charlop, Gilmore, & Chang, 2008; L. Koegel, Park, & Koegel, 2014; Scattone, 2008). Although a wide range of capacities and skills are undoubtedly important to fluent and socially fulfilling conversation, they need to be used in a flexible and contextualized manner (Owens, 2014; Thornbury & Slade, 2006).

A number of different approaches may be taken to evaluating the conversational capacities of individuals with ASD. Descriptive studies of aspects of conversation in individuals with ASD may provide preliminary insights but are limited in the absence of normative or comparative data. An alternative approach is to compare individuals with ASD to typically developing (TD) individuals or those with other disabilities. Comparing the social communication profiles of different groups offers an insight into the relative level and impact of difficulties experienced. For example, comparison with TD individuals may offer direct insight into the degree of difficulty or dysfunction experienced by individuals with ASD in regard to conversational abilities. It may also clarify whether or not the deficits are unique or distinctive to a diagnostic group or the extent to which deficits are common across groups. Consequently, comparative studies offer the potential to provide significant practical and theoretical insights of the nature of conversational capacity.

Comparative studies have been conducted investigating the differences between the pragmatic language abilities of individuals with autism and peers who are TD or have other pragmatic difficulties (e.g., speech language impairment, conduct disorder) but thus far, no attempts have been made to systematically review the findings from these studies. Although Volden (2017) provided a selective narrative and descriptive analysis of the pragmatic differences between individuals with ASD and their peers, to date there appears to have been no attempt to systematically analyze and review the current research.

Overall, the consensus appears to be that individuals with ASD have difficulties with pragmatic communication to achieve a social end (e.g., during social conversations) compared with other groups with language delay thus this paper aims to provide a systematic review that will synthesize the results of studies that

compared the conversational abilities of people with ASD with people who are TD or who have other disabilities. Analysis will be restricted to pragmatic features and the differences, if any, between different groups.

Method

Identification of studies

The terms "autis*," "ASD," "conversation" were used as search terms to locate relevant items in the Psycinfo and CINAHL databases with no restriction on the publication date or type of item. After duplicated items were eliminated, 296 items remained.

The abstract and title of each item were then examined and items were included if the following criteria were met; refereed journal article or a thesis at master's level or above, in English, included participants with autism, examined at least one form of non-instrumental verbal exchange, and compared people with ASD to some other group. Books, reviews and intervention studies were excluded. As the focus was conversation abilities, specifically social conversation, studies examining verbal requests or rejections only were excluded as conversation requires more complex pragmatic skills. Where the abstract and title did not clearly indicate if the criteria were met, studies were retained for examination of the full text. At the end of this initial screening, 31 studies were retained. Ancestral searches were conducted of the reference lists of these articles from the first stage of screening. This process identified a further six articles.

Inter-rater reliability (IRR) was calculated for initial article selection. The first author examined all titles and abstracts and screened for inclusion in this review based on the criteria described previously. After a training session, a research assistant independently screened 65 randomly selected items (22% of articles found in database searches) using the same criteria. An agreement for inclusion was scored if both the independent rater and the first author agreed that the article met inclusion criteria. Reliability of 93.8% was obtained for initial screening calculated by dividing the number of agreements by the total number of articles and multiplying by 100.

At the second stage of screening, the full text of each of the 37 studies was obtained and reviewed to determine whether each study met the criteria stated above and that a measure of verbal exchange in a social conversation was included. Three articles were discarded as they were written in a language other than English (Collet, 1992; De Giacomo et al., 2009; Takahashi, 1997). Sixteen articles were excluded because although the dependent measures were verbal in nature, the nature of the conversational turns was not described. For example, Jackson et al. (2003) compared the number of sustained interactions during conversational exchanges and their operational definition of a conversation included requests, comments, questions and one word responses. No further information was reported and the possibility that all sustained interactions consisted of requests could not be discounted. Warren et al. (2010) compared the number of words spoken during conversational turns comparing a group with ASD with a group of TD children but no information was provided on the nature of the utterances and Gilchrist et al. (2001) did not report on isolated conversational measures. Eighteen studies met the final inclusion criteria. Reliability on inclusion was also conducted for this stage. This was calculated by comparing the results of independent selection by the first author and the trained research assistant who examined the full text of eight articles (21.6%). The reliability of 87.5% was obtained using the method stated above. No additional articles were included and disagreements were discussed and resolved.

Data extraction

The following information was extracted from each study: type of item (refereed journal article or thesis), research questions, aspect of interaction examined (syntax, semantics, pragmatics, phonology or other), reliability measures on data collection, measurement strategies, setting, the context of the interaction, conversation partner and findings. Participant information for the group or individual including gender, diagnosis, diagnostic tool, diagnostician, IQ, mental age, chronological age, language data and the instrument used to quantify autistic symptomatology such as the Autism Diagnostic Observation Schedule (ADOS) (Lord et al., 2012) were also extracted.

IRR was obtained for data extraction. The author trained the research assistant on the use of a spreadsheet detailing the data to be extracted. The author and the research assistant independently examined eight randomly selected articles and extracted the following data: research questions, category of dependent variable, participant group information (e.g., age, diagnoses, IQ data, etc.), reliability results, conversation partner and how the language sample was obtained. The reliability for the extraction of data was 98.6%. The disagreements were minor in nature and were discussed and resolved.

As the focus of this review was the pragmatic abilities of the participant groups, each of the variables evaluated were classified further into the following groups: presupposition, repairing, turn-taking, conversational balance, questioning, topic preservation, topic

shift, initiations or greetings, interrupting, terminations or closings, paralinguistics and other pragmatics (definitions provided in Table 1). Since the variables investigated were so disparate a framework was developed to analyze the studies and make relationships more apparent. Where researchers referred to other published work for definitions of variables examined, these were obtained. This classification process was complicated due to the lack of information provided on the exact nature of the variables investigated in some studies.

The authors independently examined the variables measured in the articles and indicated which groups the variables could potentially be coded. Any disagreements were discussed and in some instances the definitions were adjusted for clarity. This occurred over the course of numerous meetings until the definitions were satisfactorily resolved to facilitate the final coding process. For instance, the definition of conversational balance for the purpose of this review was a quantitative comparison of the balance during a conversation. A comparative measure of speech acts for both partners had to be provided for coding in this group (e.g., mean length utterance (MLU), number of turns or percentage of responses measure for both speakers). During our discussions, we also resolved to include perseveration on a topic under the ''topic shift'' category as a resistance to a partner's attempt to shift the topic was a commonly examined variable in studies.

Following development of the coding system described above, reliability was conducted relating to the categorization of data for analysis. The first author extracted and collated all the variables examined in the included studies in a database. The first and second authors independently double coded the variables listed and categorized each of them into the pragmatic categories mentioned earlier. A total of 13 categories could potentially be coded (12 pragmatic categories and the presence of a non-pragmatic variable). Where disagreements occurred, they were discussed amongst all three authors and resolved. An agreement was scored when both raters concurred on the scoring of the dependent variable in each of the 13 categories. The IRR measure was 97.1%.

Table 1. Operational definition for categorization.

Category	Definition
Non-pragmatic	Any items that do not fall under pragmatics
Pragmatics	The use of language for social purposes, including the production of cohesive and relevant messages during conversations (American Speech-Language-Hearing Association, 2016).
Presupposition	A level of inferred knowledge or understanding that modifies the language used to convey messages in a social context. (McCormick, 2003; Owens, 2014).
Repairing	The extent to which clarification of an utterance that has been misunderstood or is unclear is provided or requested.
Turn-taking	The extent to which opportunities for turns are appropriately taken or given during a conversation. This does not refer to the quality of turns, just whether the turn itself was taken or given.
Conversational balance	The quantitative extent of conversational balance as compared between conversation partners within a social verbal exchange, e.g., comparing MLU, number of turns, percentage of responses etc.
Topic preservation	Includes: 1. topic maintenance – the degree to which individuals stay on the current topic in an appropriate manner, and 2. elaborations – extending the current topic by adding information that has not previously been provided in the exchange.
Topic shift	This term is used to refer to the extent to which one resists or attempts shifts to a different topic during an on-going verbal exchange. It includes an insistence on talking about restricted topics or steering the conversation towards restricted topics (topic preoccupation/perseveration).
Initiations or greetings	A bid to begin a verbal exchange.
Interrupting	An attempt to join or provide information during an on-going verbal exchange between other people or respond to an interruption.
Terminations or closing	A bid to end an existing verbal exchange, includes accepting a bid to end an exchange.
Paralinguistics	This term is used to refer to parts of communication that modifies verbal meaning of speech, e.g., eye-gaze, volume, intonation, rate, body language, pitch, facial expression or gestures.
Other pragmatics	Any pragmatic measures not specified above.

Results

The groups that were compared, participant details, setting, context in which the language samples were obtained and the conversation partner are presented in Tables 2 and 3. Additional information on the key findings are provided online as supplemental materials.

Participants with ASD

The age of participants investigated ranged from 4 to 37 years of age across all the studies reviewed but the age ranges within individual studies were narrower. Where IQ information was provided, the majority of participants with autism were within typical IQ range (n = 13). Participants with moderate intellectual impairment (mean IQ 68.5, (Eales, 1993) and 56.9, (Price et al., 2008)) were included in only two studies.

The number of participants in each group with ASD ranged from 6 to 36. There were five studies where there were fewer than 10 participants with ASD in the group, 11 studies with between 11 and 20 participants and only three studies that provided comparison of groups made up of more than 21 participants with ASD. The participants with ASD in eight studies were all male. Where groups were made up of a mix of genders, male participants outnumbered females. The gender composition of the groups was not reported in two studies. The majority of participants were English speaking, residing in the USA, Canada or Australia. The study by Bauminger-Zviely, Karin, Kimhi, and Agam-Ben-Artzi (2014) included participants from Israel.

Comparison groups

A comparison group of TD peers (n = 10) was the most commonly used by researchers. Groups of participants with Down syndrome (DS) were employed by four researchers (Price et al., 2008; Roberts et al., 2007; Tager-Flusberg, 1992; Tager-Flusberg & Anderson, 1991). The reasons justifying comparisons with a group with DS included comparable expressive language and adaptive difficulties and the presence of moderate intellectual impairment in both groups. Comparisons were also made between groups with fragile X syndrome and groups with co-morbid fragile X syndrome and autism, to investigate whether any impairments were specifically related to autistic traits (Price et al., 2008; Roberts et al., 2007).

Fine, Bartolucci, Szatmari, and Ginsberg (1994) made a three-way comparison between a group with high-functioning autism (HFA) and a group with Asperger syndrome (AS) with a clinical control group that was made up of individuals, without ASD, who had demonstrated difficulties with peer social relationships. The clinical control group was included to investigate if any social impairments found were uniquely attributable to ASD. A similar rational was provided by Adams, Green, Gilchrist, and Cox (2002) who made comparison with a group with conduct disorder. Eales (1993) compared a group with autism to a group of children with developmental receptive language disorder to allow examination of differences that can be attributable to autistic traits. Other comparison groups included schizotypal personality disorder and speech language impairment. A group with schizotypal personality disorder was investigated by Baltaxe, Russell, D'Angiola, and Simmons (1995) as a comparison group because individuals with this diagnosis often have traits common to those with an autism diagnosis (i.e., few friends, odd speech and behaviors and affect difficulties). Ziatas, Durkin, and Pratt (2003) investigated a comparison group with speech language impairment as individuals with this diagnosis also have social and communicative difficulties but these problems stem from syntactic problems rather than social cognition as may be the case in individuals with ASD.

The number of participants in the comparison groups was usually closely matched to the group with autism (between 6 and 46 participants). The researchers in five studies included groups that were slightly mismatched in numbers (Fine et al., 1994; Jones & Schwartz, 2009; Paul et al., 2009; Price et al., 2008; Roberts et al., 2007). As was the case in the groups with ASD, the number of male participants outnumbered the female participants.

Contexts

Language samples were elicited in a natural conversation in three instances (Bauminger-Zviely et al., 2014; Jones & Schwartz, 2009; Tager-Flusberg & Anderson, 1991). A conversational sample obtained using the ADOS protocol was used in five studies. A semi structured interview or a play activity was used by researchers in the remaining studies to elicit language samples for analysis.

Partners

The language samples used for analysis were elicited by a variety of conversation partners. These included nine studies using unfamiliar adults (e.g., clinician, therapist, researcher or research assistant), three studies using familiar adults, two studies using the participants' family, and one study using same aged peers. The researchers did not provide information about the conversation partner in two studies (Baltaxe et al., 1995; Eales, 1993).

Table 2. Group and participant details.

Study	Groups compared (n)	Matched	Gender	Mean age (SD or R)	Mean IQ (SD or R)	Mean language data (SD)
Adams et al. (2002)	Asperger syndrome (19)	Chronological age	M	13.81 (2.6, R = 11–19)	92.53 (18.1, R 71–141)	93.79 (22.9)
	Conduct disorder (19)		M	14.5 (1.6, R = 11–19)	91.05 (9.4, R 74 – 107)	85.5 (13.2)
Baltaxe et al. (1995)	Autism (8)	(not clearly stated)	M = 7 F = 1	15:10 (R = 10–19)	IQ stated as within normal range (72–126)	Verbal IQ 93.5
	Schizotypal (9)		M = 8 F = 1	12:1 (R = 10–19)	IQ stated as within normal range (72–126)	Verbal IQ 103.1
Bang et al. (2013)	HFA (20)	(not clearly stated)	M = 18 F = 2	11 (1.1)	WASI 106.5 (17)	CELF 107.1 (14)
	Typically developing (17)		M = 13 F = 4	10.83 (1.42)	WASI 112.5 (14)	CELF 112.7 (12)
Bauminger-Zviely et al. (2014)	HFA (27)	SES, verbal, non-verbal mental age, IQ and age	M = 23 F = 4	4.92 (0.9)	WISC 105.4 (17.2)	Verbal MA 60.3 (11.45)
	Typically developing (30)		M = 26 F = 4	4.6 (0.87)	WISC 107.6 (14.1)	Verbal MA 58.7 (10.5)
Capps et al. (1998)	Autism (15)	Language and mental age	M	11.9 (3.3)	SB4 75.2 (17.3)	Verbal MA – CELF 6.3 (2.2)
	Developmental delays (15)		M	9.4 (2.6)	SB4 78.9 (13.1)	Verbal MA – CELF 5.8 (1.5)
Capps et al. (2000)	Autism (13)	Language, mental age and IQ	N/A	12.6 (3.1)	SB4 75.2 (17.3)	Verbal MA – CELF 6.3 (2.3)
	Developmental delays (13)		N/A	9.8 (2.8)	SB4 78.9 (13.1)	Verbal MA – CELF 6.1 (1.4)
	Typically developing (13)		N/A	6.0 (1.6)	N/A	Verbal MA – CELF 6.2 (2.1)
Eales (1993)	Autistic disorder (15)	(not clearly stated)	M	23.9 (1.7)	WAIS-R 68.5 (2.6)	PPVT 45 (23.8)
	Developmental receptive language disorders (17)		M	24.7 (1.6)	WAIS-R 75.4 (7.6)	PPVT 64.5 (19.1)
Fine et al. (1994)	Autism (18)	Not matched	M = 14 F = 4	22.8 (R = 7–32)	WISC/WASI 82.3 (12.9)	85.5 (16.6)
	Asperger syndrome (23)		M = 18 F = 5	14.3 (R = 8–18)	WISC/WASI 86.6 (14.6)	85.8 (15.0)
	Clinical control group (34)		M = 28 F = 6	13.7 (R = 7–18)	WISC/WASI 102 (12.5)	101.9 (12.0)
Jones and Schwartz (2009)	Autism (20)	Age, gender, ethnicity and family size	M = 19 F = 1	5.7 (R = 3.6–6.9)	N/A	EOWPVT-R: 6.6
	Typically developing (10)		M = 9 F = 1	5.2 (R = 3.9–5.9)	N/A	N/A
Nadig et al. (2010)	High functioning autism (20)	Age, language, gender and performance IQ	M = 18 F = 2	11:0 (1:1)	WASI – 106.5 (17)	CELF 107.1 (14)
	Typically developing (17)		M = 13 F = 4	10.10 (1:5)	WASI – 112.5 (14)	CELF 112.7 (12)

(continued)

Table 2. (continued)

Study	Groups compared (n)	Matched	Gender	Mean age (SD or R)	Mean IQ (SD or R)	Mean language data (SD)
Paul et al. (1987)	Autism (12)	Age, IQ and duration at facility	M	37.5 (9.8)	N/A (mental age provided)	N/A
	Fragile X syndrome (12)		M	37.8 (8.3)	N/A (mental age provided)	N/A
	Intellectual disability (12)		M	39.6 (7.1)	N/A (mental age provided)	N/A
Paul et al. (2009)	Autistic disorder and PDD-NOS (11)	Age	M = 11 F = 3	14.5 (2.3)	WISC/WAIS 88.1	TLC 84.3 (16.3)
	Asperger syndrome (15)		M	14.8 (2.7)	WISC/ WAIS 93.3	TLC 90.0 (18.6)
	Typically developing (26)		M = 22 F = 4	14.9 (3.2)	N/A	N/A
Price et al. (2008)	Fragile X with autism (36)	(not clearly stated)	M	8.4 (2.9)	LBIQ 56.9 (13.1 R 38 – 87)	N/A
	Fragile X (35)		M	9.9 (2.0)	LBIQ 54.4 (15.0 R 37–108)	N/A
	Down syndrome (31)		M	9.2 (2.9)	LBIQ 55.8 (10.6 R 37–83)	N/A
	Typically developing (46)		M	4.5 (1.1)	Not stated	N/A
Roberts et al. (2007)	Fragile X with autism (26)	(not clearly stated)	M	9.1 (2.93, R = 4.4–14.0)	LBIQ Non-verbal mental age 4.7 (0.97, R 2.4–5.9)	N/A
	Fragile X syndrome (28)		M	9.9 (2.66, R = 3.2–14.4)	LBIQ Non-verbal mental age 5.1 (0.95 R 3.2–14.4)	N/A
	Down syndrome (29)		M	9.4 (3.2, R = 4.3–16)	LBIQ Non-verbal mental age 4.8 (1.0, R 2.8–7.1)	N/A
	Typically developing (22)		M	4.4 (1.14, R = 2.4–6.4)	LBIQ Non-verbal mental age 4.8 (1.0, R2.8–7.1)	N/A
Tager-Flusberg and Anderson (1991)	Autistic disorder (6)	Age and MLU	M	5.3 (1.69)	89 (18.03)	MLU = 2.74 (0.94)
	Down syndrome (6)		M = 4 F = 2	5.0 (1.22)	54 (8.25)	MLU = 2.6 (0.85)
Tager-Flusberg (1992)	Autistic disorder (6)	Age and MLU	M	5.3 (1.69)	89 (18.03)	MLU = 2.74 (0.94)
	Down syndrome (6)		M = 4 F = 2	5.0 (1.22)	54 (8.25)	MLU = 2.6 (0.85)
Volden (2004)	Autism or PDD-NOS (9)	Language age	N/A	10.67	N/A	Equiv. 7.58 years
	Typically developing (9)		N/A	8.25	N/A	Equiv. 7.5 years
Ziatas et al. (2003)	Autism (12)	Gender and age	M = 10 F = 2	8.25 (2.58)	N/A	PPVT 5.75 (1.92) TROG 6.25 (2.0)

(continued)

Table 2. (continued)

Study	Groups compared (n)	Matched	Gender	Mean age (SD or R)	Mean IQ (SD or R)	Mean language data (SD)
	Speech language impairment (10)		M = 10 F = 2	8.17 (2.58)	N/A	PPVT 6.08 (1.83) TROG 6.58 (2.25)
	Typically developing (12)	Gender and verbal mental age	M = 10 F = 2	5.67 (1.75)	N/A	PPVT 6.08 (1.83) TROG 6.25 (2.25)
	Asperger syndrome(12)	Gender and age	M = 8 F = 4	6.92 (2.08)	N/A	PPVT 6.33 (2.0) TROG 7.25 (2.42)
	Speech language impairment (12)		M = 8 F = 4	6.92 (2.17)	N/A	PPVT 6.58 (2.0) TROG 7.25 (2.42)
	Typically developing (12)	Gender and verbal mental age	M = 8 F = 4	6.42 (2.0)	N/A	PPVT 7.0 (2.42) TROG 7.33 (2.0)

SD: standard deviation; R: range; MA: mental age; WASI: Wechsler Abbreviated Scale of Intelligence; CELF: Clinical Evaluation of Language Fundamentals; WISC: Wechsler Intelligence Scale for Children; PPVT: Peabody Picture Vocabulary Test; EOWPV: Expressive One Word Picture Vocabulary Test; WAIS: Wechsler Adult Intelligence Scale; TLC: Test of Language Competence; LBIQ: Leiter Brief IQ; MLU: mean length utterance; TROG: Test for Reception of Grammar.

Table 3. Details on how language samples were collected.

		Context			
Study	Setting	Semi-structured interview or play activity	Natural conversation	Procedure	Partner
Adams et al. (2002)[a]	Not stated	√		The interviewer facilitated a conversation around an event that had happened in the interviewee's life with the conversational section of the ADOS.	Adult
Baltaxe et al. (1995)	Not stated	√		One hour long language samples were elicited using a semi-structured interview consisting of open-ended questions ranging from concrete (where do you live) to abstract (what would you do if you were president).	Unclear (probably adult researcher)
Bang et al. (2013)	Lab / clinic	√		The participant was asked to discuss a special interest or favorite hobby, as well as a generic topic (i.e., siblings, pets, or friends). Conversations were 2–6 minutes in duration.	Adult research assistant blind to group status

(continued)

Table 3. (continued)

Study	Setting	Context: Semi-structured interview or play activity	Context: Natural conversation	Procedure	Partner
Bauminger-Zviely et al. (2014)	Participants' preschool		√	Target children were observed during structured play activities in their preschools for two 10-minute free-play interactions, once with the friend and once with the non-friend, in counterbalanced order. Children received no specific instructions.	Peer – (friend or non-friend)
Capps et al. (1998)	Not stated	√		Seated at a table for a 6 minute semi-structured conversation. Conducted by 2 coders, 1 blind to the group status.	Familiar adult
Capps et al. (2000)[a]	Not stated	√		The conversation partner was instructed to introduce the following three topics: vacations, friends, and school. These interactions lasted six minutes and were audio and videotaped.	Familiar adult blind to group status
Eales (1993)	Not stated	√		Used the ADOS conversational samples from the interview.	Not stated
Fine et al. (1994)	Not stated	√		Semi-structured 10 minute interview on familiar topics like school, family, hobbies and vacations.	Clinical psychologist blind to purpose of study
Jones and Schwartz (2009)	Family home		√	Recorded a typical conversation between family at the dinner table.	Family (no more than 6 people)
Nadig et al. (2010)	Not stated	√		Each participant was asked to tell his/her partner about (1) a circumscribed interest or hobby and (2) a generic topic (siblings, pets, or friends). Topics were presented in counterbalanced order. Adult partners followed a standard procedure of asking an opening question about the topic and then responding naturally to what the participant said without leading the exchange. If the participant was unresponsive they were asked to initiate no more than two questions beyond the opening one.	Adult research assistant blind to group status
Paul et al. (1987)	Residential institution	√		Clinician who was familiar had a conversation with the participant on social topics (e.g., weekend, subjects' job assignments etc.). Conversations with low-functioning subjects used pictures to stimulate verbal output when a normal conversation failed to elicit speech.	Clinician familiar to participant

(continued)

Table 3. (continued)

Study	Setting	Context		Procedure	Partner
		Semi-structured interview or play activity	Natural conversation		
Paul et al. (2009)	Not stated	√		Used the ADOS modules 3 and/or 4 interview as a language sample for all participants.	Clinician, diagnostician or speech therapist
Price et al. (2008)[a]	Home, school or university research center	√		Used ADOS to get a language sample.	Adult examiner
Roberts et al. (2007)[a]	Not stated	√		Used ADOS to elicit language and social behaviors with developmentally appropriate social and play-based interactions, e.g., free-play, balloon and bubble blowing, a pretend birthday activity, and storybook reading.	Examiner blind to the study purpose
Tager-Flusberg and Anderson (1991)[a]	Home		√	Spontaneous speech samples were collected in the children's homes while they interacted with their mothers, in play or other loosely structured activities selected by the mothers. Language samples were taken over 1 year (every 4 months).	Participant's mother
Tager-Flusberg (1992)[a]	Home	√		The mother set up an activity of her choice with the participant and a language sample was taken.	Participant's mother
Volden (2004)	Not stated	√		A trained research assistant engaged the participant in conversation about topics of general interest. Every few minutes, the examiner pretended not to understand the participant's message. Conversation continued until 10 episodes of breakdown occurred for each child. First asked "What?," then "I don't understand," finally "tell me another way" (semi-structured prompt).	Trained research assistant
Ziatas et al. (2003)	Home	√		A home-based, gently structured play interaction was chosen as the most valid method of sampling the full range of these behaviors. The researcher took a standard set of toys to each child's house and played with the child in a quiet room for approximately 45 minutes. The same toys were presented in essentially the same order to each child and followed the child's lead in the conversation in as natural a manner as possible.	Researcher

[a]Part of a wider study.

Pragmatics

The majority of studies (n = 16) examined pragmatic abilities. A wide range of different aspects of pragmatic capacity was evaluated as indicated in Table 4.

Initiations and terminations. Both initiations and terminations were considered in two studies and initiations (called assertiveness) and terminations only were measured in two separate studies. Adams et al. (2002) found no difference in the propensity to initiate and exchange between a group with ASD and a group with conduct disorder. Eales (1993) reported on ''initiation ratio'' when they compared participants with autistic disorder with a matched group with developmental receptive language disorders. They found that the group with autism showed lower initiation ratios but this calculation included ''continuations,'' (i.e., statements that follow on from a previous utterance) thus conflating data across two categories. Jones and Schwartz (2009) evaluated the function of a communication (i.e., to begin an interaction or end an interaction) made by children with autism during family dinner times and compared them to their TD peers in the same context. They found that not only did the group with autism initiate less than the TD group, they also ignored more bids for interaction. Volden (2004) included a measure of termination but it was aggregated with a broader measure.

Topic preservation. Topic preservation included the degree individuals stay on the current topic, and whether they provide elaborations (i.e., new information that add to the topic). This was considered in nine studies. The types of variables investigated were very diverse as there are many elements that may contribute to preserving an ongoing topic of conversation. Variables examined included the contribution of novel relevant information, the ''goodness of fit'' or appropriateness of a statement or response, requests for relevant information or the flipside of this such as the provision of irrelevant or inappropriate information and non-responses to a bid or continuation of an interaction. Adams et al. (2002) coded statements that

Table 4. Categories of dependent variables measured.

Study	Non-pragmatic	Presupposition	Repairing	Turn-taking	Conversational Balance	Topic Preservation	Topic Shift	Initiations/Greetings	Interrupting	Terminations/Closings	Paralinguistics	Other Pragmatics
Adams et al. (2002)			√	√	√	√		√				√
Baltaxe et al. (1995)	√											
Bang et al. (2013)	√											√
Bauminger-Zviely et al. (2014)	√	√	√	√		√	√				√	√
Capps et al. (1998)			√			√					√	√
Capps et al. (2000)						√						
Eales (1993)	√			√		√	√	√		√	√	√
Fine et al. (1994)	√	√										
Jones and Schwartz (2009)	√					√		√		√	√	√
Nadig et al. (2010)	√				√	√					√	√
Paul et al. (1987)	√						√				√	
Paul et al. (2009)	√			√		√	√		√		√	√
Price et al. (2008)	√										√	√
Roberts et al. (2007)						√	√					√
Tager-Flusberg and Anderson (1991)	√			√		√	√					
Tager-Flusberg (1992)	√											
Volden (2004)			√							√	√	
Ziatas et al. (2003)					√							√

served to develop, maintain or extend a topic but data were collapsed into levels within an exchange and were not reported separately. They also measured the ''goodness of fit'' of statements or answers and found that the group with AS produced far more problematic responses than the group with conduct disorder. These problematic responses were more pronounced in conversations that focus on socio-emotional contexts.

Out-of-sync content (i.e., statements or responses that are tangential, focus on insignificant aspects of the partner's previous turn or a misinterpretation of partner's intent) was measured in the studies by Bauminger-Zviely et al. (2014) and Paul et al. (2009). The groups with HFA and AS were significantly different to the group of TD teenagers in the amount of out-of-sync content produced but there was little difference between the HFA and AS groups themselves (Paul et al., 2009). Although Bauminger-Zviely et al. (2014) found that there was a difference between the amount of problematic content from the group with HFA compared to a TD group, it was impossible to isolate out-of-sync content as it was reported along with unannounced topic shifts. Similarly, the failure to expand on a partner's information was also measured but was merged with a measure of the tendency to interrupt and the failure to elicit partner participation. Measures of the ''goodness of fit'' (meshing) of the interaction and the responsiveness of the child to partner initiations indicated that preschoolers with HFA produced lower quality exchanges than their TD peers but, like their TD peers, were more likely to produce good quality conversations when the partner was a friend (i.e., someone familiar). The researchers also found that higher verbal mental age correlated with more intact conversational exchanges. Eales (1993) investigated the furnishing of irrelevant or uninformative on-topic information within a wider variable of impairment of communicative intention, thus, it was impossible to isolate the relevant data.

Capps et al. (1998) found that the group with autism was less likely to extend a conversation by offering novel information than the comparison group with developmental disabilities but the groups did not differ in their response to requests for new relevant information. Capps, Losh, and Thurber (2000) measured the contribution of novel information during a verbal exchange and found that the group with autism provided far less novel and relevant information than the group with developmental delays.

Unlike the other studies included, Jones and Schwartz (2009) collected language samples in a natural context and compared a group with autism and a group of TD children. The researchers looked at the verbal exchanges that occurred during a dinner time conversation and found that children with autism ignored or rejected more comments from their family than directives or questions, indicating difficulties with preserving a topic.

Nadig, Lee, Singh, Bosshart, and Ozonoff (2010) measured the proportion of elaborations and questions to all utterances. They found that although there was no difference between the proportion of elaborations and questions between the groups with autism or TD, the group with autism produced far fewer contingent elaborations (i.e., elaborations that related to the partner's prior utterance serving to maintain a topic). Interestingly, the group with autism produced fewer contingent elaborations when talking about their interest topic than a generic topic and made more self-contingent elaborations that served to maintain a topic that they had introduced. There was no difference in the number of elaborations and questions in the TD group irrespective of the topic type.

Roberts et al. (2007) evaluated the degree to which an utterance maintained the current topic. They compared four groups of boys: (i) fragile X with ASD, (ii) fragile X without ASD, (iii) DS and (iv) a group of TD boys and found that the boys with fragile X and ASD showed a much larger number of non-contingent topic maintenance responses than any of the other groups. Non-contingent responses were defined as those that clearly attempted to continue the topic but did not provide the expected information or failed semantically in some way. The TD group contributed more elaborate topic maintenance turns than the other three groups. Finally, Tager-Flusberg and Anderson (1991) compared the rate of contingent responses of a group of boys with AD to a group with DS at four points in time over the period of a year. These data were also compared to existing data on TD children. They found that all three groups produced more contingent than non-contingent utterances, but unlike their TD and DS peers, the group with AD did not show an increase in the level of contingent utterances as the MLU increased over the period of the study.

Topic shift. The extent to which participants resisted or attempted to shift topics during verbal exchanges was investigated in six studies (Bauminger-Zviely et al., 2014; Eales, 1993; Paul et al., 1987; Paul et al., 2009; Roberts et al., 2007; Tager-Flusberg & Anderson, 1991). Under the definition employed, topic shift included both attempts to shift topic as well as resistance to topic shift, including perseveration and preoccupation. Most of the measures relating to topic shift examined the propensity for talking about a particular special interest or activity, either by refusing to accept partner attempts to change the topic or by perseverating on the topic of interest ($n = 5$). Bauminger-Zviely et al. (2014) found that the group of preschoolers

with HFA tended to perseverate on certain topics more than the TD group, but there were no between group differences in levels of perseveration when talking to their friends or non-friends. Group differences in unannounced (i.e., inappropriate) content shift was also evaluated and it was found that the group with autism tended to shift topic more abruptly than the TD group. Eales (1993) measured the level of topic preoccupation and the regularity of ignoring partner attempts to shift topic but the data were aggregated with utterances that were uninformative, and therefore, it was not possible to report on this separately. Paul et al. (1987) compared the rate of topic perseveration between groups of adults with fragile X, autistic disorder and non-specific intellectual disabilities and found no significant group differences. Paul et al. (2009) reported that the group with AS perseverated on a topic more than the group of TD adolescents. No difference on topic perseveration was found when the HFA and the TD group were compared. There was also a significant difference in unannounced topic shifts in both the group with AS and the HFA group compared with the TD group. Tager-Flusberg and Anderson (1991) and Roberts et al. (2007) both considered participant propensity to introduce a new topic during a conversation but the data from Tager-Flusberg and Anderson (1991) were conflated with another measure, making it impossible to extract the relevant data. Roberts et al. (2007) found that the group of boys with autism tended to change topic abruptly more often than the groups with fragile X syndrome, DS and TD boys. Furthermore, the boys with fragile X syndrome (with or without autism) tended to perseverate more than the group with DS or their TD peers.

Turn-taking. For the purposes of this review, turn-taking was defined as the extent to which an opportunity to give or take a turn was demonstrated during a conversation. Turn-taking was addressed in five studies. Adams et al. (2002) compared the frequency of turns taken between a group with AS and a group with severe conduct disorder and found no significant differences between the groups. Bauminger-Zviely et al. (2014) compared turn-taking measures of a TD group and an HFA group using friends or non-friends as conversational partners and found that although the HFA group were not overly talkative or did not dominate the conversation, they were more likely to be unresponsive to a conversation partner and offer fewer turns to the partner (conversational to-and-fro). The rate of empty turns, defined as a lack of response where a response was expected, was examined by Eales (1993). He found that, compared to the group with receptive language disorders, the group with autism showed a higher rate of empty turns. A further breakdown showed that within the group with autism, the participants with lower language functioning produced significantly more empty turns than their higher functioning peers. Paul et al. (2009) compared a group with HFA/PDD, AS and a TD group to examine their responsiveness to examiner cues and the degree of reciprocal to and fro exchange. Compared to a TD group, the group with AS took and responded to fewer turns in a conversation. The reported effect size of this difference was large for both these turn-taking measures. When the same comparison was done between the TD and HFA/PDD group, there was no statistically significant difference.

Conversational balance. The operational definition of conversational balance used in this review is the extent to which the exchange between partners is equitable (e.g., comparison of MLU or number of turns for both partners). Conversational balance was examined in the context of a social conversation in three studies (Adams et al., 2002; Nadig et al., 2010; Ziatas et al., 2003). These comparisons were made between a group with AS and a group with severe conduct disorder (Adams et al., 2002), a group with HFA and a TD group, (Nadig et al., 2010) and finally a triad of groups with autism, speech and language impairment and a TD group (Ziatas et al., 2003). No differences were found in the proportion of utterances between the groups and their respective conversation partners in any of these studies.

Repairing. The methods of repairing a communicative breakdown during conversation were examined in four studies but two (Adams et al., 2002; Capps et al., 1998) provided limited analysis or results for the participants with ASD. Adams et al. (2002) collapsed several types of communicative acts (e.g., questions, requests for acknowledgement, or requests for clarification) into levels of the conversational exchange (i.e., first parts, second parts and neutral parts); therefore, it was not possible to extract the data specifically on repair. Capps et al. (1998) reported that there was no difference in the requests for clarification but no data were presented. Bauminger-Zviely et al. (2014) compared the interactions between participants with HFA and participants who were TD. They found that, although participants in the HFA group who had higher linguistic and cognitive function showed a tendency towards better pragmatic abilities, but this did not hold true for clarifying misunderstood utterances. Volden (2004) provided the most comprehensive comparison of repairing strategies of those examined in this review. She found that individuals with HFA were as capable of recognizing a need to repair a

communicative breakdown as their TD peers but as the need to repair the misunderstanding became more pressing (i.e., second or third attempts at repairing), they were more likely to provide a bizarre or inappropriate response or to change the topic completely.

Interrupting. Paul et al. (2009) investigated the frequency of interruptions during a partner's turn but this was conflated with other variables (conversational to-and-fro) so the relevant data could not be isolated.

Presupposition. Presupposition was addressed in two studies. Bauminger-Zviely et al. (2014) found that there was little difference between the HFA and TD groups in the provision of background information needed for the partner to understand the context of the statement. Fine et al. (1994) investigated the number of utterances that made references to assumed general knowledge (e.g., references to the President or the Queen). They found that the group with HFA made cultural links far more than the AS group and the group with non-specific social problems.

Paralinguistics. Paralinguistics was addressed in eight studies. Capps et al. (1998) found that children with autism smile as much as the comparison group of children with developmental delays but nod to acknowledge responses much less. Bauminger-Zviely et al. (2014) examined a range of paralinguistic markers. The group of preschoolers with HFA were significantly different to the comparison TD group in unusual intonation, inappropriate facial expression and gaze during social interactions. There was no between group differences in the rate of speech, inappropriate volume, timing of response and physical distance. The researchers also made comparisons between the groups when speaking to a friend or non-friend and found again that the group with HFA made more appropriate gestures, facial expressions and gaze when interacting with a friend rather than a non-friend partner. Eye gaze was also examined by Nadig et al. (2010) and Paul et al. (2009). While Nadig et al. (2010) found no difference in the eye gaze characteristics of HFA and TD groups, Paul et al. (2009), in contrast, found that both the group with HFA/PDD and the group with AS displayed more inappropriate eye gaze than the TD group. Vocal quality, volume, the rate of speech and intonation patterns were examined in the study by Paul et al. (1987). They found that there was a statistically significant difference between the vocal quality of the groups with autism and fragile X syndrome compared to the group with intellectual disabilities (ID), the former groups were more often coded as showing "harsh" vocal quality. Volden (2004) compared the use of gestures and altered speech volume, rate of speech, word emphasis or articulation between a group of individuals with HFA and a TD group when repairing a conversation. She found that both groups were equally likely to alter their speech and use gestures during a communicative breakdown.

Although it was reported that certain paralinguistic variables were addressed by researchers in some studies, the data were consolidated and could not be extracted separately. For instance, Jones and Schwartz (2009) used a definition of acknowledgements and rejections that included non-verbal behavior (e.g., a nod or head shake) and coded the action accordingly, the data were reported together with verbal acknowledgements and rejections and could not be isolated.

Other pragmatics. Variables that did not fit into the previous categories were included in this category. Examples of variables that were classified here include odd humor, the description of a temporally ordered event, asking questions, references to other's emotions, no response (where it was not possible to determine why a response was not provided), idiosyncratic habits such as stereotyped movements or idiosyncratic compulsions or rituals.

Capps et al. (1998) investigated if there was a difference in the number or type of questions (i.e., yes/no, open ended or forced choice questions) conversation partners asked participants with autism or developmental delays and found that there was no difference between either the number or type of questions asked of the participants in both groups. Jones and Schwartz (2009) explored whether a group with autism asked questions more than a group of TD children during family dinners. Although the group with autism used questions as a bid for interaction at a lower rate than the comparison group, this result did not reach statistical significance. Nadig et al. (2010) examined the proportion of questions the participants in each group asked in an exchange and the proportion of questions a conversation partner asked. They found that there was no difference between the number of questions adult conversation partners asked when attempting to engage participants in conversation in the HFA group or the TD group and both groups asked questions at very low rates (less than 5% of utterances). The number of questions and negations the participants produced were considered in the study by Price et al. (2008) but the results reported were collapsed so it was not possible to separate negations from the questions.

Adams et al. (2002) coded the "goodness of fit of the statement or answer" into degrees of appropriateness i.e., adequate, inadequate, pragmatic problem or no response. The reason for coding a statement or answer as inadequate could have been due to a number of factors. It could not be determined whether

the inappropriate statement resulted from a failure of presupposition or a failure to maintain the current topic. They did find that when compared with a group with conduct disorder, the group with AS produced far more problematic pragmatic responses associated with socio-emotional exchanges. Further, they posited that these problems could be attributed to the misunderstanding of emotional concepts as these issues were present only in social-emotional contexts.

Bauminger-Zviely et al. (2014) reported that the groups with HFA and TD used or signaled humor similarly but utterances by the group with HFA contained more awkward expressions. Capps et al. (1998) compared a group with autism and a group with developmental delays and found no difference in the number of one word responses or the use of yes/no responses but they did find that the group with autism offered more bizarre comments. In the same vein, Paul et al. (2009) found that a group with AS made more irrelevant or overly detailed comments than a TD group but in contrast the group with AD/PDD-NOS did not differ from the TD group in this measure. Ziatas et al. (2003) studied the types of comments made by a group with autism and a group with AS in detail. They noted that the group with autism talked about their own emotions or intentions much less than the groups with speech language impairment, TD and AS. In contrast, the AS group talked about their emotions and intentions the most out of the groups compared. Bang, Burns, and Nadig (2013) found that individuals with autism told their partner fewer personal narratives than their TD peers and Capps et al. (1998) found that narratives were often topically irrelevant and described immediate surroundings rather than personal events. This is finding is similar to Ziatas et al. (2003) who reported that the group with autism often referred to the current environment and rarely offered comments about their own or other's mental states. Finally, Bauminger-Zviely et al. (2014) and Nadig et al. (2010) found that HFA individuals produced more scripted speech and stereotyped language than a TD group.

Discussion

In the past comparative studies have been conducted investigating the differences between the pragmatic language abilities of individuals with autism and matched TD peers. A number of settings and conversational contexts have been examined including naturalistic, semi-structured and structured contexts (e.g., Adams et al., 2002; Jones & Schwartz, 2009; Volden, 2004; Ziatas et al., 2003). As reported in the results section, it was not possible to isolate data on a number of variables across the different categories. The following section will focus on the data that were able to be isolated. Firstly, we will discuss the participants, the context and the conversation partners in the studies reviewed and then the issues surrounding the definition of variables and measurement strategies will be addressed. Finally, key conversation skills will be discussed individually.

Participants

The majority of participants with ASD were within or above the normal range of IQ. This may be because individuals with ASD within this range are more likely to have the language skills required to engage in complete and sophisticated conversation making it easier to elicit language samples and make comparisons with individuals of a different profile. When comparisons are then made with their TD peers, any deficiencies are likely to be attributable to autistic traits. However, this should not discount effects that may be due to delays in language development and to counter this, researchers made comparisons with their language matched TD peers and groups with DS, developmental delays or receptive language disorders. Comparisons based on language abilities may offer insight on performance based solely on language abilities but does not consider the impact cognitive impairment has on a social interaction. Tager-Flusberg and Anderson (1991) compared a group with ASD to a group with DS on the premise that these two diagnoses are rarely comorbid and individuals with DS are widely reported as being highly social. The intent of comparing these two groups was to attribute any group differences to a specific impairment but unfortunately the basis for this comparison has been questioned (Starr, Berument, Tomlins, Papanikolaou, & Rutter, 2005). Therefore, it would be prudent to consider the results from studies where comparisons have been made with groups with DS carefully (Price et al., 2008; Roberts et al., 2007; Tager-Flusberg, 1992; Tager-Flusberg & Anderson, 1991).

As comparisons were almost exclusively made between high functioning individuals and other groups, the data are limited to those with, at the most, a mild intellectual disability. Individuals with moderate intellectual abilities are able to engage in conversation interactions, albeit at a more basic level and the lack of participants with intellectual disability indicates that more research is needed. Only one study offered a cross-sectional comparison of groups across age groups. Research of this nature offers the potential to understand the emergence of differences in conversational abilities in ASD and is a priority for future research. The predominant language of the participants was English and the researchers were located mainly in

developed Western countries. There is research indicating the presence of pragmatic differences in speech acts between languages and cultures (Trosborg, 2010; Wierzbicka, 1985). For example, honorific languages such as Japanese and Korean may use speech differently to English with greater adjustment of language used depending on the social statues of the conversation partner. Research conducted in a variety of cultural contexts may offer insight into whether between group differences hold true across cultures but the lack of cultural diversity in the groups studied offers limited scope for intercultural pragmatic comparisons.

Context and partner

Although pragmatic functioning has been long recognized as presenting difficulties for individuals with autism (Baron-Cohen, 1988; Kanner, 1943), it is difficult to assess as performance is context dependent. Thus, standardized tests and protocols may be problematic with regard to the measurement of pragmatics. True pragmatic difficulties may only become clear in unstructured and naturalistic situations (Bishop, 1998). Observations that are made in structured or artificial settings with a trained adult may be less likely to be an accurate reflection of the behavior that may be demonstrated in more natural contexts with peers.

Most of the language samples were obtained from a semi-structured interview where an unfamiliar adult guided the participants through a conversation topic. At best, this can be considered an atypical social context and it certainly cannot be automatically assumed that findings would necessarily be representative of everyday interactions. Only three researchers obtained samples for evaluation in a truly spontaneous natural context. Bauminger-Zviely et al. (2014) gave no instructions to participants and merely observed their interactions with their peers at preschool, Jones and Schwartz (2009) put no restrictions on participating families and video-recorded their interactions during a family dinner and finally, Tager-Flusberg and Anderson (1991) video recorded the participants' mothers interacting with their child in a ''loosely structured'' activity selected by the mother. A true social exchange has a more unstructured and spontaneous form and thus the results from studies of this type may offer greater insight into the comparative differences between groups.

The conversation partner varied across the studies but in the majority of cases was an unfamiliar adult and, where the conversation sample was collected as part of a standardized test, the partner was often a trained clinician. This may be problematic as trained clinicians may have a different interaction style and results cannot be extrapolated to interactions with peers and the adults that children typically interact with. Samples collected during play settings typically used an adult partner who was familiar to the student. A trained or familiar adult partner may be able to sustain a verbal interaction differently to a similar aged peer so the results obtained need to be carefully interpreted.

Bauminger-Zviely et al. (2014) studied the difference in spontaneous conversations between preschoolers with HFA and a matched group of TD peers with friends and non-friends during a play session. Their findings substantiated those of previous studies showing that individuals with ASD with higher cognitive functioning and verbal mental age were better able to sustain verbal social exchanges. Higher cognitive function and verbal abilities did not appear to be an advantage when attempting to repair conversational breakdown and provide background information as these did not correlate positively with these pragmatic difficulties reported. Not surprisingly both the HFA and TD group demonstrated more intact conversations with friends as a conversation partner but, there was a marked difference between the groups. The HFA group scored substantially better when talking to a friend compared to the TD group indicating that familiarity played a part in fostering more intact conversational exchanges. The TD group was able to sustain more intact conversations regardless of partner, giving further credence to the notion that conversation partners have an effect on the performance of individuals with HFA. The difference in conversation partner was only investigated in one study, and further investigation is warranted to determine the effects of partner familiarity.

In sum, conversations were rarely examined in naturalistic contexts and unfamiliar conversational partners were often employed. Given this, interpretation of the current research must necessarily be tentative and it cannot be assumed that findings would necessarily be typical of ordinary social intercourse. While the conduct of research in more naturalistic contexts may present technical and practical challenges, it certainly stands as a priority for future research.

Definition and measurement of variables

One of the major challenges to analysis in this review was the diversity in the variables measured and the various ways in which they were measured. Researchers tended to classify and define measures without reference to prior studies, thereby making comparisons difficult. Individual measures also tended to be aggregated, hindering detailed analysis. For example, Adams et al. (2002) coded the goodness of fit of a response as adequate, inadequate, pragmatic problem

or no response. The inadequacy of the statement could be due to a failure of presupposition, a failure to preserve the topic or a failure to repair a misunderstanding. Where definitions were provided, they often varied substantially from study to study or were examined more closely in one study than another. Although repairing was measured in separate studies it was not possible to make coherent comparisons as the variables measured did not align and comparisons could not be made. For example, Volden (2004) examined and coded how each attempt at repairing was made (e.g., a repetition, a revision of the original statement or provision of additional information), Bauminger-Zviely et al. (2014) examined how well the repair was executed according to a rating scale and Capps et al. (1998) measured the presence of a request for clarification.

Where operational definitions were provided, there was often limited information provided. Sometimes no more than a descriptive label was given. For example, Capps et al. (1998) provided the following as coding transcripts of conversations with these parameters ''bizarre/idiosyncratic,'' ''request for clarification'' and ''extended/new information.'' This absence of detail made between study comparisons of the variables measured problematic. It would be of benefit if future researchers ensured that clear operational definitions of variables under examination are included to minimize the need for reader inference.

Pragmatic capacities

A number of key pragmatic capacities and skills have been identified as important to fluent and socially satisfying conversation, including the ability to initiate and terminate a conversation, preserve a topic, shift topics, take turns and maintain conversational balance as well as repairing breakdowns. These key issues will be discussed initially followed by other pragmatic capacities examined in the research.

Initiations and terminations. Only two studies (Adams et al., 2002; Jones & Schwartz, 2009) provided results that could be isolated for discussion. There was no difference in the rates of initiation between a group with ASD and a group with conduct disorder (Adams et al., 2002) but a group of children on the autism spectrum initiated less than their TD peers (Jones & Schwartz, 2009). This finding is unsurprising given that the low levels of initiations by children with ASD have also been reported in a broader social communication context (Chiang & Carter, 2008). It is interesting that the rate of initiations by individuals with autism was not examined by more researchers. A possible explanation may be that the number of opportunities to initiate a social exchange is limited when language samples are conducted within a semi-structured context. Data on initiations or terminations may be better examined by observation in a natural context. In addition, opportunities to initiate a new conversation are inherently fewer than opportunities to extend an existing conversation; therefore, much more observation time would be involved. Data on terminations could not be isolated as attempts to change the topic and terminate an exchange were conflated together. Given that abrupt endings to social exchanges may be deemed impolite it would be beneficial to investigate if group differences are present.

Topic preservation. Topic preservation was one of the most widely examined categories and a number of consistent between group differences were reported by researchers. The groups with autism offered more irrelevant or inappropriate details, were less likely to extend a topic or offer new information during conversational exchanges and in general, appeared to struggle to participate appropriately in a conversation compared to groups with conduct disorder, developmental delays and TD individuals (Bauminger-Zviely et al., 2014; Capps et al., 1998; Capps et al., 2000; Nadig et al., 2010; Paul et al., 2009; Roberts et al., 2007). These results were obtained across a variety of conversation partners and in both semi-structured and natural conversations.

Given that individuals with ASD, compared to a range of peers, appear to have difficulties preserving a topic during a conversation, interventions that focus on teaching students to extend an on-going topic or provide pertinent information may be an important area of research. Bauminger-Zviely et al. (2014) reported that individuals with HFA appeared to stay on topic more appropriately when talking to a friend rather than a non-friend, this may indicate that conversational competence may need to be taught in a natural context with a range of partners rather than in a structured setting with a single partner. In addition, Jones and Schwartz (2009) found that children with autism ignored non-obligatory utterances (e.g., comments and statements) more than obligatory utterances (e.g., questions or directives). Within the context of topic preservation, if a comment or statement is ignored it may serve to terminate an exchange; therefore, it may be worthwhile teaching individuals with ASD to respond appropriately to comments and statements in order to prolong social interactions.

Topic shift. It was not possible to extract topic shift data from several studies as the measures were conflated across categories. The general trend in the results from Bauminger-Zviely et al. (2014), Paul et al. (2009)

and Roberts et al. (2007) indicated that individuals with autism tend to perseverate on topics and shift topics inappropriately more than their TD peers. In contrast Paul et al. (1987) found that there was no difference in the resistance to shift topics between adults with autistic disorder, fragile X syndrome and non-specific intellectual disabilities. This could be interpreted as suggesting that conversational perseveration is a more general trait characteristic of developmental disability rather than a unique feature of ASD but Paul et al. (2009) compared groups with AS and HFA and found that the AS group were more prone to topic perseveration. Any conclusions drawn may be premature given the limited available research. Therefore, further comparative research examining appropriate and inappropriate topic shift as well as resistance to topic shift is warranted with both TD and other disability groups.

Turn taking. Note that for the purpose of this review, turn taking referred to whether an opportunity for a turn is taken or given. Given this operational definition, there were limited between group differences in "turn taking" measures. Adams et al. (2002) and Bauminger-Zviely et al. (2014) found that there was no difference in conversational dominance between groups with AS and HFA as they were equally likely to allow the conversational partner an opportunity to speak as a TD or conduct disordered group. Despite this, Bauminger-Zviely et al. (2014), Eales (1993) and Paul et al. (2009) all found that the groups with autism were more likely to avoid responding to a conversational partner. Taken together, this may suggest that individuals with autism tend to avoid engaging in social initiations and in doing so offer the conversation partner additional opportunities for a turn. The language samples addressed here were taken equally from natural conversations and semi-structured contexts with a variety of conversation partners giving weight to the findings as a whole.

The groups compared in this category offer an interesting insight into the possible reasons for the lower rates of responses. One possible reason is that receptive language difficulties play a part in the absence of responding. A failure to understand a partner's utterance may result in missing an opportunity to speak. Another possible reason is the well documented impairment in theory of mind (Baron-Cohen, 1995). If an individual is unaware that people have different mental states or access to different knowledge, the need to share information may be seen as unnecessary thereby reducing the number of turns during an exchange. It is important to draw conclusions cautiously as the number of relevant studies is small.

Conversational balance. Conversational balance was operationally defined in this review as a direct comparison between the conversation partner and the participant. Measures of conversational balance offer an insight into how much of the conversation was driven by one party or the other. For example, if it is shown that the conversation partner produced a greater number of turns or utterances, it could indicate imbalance in conversational effort. Adams et al. (2002), Nadig et al. (2010) and Ziatas et al. (2003) reported minimal group differences in the speech output or utterances between the conversation partner and participants. The common finding that there was no significant group difference is interesting, as although the conversation partners were all adults, conversational balance was examined differently (conversation section of the ADOS, unscripted semi-structured interaction, semi-structured play activity) in these three studies. This lack of group difference is slightly surprising as one might expect a conversation partner to have a different interaction style when communicating with TD individuals compared to individuals with ASD and that differences in communication skills in individuals with disabilities may affect how much a conversation is driven by each party. It is worth noting that none of the language samples were conducted in a natural context and only adults served as conversation partners. In future, it may be worthwhile conducting research in more natural contexts or with similar aged peers as those results might provide further insight.

Repairing. Given the importance of being able to take another's perspective in repairing breakdowns, it would be expected that individuals with ASD may find repairing breakdowns in conversation problematic in comparison with other groups. This proposition does not appear to be supported by the findings in the studies included here. Somewhat surprisingly, the differences found were relatively minor. The only difference was that the group with autism tended to offer bizarre comments or shift the topic inappropriately with the intent to terminate the interaction when they were asked for a clarification. Bauminger-Zviely et al. (2014) reported that participants with ASD with higher linguistic and cognitive function, showed a tendency towards better pragmatic abilities but this did not hold true for clarifying misunderstood utterances. This suggests that repair may be dependent more upon an understanding of another's mind or theory of mind than general pragmatic capacity. Although these findings are unexpected, the relatively limited group differences may be accounted for by the explicit signals provided by the partners. Most of the studies where a conversational repair was measured relied on an explicit request for clarification by the partner. A more authentic measure

would arise from a lack of clarity that is present in a natural conversation where a misunderstanding would be more difficult to detect if a partner does not explicitly ask for a clarification. For example, in natural conversations more subtle indications of breakdown may be signaled by non-verbal partner behavior, or inappropriate partner conversational responses that signal a lack of understanding on their part. Thus, the present results may have been an artifact of the way the breakdown was signaled and future researchers could examine responses to more subtle indicators of conversational breakdown.

Interrupting. Interrupting is undoubtedly a socially valuable conversational skill but was only examined as a variable in the study by Paul et al. (2009). Unfortunately, it was not possible to extract data for this variable as it was not reported discretely in the study. Given that inappropriate interruptions have the capacity to offend partners, research on this aspect of conversational exchange would seem appropriate.

Presupposition. Presupposition deals with how language is used to convey information based on judgments of what the conversation partner already knows. For example, the introduction of new information during a conversation before making reference to it or specifying who pronouns refer to before using "he," "she" or "them." Problems with use of pronouns seem to be a recognized feature of ASD (Rapin & Dunn, 2003; Wilkinson, 1998) and may lead to misunderstandings when they are misused in social contexts but Bauminger-Zviely et al. (2014) found that there was no difference between the HFA group and TD group in the use of pronouns. The HFA group, however, refers to background information or assumed knowledge in a more problematic manner than the TD group. The HFA group in the study by Fine et al. (1994) made more references to cultural knowledge than both the group of participants with AS and the clinical control group. The number of cultural references detected however was very small in number. The small number of studies located examining presupposition does not allow conclusions to be drawn at this stage. A measure of presupposition was only investigated in three studies. This may be attributed to the difficulty in measuring what an individual presupposes a conversation partner knows in a clinical setting (Volden, 2017).

Paralinguistics. There was a conflicting result with regard to one aspect of paralinguistic behavior in conversational exchanges. A group difference in the use of eye-gaze was found in the studies by Bauminger-Zviely et al. (2014) and Paul et al. (2009) between the groups with HFA, Asperger's Syndrome/PDD-NOS and the TD group but Nadig et al. (2010) found no significant difference between groups with similar diagnoses. A possible explanation may be the difference in the age and IQ of the participants and the way in which data were collected. The setting, context and partner were different in each of these studies which may also have had an impact on the results. Bauminger-Zviely et al. (2014) collected data from a natural play session with peers at a preschool so it is possible that the children were more focused on looking at the toys during their interactions with each other. Paul et al. (2009) used the interview section of the ADOS in their study and this involved the use of construction materials, books and pictures which may also have minimized the need for eye contact. In contrast, the study by Nadig et al. (2010) was conducted without possibly distracting materials. The absence of a specific object to focus on may have contributed to the lack of difference between groups on this measure.

Other pragmatic measures. A number of other variables were reported that could not be classified into the discrete categories developed for this review. Most of the measures that were included in this catch-all category yielded expected results. Given the social deficits of individuals with ASD it was not surprising that as a group they were more likely to use awkward expressions, make inappropriate utterances and empty turns, identify items in the surrounds, use scripted language, be echolalic and repeat questions verbatim (Bauminger-Zviely et al., 2014; Capps et al., 1998; Eales, 1993; Nadig et al., 2010; Ziatas et al., 2003). Surprisingly, compared to a TD group there was no difference in the use of humor (Bauminger-Zviely et al., 2014) or the number of times individuals with autism respond with "I don't know" or provide "Yes" or "No" responses compared to developmentally delayed peers (Capps et al., 1998).

Given the prevailing notion that individuals with autism are less inclined to engage in spontaneous commenting (Chiang, 2008) it would be expected that the partner would have to ask more questions or try harder to elicit participation but no difference was reported. It is worth noting that all the partners in the studies where this was measured were adults and most of the data were collected in a semi-structured context which may have limited the scope for extending conversation opportunities.

General discussion

Given the variety of measures addressed by the authors of the studies in this review, we have attempted to analyze the results within the framework of the rubric

designed to categorize the variable measured in the reviewed studies. Despite this, the analysis presented here demonstrates how difficult it is to compare variables that have not only been measured with different instruments, but also with different conversation partners and in different contexts. We also should point out that the number of studies that compare the conversational abilities of individuals with autism with their TD peers is relatively small. The focus of this review was on the pragmatic abilities of people with ASD within a conversational context which limited the number of eligible studies, but this restriction notwithstanding, 18 studies is a modest number given that deficits in social communication and interaction deficits are a key component of the diagnostic criteria for ASD (American Psychiatric Association, 2013).

The research in conversation skills appears to be fragmented and lack uniformity. In particular, there were few common measures and later studies do not appear to build on the findings of previous ones. Only one researcher (Eales, 1993) attempted a longitudinal examination of the development of conversation skills and there is a lack of exact or systematic replication of earlier studies. Replication is the keystone of research serving to confirm and validate knowledge (Makel & Plucker, 2014; Schmidt, 2009; Smith, 1970; Spector, Johnson, & Young, 2015). Most of the studies included here can only be considered at face value as there is little common ground to allow synthesis of results.

Despite the fragmented research and the small number of studies there were some consistent findings. Individuals with ASD initiated interactions and responded to partners less than TD individuals and peers with a receptive language disorder. Compared to a TD group, they also tended to have difficulties preserving a conversation by extending a topic or offering novel information and were more likely to resist topic shifts by perseverating and making bizarre comments. There was no difference between the groups in the number of turns offered to a conversation partner, and no difference in the number of questions a partner asked to a group with autism and a group of TD peers. The only contradictory finding was on the use of eye-gaze during conversations.

Overall there were fewer differences found between the groups with autism and comparison groups than might be expected. This is surprising given that individuals with autism have social communication deficits as a core element of diagnosis. As previously noted, the lack of difference may be due to the artificial way much of the data were collected. Few studies were conducted in natural contexts and most of the conversation partners were adults either known to the participants or who had experience working with individuals with disabilities. The possibility that the methods used to measure and isolate the pragmatic skills are not sophisticated enough to tease out the nuanced differences must also be considered.

A further matter for consideration is the diversity in the characteristics of individuals with autism. Although there are characteristics common to individuals with an ASD diagnosis, each person is unique and these individual features can have an impact on group results. For instance, Adams et al. (2002) noted in their results that although as a group the participants with AS were no more likely to initiate an exchange or be more talkative than the group with conduct disorder, three of the participants in the AS group made significantly more lengthy contributions to an exchange than the remaining 16 participants in that group. These outlier individuals made an impact on the group results. Given the relatively small sample size in most of the studies, the overall variability in the groups makes it difficult to generalize results from these studies to the wider population. Volden (2017) argues that, although individuals with ASD clearly have pragmatic difficulties, the nature of the impairment has not been fully understood. Volden (2017) posits that there may not be a single underlying pragmatic deficit in ASD, rather a number of independent but cumulative deficits result in an acute impairment in the use of language for social interactions. This may be a reasonable proposition given the somewhat limited group differences identified in this review and consensus that problematic social/communicative interactions are a defining feature of ASD. That is, conversational issues in ASD may arise from a number of more difficult to detect smaller deficits, which act in combination to impair social exchange.

Implications for practice

Given the somewhat fragmented nature of the extant research and it would be premature to make strong recommendations for practice. Nevertheless, there are some consistent findings and it may provide a focus for intervention. In particular, when compared to groups with DS, conduct disorder or a TD group, individuals with ASD present with consistent difficulties with topic preservation (i.e., providing novel and pertinent information during an exchange) and appropriate topic shifts. Specifically, individuals with ASD tend to provide more ''out-of-sync'' content and fewer novel information during a conversation and also make more unannounced or abrupt topic shifts than their TD peers. These may be appropriate targets for intervention.

Limitations

Although attempts were made to ensure this review was systematic by using a framework to analyze the results

of the studies included, the fact that the variables measured in the studies differ so much made analysis challenging. Although the framework was developed through trialing, any such rubric is necessarily artificial and the appropriate classification of studies remained challenging in many instances. This problem was exacerbated by the limited operational definitions of constructs and variables provided by researchers, which in some cases amounted to no more than a descriptive label. Due to the disparate nature of the studies, the inherently problematic nature of defining something as multifaceted as conversation skills and in particular, the measures employed, conclusions drawn need to be cautiously interpreted.

Conclusion

Given individuals with autism demonstrate impaired social communication, one would expect to find differences in a range of measures of communicative competence between individuals with autism and their TD peers or peers with other disabilities. Although interpretation of the relevant research is problematic, the findings of this review suggest that these differences are not as pronounced as might be expected and research was often contradictory. There remains a need for a more cohesive framework to make these comparisons including exact and systematic replication of existing studies. Furthermore, the context used in obtaining language samples for comparison needs to be considered. In particular, while it is understandable that language samples elicited in a semi-structured context with a skilled clinician represent a practical approach to obtaining data, this may not be reflective of naturalistic conversation.

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