



Autobiographical memories in individuals with autism spectrum disorders: a systematic review

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Accepted: 20 July 2024 / Published online: 22 August 2024

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Abstract

Autism spectrum disorder (ASD) is associated with distinct deficits in communication, movement, and autobiographical memory (AM), the later one is selected for review having implications for social functioning. This systematic review synthesized empirical studies, evaluating AM in people diagnosed with ASD throughout their lifetime. This review aims to study the status of AM among individuals diagnosed with ASD. A literature search on nine electronic databases between the date of inception of each respective database and January 2023 was done. The final sample consisted of 19 studies which were analysed considering the aim of research. Before exploring the main aim, preliminary analysis also identified the measures used for ASD and AM as well as other measures used in these studies. Results revealed that individuals with ASD experienced issues in AM primarily in the form of (a) errors of omission, (b) fewer specific memories, (c) impairments in personal episodic memory but not in personal semantic memory; (d) deficits in event-specific knowledge and intact general event knowledge; and lastly the (e) role of intervention in AM was also identified. These findings highlight the nature of AM deficits among individuals with ASD and provide an avenue for targeted/tailored interventions.

Keywords Autism spectrum disorder · Autobiographical memory · Systematic review

Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by deficits in social communication and restrictive, repetitive patterns of behaviours (American Psychiatric Association, 2013). ASD individuals may show distinct approach to movement, learnings, and attention (Centre for Disease Control and Prevention, 2022) and is linked to genetic defects and premature child birth (Muhle

et al., 2004). Due to the genetic factors, it is mostly diagnosed between the 18 months to 24 months of early childhood (Okoye et al., 2023). Early symptoms may include social interaction receptiveness such as unsustainable eye contact, unresponsiveness when called by name, limited or no facial expressions, gestures, no empathy, isolation from other children, and no involvement in role pretended plays (McFayden et al., 2022).

Beyond this, the impairments experienced by individuals with ASD extend to other domains of functioning, with one such domain being autobiographical memory (Cooper & Simons, 2019). Autobiographical memory (AM) refers to the recollection and integration of an individual's personal experiences to form a personal life narrative (Fuvish, 2011). AM is conceptualized as being comprised of two types; autobiographical episodic memory (AEM), which entails spatiotemporal information of the personal experience as well as its emotional significance, and autobiographical semantic memory (ASM), which involves information relating to the self (Conway, 2005; Fivush & Graci, 2017; Tulving, 2002).

AMs are an important component of the memory system as it holds several roles in daily functioning, such as in social

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relationships, emotional regulation, self-development, and directive functioning (Bluck, 2003). In the case of individuals with ASD, studies have highlighted deficits in AM, such as poorer recollection and memory specificity (Gaigg et al., 2014). AMs are notably central to the development of the sense of self (Prebble et al., 2013). Self-identity is closely linked with AMs and personal narratives in general (Westby, 2022). Indeed, impaired AEM has been noted as a factor in the diminished concept of the self among individuals with ASD (for a review, see Lind, 2010). Specifically, owing to the inability to produce causal cohesion in personal than fictional narratives (Losh & Capps, 2006), and less use of AEMs in social and intrapersonal judgments, people with ASD may be unable to properly form an interpersonal and narrative self (Johnson et al., 2018).

Previous literature reviews have approached the nature of AM deficits in individuals with ASD. Of note, a review revealed that AM impairments are depicted as having lower coherence and memory specificity, diminished detail of personal narratives, and an increased reliance on scaffolding (McDonnell et al. 2017). These domains are consistent with a more recent review by Westby (2022). These findings serve as a platform for further exploration of AM deficits characterized by existing literature.

Rationale

Globally, the reported case of ASD increased from 0.62% in 2012 to 1.0% in 2021 (Zeidan et al., 2022). There are numerous reasons for this increasing prevalence rate such as modifying diagnostic criteria over the time and amplified associated risk factors (Anwar et al., 2018). A number of review articles, systematic reviews, and meta-analysis

existed regarding various dimensions associated with ASD such as epidemiology (Fombonne, 1999), prevalence (Wing, 1993), early diagnosis of ASD (Okoye et al., 2023), neuropathology (Pickett & London, 2005), motor abilities (Gowen & Hamilton, 2013), interventions (Goldstein, 2002), and even memory (Lind, 2010). However,

while there are theoretical accounts and literature reviews that characterize deficits in AM in ASD (McDonnell et al., 2017; Westby, 2022), there is currently no systematic review which implements the guidelines proposed in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Moher et al., 2010). Moreover, the reviews related to ASD and memory either focused on memory (Lind, 2010; Shalom, 2003) and its one dimension such as working memory (Kercood et al., 2014) and episodic memory (Griffin et al., 2022) or one research design (Desaunay et al., 2020). Even one recent review article explore the role of scene construction in ABM among individuals with ASD (Agron et al., 2024) focusing on the difficulties associated with reconstruction without utilizing PRISMA. Hence, this systematic review, inspired by previous literature syntheses, seeks to characterize the deficits in AM among individuals with AS using PRISMA.

Materials and methods

Protocol

The review was organized and its integrity was maintained using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement for systematic reviews (Page et al., 2021).

Inclusion and exclusion criteria

Inclusion and exclusion criteria were based on the “PICOS” (Beller et al., 2013) approach to review empirical studies: population, intervention, comparators, outcomes, and study design (please see Table 1).

Information sources and search strategy

A total of nine electronic databases were used from inception to Jan 2023: Medline, Embase, ERIC/Proquest, ScienceDirect, Pubmed, PsycINFO, CINAHL, Scopus, and EBM Reviews - Cochrane Central Register of Controlled Trials. Search strings, based on Boolean operators, truncation, MeSH terms and wildcard features as appropriate for each database’s indexing reference (Dinet et al., 2004) (see Table S1). In addition to that, synonymic keywords were searched in each database and the reference lists of the retrieved

Table 1 Showing inclusion and exclusion criteria

	Inclusion criteria	Exclusion criteria
Population	All age groups Primary diagnosis of any Autism Spectrum Disorders All treatment settings Any cultural background, ethnicity, and sex	Autism Spectrum Disorders not being the primary diagnosis
Intervention	No restriction was set on intervention	
Comparator	No restrictions were set on comparators.	
Outcome	Autobiographical memories	Any outcome other than Autobiographical memories
Study Design	Studies based on any research design and published in English	Commentary, correction, editorial letter (unless research letter reporting data)

articles for any further relevant studies were screened. The search terms were selected by consulting prior research, theory, and practice (see Table S2).

Study selection

An initial screening of the studies’ titles and abstracts was autonomously executed by the two authors (KM, VN, AJS, SJ, and MR). All the irrelevant studies were excluded after screening their reference lists. Moreover, both authors autonomously screened all the full-text articles for final selection. Any emerging disagreements were resolved through discussions.

Figure 1 presents the flow chart for the selection of the included studies. After removing duplicates, an initial search of the databases returned 650 articles published in English-language. One of the authors (KM) screened the titles and abstracts and this was subsequently reviewed by other authors (AJS and SJ). This resulted in 188 potentially related studies. A total of 462 records were excluded at this stage as they did not specifically mention the search terms in the abstract section. studies were not identified through manually searching the reference lists of reviews and other key papers. Next, each study was examined full-length and this process retained a total of 19 relevant studies for inclusion into the review. The entire process was repeated

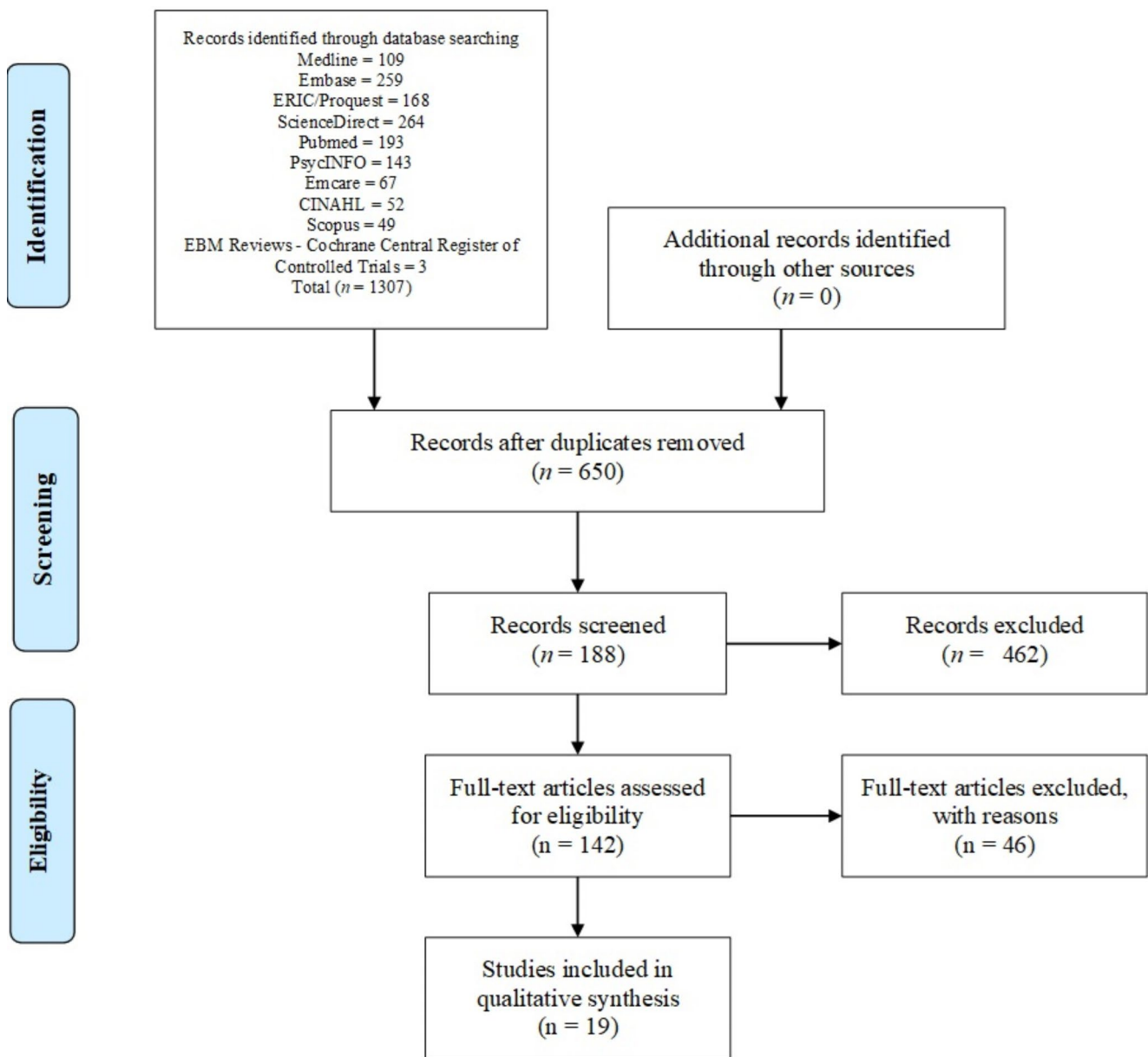


Fig. 1 PRISMA flow diagram showing the process of study selection for inclusion in the systematic review

independently by other authors (VN and SJ) and disagreements were settled through mutual discussion (see Fig. 1: PRISMA flow diagram showing the process of study selection for inclusion in the systematic review).

Critical appraisal method

The methodological quality of all the included studies was assessed through the 14 criteria scoring systems (Kmet et al., 2004). A total score (from 0 to 1) was awarded to every study; higher scores showed better methodological quality. Previous systematic reviews have used this scoring system to ascertain the methodological quality of studies (Choudhry et al., 2019, 2021; Ishak et al., 2022; Munawar et al., 2018, 2020, 2022, 2023; Rahmanian et al., 2021) and required the least score of 0.55 for selecting a study. Nevertheless, the least score of study included in this review was 0.50. The authors (KM, AJS and MR) autonomously evaluated all the included studies and disagreements between authors in quality ratings were resolved through mutual consensus. No study was excluded in this stage (please see Table S3 in the electronic supplementary material for details).

Data extraction

The data were extracted by first author using a systematic extraction form for each article to collect the following data: First author and year, country, study design, sample size, diagnosis through (DSM/ICD), diagnosis/mental health issue, participant characteristics (age, gender), intervention (content, group, duration), control group, assessment measures, time of assessment, follow-up duration, conclusion, and study quality. The author (MR) confirmed data extracted from each study. All the disagreements during this stage were settled through discussion. (please see Table S4).

Table S4 shows that published studies ranged from 2008 to 2021 and were mostly conducted in the UK ($n=10$), followed by USA and France ($n=4$ studies each) and Israel ($n=1$). Except four studies, all other studies were based on experimental research design.

Sample participants characteristics Across 19 included studies, a total of 1730 participants participated (males = 679, females = 267). The age of participants in included studies ranged from 5 to 55 years. This included data from nine studies of in which participants received a formal diagnosis of ASD from a Clinical Psychologist or Psychiatrist that is experienced in the field of autism, through DSM or ICD.

ASD assessment measure To evaluate ASD or its severity, 14 studies mentioned some form of ASD assessment measure. The Autism Spectrum Quotient (AQ) questionnaire

was used in seven studies. Furthermore, Revised or translated versions of Autism Diagnostic Interview and/or the Autism Diagnostic Observation Schedule-Generic were used in four studies. The French version of Ritvo Asperger Autism Rating Scale-Revised as well as the Social Communication Questionnaire (SCQ) ‘lifetime’ version’ were administered in two studies each. Other measures to assess ASD were Childhood Autism Rating Scale, Ritvo Asperger Autism Rating Scale-Revised, Wing Autistic Disorder Interview Checklist (WADIC), and Broad Autism Phenotype Questionnaire.

Autobiographical memory test A variety of ABM tests were used to elicit, recall, and/or rate ADMs of participants. The Autobiographical Memory Cueing Task was used in eight studies. Other measures used to gather data related to ABMs were Personality Trait Questionnaire (PTQ), Thinking About Life Experiences (TALE), Episodic and Semantic Autobiographical Memory Interview based on the Children’s Autobiographical Memory Inventory (CAMI), Children’s Autobiographical Memory Interview, and Children’s Memory Scale (CMS).

Other measures Other than ASD and ABMs assessment measures, the included studies analysed data of a variety of other measures. The commonest scales were Wechsler scales; subscales from different versions and translations of Wechsler Adult Intelligence Scale (WAIS), Wechsler Intelligence Scale for Children (WISC), Wechsler Memory Scale, and Wechsler Abbreviated Scale of Intelligence (WASI) were used in 16 studies. In addition to these, Rosenberg Self-Esteem Scale, Beck Depression Inventory, False-belief task, Empathy Quotient (EQ), and British Picture Vocabulary Score were administered across the 19 studies.

Synthesis and analysis of results

Standard methods for thematic analysis (Liamputtong & Ezzy, 2005) were used to synthesize findings of the included studies.

Risk of bias and heterogeneity

The meta-analysis was not performed owing to considerable heterogeneity in the included studies. Thus, the findings were analysed through a thematic analysis. Furthermore, no subgroup or sensitivity analyses were conducted, as these were not in line with our study aims.

Results

Sample participants characteristics Across 19 included studies, a total of 1730 participants participated (males = 679, females = 267). The age of participants in included studies ranged from 5 to 55 years. This included data from nine studies of in which participants received a formal diagnosis of ASD from a Clinical Psychologist or Psychiatrist that is experienced in the field of autism, through DSM or ICD.

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The included studies repeatedly demonstrated impairments in various components of ABMs among individuals with ASD and five themes emerged in this regard.

1) Error of Omission

The comparison of ABMS recalled by individuals having ASD to health control showed that individuals with ASD showed poorer ABM compared to controls group participants. The memories were dominated by errors of omission rather than errors of commission, as well as poor recall of memories related to initial life-events (Bruck et al., 2007).

2) Fewer specific memories

According to Goddard et al. (2014a, b), individuals with ASD had diminished recall of remote past, impairments regarding ability to recall recent memory as well as visual memory. Aloofness was shown to negatively impact ABMs, fewer positive specific memories, which eventually resulted in problems with goal-directed behaviour (McDonnell & Nuttall, 2018). Moreover, Individuals having ASD without Intellectual Deficiency were shown to have a reduced clarity of self-concept and poor social function of ABMs (Coutelle et al., 2020). However, another study showed absence of any group difference in the number of internal details during spontaneous recall (Coutelle et al., 2021).

Studies highlighted that there were fewer specific memories, prominent sensory elements in self-defining memories, and reduced extraction of meaning from memories (Adler et al., 2010; Crane et al., 2010, 2012, 2013; Goddard et al., 2007; Tanweer et al., 2010). In this regard, highly imageable cue words enabled the specificity of ABM retrieval. A study by Crane and Goddard (2008) showed contrary findings.

3) Impairments in personal episodic memory

A study on an individual with Asperger’s syndrome showed a damaged recall of semantic component of ABMs, as well as weakened current and recent personal event memories (Bon et al., 2013). Authors also showed that there was preservation of remote memories referring to event that occurred before the age of seven years. The comparisons of ABMs recalled by individuals having ASD to that of health controls showed that individuals with ASD showed poorer recall of memories related to initial life-events (Bruck et al., 2007). Studies showed impairments in personal episodic memory but not in personal semantic memory (Adler et al., 2010; Crane & Goddard, 2008; Goddard et al., 2014b; Robinson et al., 2017).

4) Deficits in event-specific knowledge and intact general event knowledge

According to Crane et al. (2009), contrary to healthy individuals, people with ASD could only structure general event knowledge (not event-specific knowledge) around goals of the self. Likewise, deficits in event-specific knowledge and intact general event knowledge was also seen in the individuals with ASD (Crane et al., 2009; Goddard et al., 2014a; Goddard et al., 2014b; Krackow, 2021; Tanweer et al., 2010). A study assessed the communication patterns employed in parent–child retrieval of shared past events (Goldman & DeNigris, 2015) highlighted that parents modified their communication according to the communication issues faced by their children to enhance conversations about past.

5) Role of intervention

Wantzen et al. (2021) designed a cognitive intervention targeting individuals with ASD. After highlighting that ASD narratives focus more on the family than on extended social spheres, the authors used their cognitive intervention to enhance communications, of individuals having ASD, using ABM to extend the social circle to include non-family members.

Discussion

This systematic review aimed at addressing ABM impairment in individuals with ASDs. To address and summarize the key study findings, five themes were extracted which assisted in addressing the research questions. The first theme summarised About the error of omission. The first theme emerged about the fewer specific memories among ASD individuals. The third theme highlighted findings of ASD individuals related to impairments in personal episodic memory but not in personal semantic memory. The fourth theme synthesized findings related to deficits in event-specific knowledge and intact general event knowledge in individuals having ASDs. Last theme explains the role of intervention to manage ABMs among ASD individuals.

A main finding of this systematic review was a general deterioration of ABMs in individuals with ASDs. The ASD symptoms were predominantly assessed through Autism Spectrum Quotient (AQ) questionnaire (Coutelle et al., 2020, 2021; Crane et al., 2009, 2010, 2012, 2013; Tanweer et al., 2010). The Autism-Spectrum Quotient (AQ) questionnaire, a self-report measure, has been rigorously used to assess autistic traits in adults of at least average intelligence with ASDs (Ruzich et al., 2015). Furthermore, from the diversity of ABM tests to elicit, recall, and/or rate ABMs of participants, Autobiographical Memory Cueing Task was the frequently employed test (Coutelle et al., 2021; Crane et al., 2009, 2010, 2012, 2013; Goddard et al., 2014a; Goddard et al., 2014b; Goddard et al., 2007).

A variety of Wechsler scales were administered in the included studies to assess intelligence of participants (Adler et al., 2010; Bon et al., 2013; Crane & Goddard, 2008; Crane et al., 2009, 2010, 2013; Goddard et al., 2014a; Goddard et al., 2014b; Goddard et al., 2007; Wantzen et al., 2021). In addition to this, some other measures were administered for assessing various symptoms/aspect of participants' psychological domains, such as Rosenberg Self-Esteem Scale, Beck Depression Inventory, False-belief task, Empathy Quotient (EQ), and British Picture Vocabulary Score (Bon et al., 2013; Coutelle et al., 2020, 2021; Goddard et al., 2014a; Goddard et al., 2014b; Goddard et al., 2007).

Regarding the deterioration of AMs or their various aspects among individuals with ASDs, the included studies showed that the memories were dominated by errors of omission rather than errors of commission; poor recall of memories related to initial life-events; fewer specific memories, prominent sensory elements in self-defining memories, and reduced extraction of meaning from memories; impairments in personal episodic memory but not in personal semantic memory; and deficits in event-specific knowledge and intact general event knowledge was also seen in the individuals with ASD (Adler et al., 2010; Bruck

et al., 2007; Crane & Goddard, 2008; Crane et al., 2009, 2010, 2012, 2013; Goddard et al., 2014a; Goddard et al., 2014b; Goddard et al., 2007; Krackow, 2021; Robinson et al., 2017; Tanweer et al., 2010).

The study implicates that ASD cause significant impairment in ABM and early interventions can be helpful in this regard that can only be possible if ASD diagnosed at early stage. As a review article indicated that diagnosis of ASD between two years to five years can improve specific developing areas such as communication and movement (Okoye et al., 2023). This also implies in case of ABM that is in the phase of development during early childhood (Wang & Blenis, 2015). This review further implicates that although researchers are exploring the role of ASD in ABM and exploring the ways to handle the issues using therapeutic interventions and mobile applications (Papoutsi et al., 2018). However, the importance of memory in intelligence and normal life functioning calls for more therapeutic techniques that aid to manage ABM among individuals with ASD. In this regard, researchers can explore the use of artificial intelligence and related applications that are already helpful for diagnosis of ASD (Rahman et al., 2020).

Recognition of factors that increase vulnerability or buffer against the development of ABM among individuals with ASD is crucial for designing intervention strategies. In this regard, experimental studies will be crucial for ascertaining mechanisms and scientifically assessing causal hypotheses. Direct assessment of ABMs in association to socio-emotional and adaptive performance, symptoms of ASD at various time points may provide a better way to recognize possible goals for intervention and illuminating the context and directions of associations across variables. It has been evident that ABMs play a pivotal role in socio-emotional performance and have been linked to solving social problems, maintaining interactions and social bonds, intervention strategies aimed at ABMs abilities may be possible for encouraging social interactions in people with ASD. The past empirical evidence has shown that ABMs can be improved through interventional strategies such as cognitive training (Neshat-Doost et al., 2013; Raes et al., 2009). Nevertheless, there is a need to empirically establish if ABM interventional strategies among individuals with ASD would substantially enhance ABMs. Future research studies along these lines will add to science of memory development and interventional strategies for individuals with ASD as well as their families.

Strengths and limitations

This review article provides a comprehensive overview about the impact of ASD on ABM, ranging from measures, error of omission, impact on semantic memory, deficits in

event-specific knowledge and intact general event knowledge and role of intervention backed with the scientific knowledge. Additionally, this study uses PRISMA model as the main reference point for systematic review. Moreover, the references studies and data up to 2023, ensuring that the information provided is current and relevant to the field.

Besides the above presented strengths, there were some limitations and difficulties faced when performing this systematic review. The main issue was to synthesize findings across variety of studies, as sample sizes, age ranges, assessment measures, and study designs varied predominantly. Owing to a restriction of resources, findings from grey literature or articles published in languages other than English were not included. It briefly provides information about the impact of ASD on memory, particularly ABM. However, a more in-depth analysis of potential drawbacks and interventions related to ASD would be beneficial. Moreover, it does not focus on the other areas of concerns impacted due to ASD such as developmental milestones delays.

Conclusion

To condense, this systematic review showed that individuals with ASD have substantial deterioration in speed, accuracy and retrieval of various aspects of ABMs across methods of memory activation. These issues faced by individuals with ASD are of crucial importance developmentally, because it may be challenging for these individuals to recall certain memories to share in social interactions. According to Fivush, discussion of experiences is central in the formation of social bonds (Fivush et al., 1996), thus, a further challenge comes in the form of development of social relationships as individuals with ASD continuously strive to access and relay specific ABMs to share before the interactions shift to other topics. All these problems add to the negative and difficult social interactions faced by these individuals and may reduce the likelihood of them seeking out interactions in future. Similarly, it may be troublesome for them to solve social problems as specific ABMs offer a repository of exemplars to problems (Williams et al., 1996). This challenge in remembering and utilizing memories may add to the pile of already present unsolved problems, thus playing a role in emotional issues (e.g., stress) that have been frequently shown in these individuals (Hill et al., 2004; Muskett et al., 2019).

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s12144-024-06447-x>.

Acknowledgements We thank Dr Safira Abu Bakar and Dr Michele Anne for their valuable discussions during the very preliminary stages of this project. This research did not receive any specific grant from

funding agencies in the public, commercial, or not-for-profit sectors.

Author contributions All authors (i.e., KM, VN, AJS, SJ, and MR) have contributed equally to this work. KM conceived the idea of this paper, supervised the entire process, and added important intellectual content. SJ, VN and MR contributed substantially to the manuscript write-up. KM and AJS formulated search strategy, carried out a search across databases, performed data extraction and formulated themes. MR, and AJS checked the search strategy, extracted data and themes. SJ, KM and VN reviewed and provided feedback for improvements. SJ made substantial contributions to the findings; made revisions that are critically for important intellectual content; gave final approval of the version to be published. All authors have also agreed to be accountable for all aspects of this manuscript in ensuring that questions related to the accuracy or integrity of any part of this manuscript are appropriately investigated and resolved.

Funding None.

Data availability All data generated or analysed during this study are included in this published article (and/or its Supplementary Information files).

Declarations

Ethics approval This article does not contain any studies with human participants or animals performed by any of the authors.

Disclosure statement No potential conflict of interest was reported by the author(s).

Competing interests None.

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