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Review

Review of AAC interventions in persons with dementia

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Abstract

Background: Communication is an important priority in dementia research. Communication strategies and scaffolds, specifically through augmentative and alternative communication (AAC), offer vital compensatory support for persons with dementia in an attempt to maintain the latter's quality of life and well-being through participation with others. To date, no research review has been published that synthesizes the current research of AAC in the field of dementia.
Aims: To provide an overview of current AAC strategies and techniques used for supporting communication in dementia by surveying the literature base in a systematic manner, synthesizing the findings and highlighting trends and gaps.
Methods & Procedures: A multifaceted search strategy included nine electronic database searches, using specific keywords. Application of predefined selection criteria during screening procedures led to the inclusion of 39 studies. Data were extracted and studies synthesized according to communication partners; description of AAC strategies and techniques; outcome measures; and communication outcomes.
Main Contribution: This review shows that the majority of the research to date has focused on supporting the interactions of persons with dementia of the Alzheimer's type (DAT) using non-electronic memory and communication aids. Future research should focus on social participation and person-centred communication to optimize functional communication with AAC. Training programmes targeting dyadic interaction and supporting persons with dementia from diverse ethnic backgrounds are avenues for further research.
Conclusions: Research trends and, more importantly, the gaps highlighted in this research review present speech–language therapists and researchers with a set of current priorities that are necessary for the advancement of the knowledge base.

Keywords: AAC, dementia, communication, interaction, research review.

What this paper adds

What is already known on the subject

Communication strategies and scaffolds, specifically through AAC, are known to offer vital compensatory support for persons with dementia. Studies of AAC in dementia are scattered across previous reviews based on the focus and scope of each enquiry. No current reviews exist that have specifically focused on supporting dementia-related communication with AAC. As such, a more systematic approach to synthesize the current knowledge base is required.

What this paper adds to existing knowledge

This research review is the first to search the literature systematically: first, to locate studies focused on AAC that are used to support communication in persons with dementia; and second, to synthesize the findings obtained.

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What are the potential or actual clinical implications of this work?
This review makes a unique contribution to the field of dementia by presenting researchers with a set of current priorities that are necessary for the advancement of the knowledge base.

Introduction

Dementia is an urgent public health problem due to its escalating global prevalence (World Health Organization (WHO) 2017). Communication is acknowledged as an important priority in dementia research on account of the irreversible cognitive changes that affect the interactions between persons with dementia and their communication partners (Hall *et al.* 2018). Communication difficulties and strengths arise from the cognitive domains that are preserved or impaired in different dementia subtypes, for example, dementia of the Alzheimer's type (DAT), vascular dementia, dementia with Lewy bodies or frontotemporal dementia (American Psychiatric Association (APA) 2013).

The communication of persons with DAT is affected by short-term memory loss and attentional difficulties that have an impact on word finding and auditory comprehension of complex language (Bourgeois and Hickey 2007). Marked receptive and expressive language difficulties associated with comprehension, word meaning and word finding gradually weaken reciprocity in conversation of persons with primary progressive aphasia (PwPPA) or semantic dementia, a subtype of frontotemporal dementia (Mahendra *et al.* 2018). As such, meaningful social interactions with family and friends taper, thereby reducing quality of life and well-being (Bourgeois and Hickey 2007).

The imperative to support the interactions of persons with dementia and their communication partners is vital. Augmentative and alternative communication (AAC) is a scientific field of research and clinical practice that aims to maintain the quality of life, participation and engagement of persons with dementia by using a variety of compensatory strategies, techniques and devices (American Speech–Language–Hearing Association (ASHA) 2019). AAC techniques are methods of transmitting messages (e.g., voice output) and AAC strategies, either taught to a person with dementia or self-learned, are ways to enhance communication and memory (e.g., printed words to assist with word finding) (Bourgeois and Hickey 2007). AAC offers communication support through systems that are unaided or aided (ASHA 2019). Unaided systems require no technology (e.g., gestures), while aided systems comprise of non-electronic, paper-based solutions (e.g., memory books) or electronic, highly technologically dependent devices (e.g., computer technology) (Waller 2019).

A systematic review by Egan *et al.* (2010) of methods to enhance verbal interactions between persons with DAT and their caregivers located eight studies that used memory books. This systematic review indicated strong evidence for the use of memory aids coupled with caregiver training to enhance topic maintenance. With a growing interest in reviewing the literature on dementia-related communication, a small number of AAC studies have been located in different reviews based on the focus and scope of each enquiry (Eggenberger *et al.* 2013, Kindell *et al.* 2017, Morello *et al.* 2017, Swan *et al.* 2018).

Recently, Swan *et al.* (2018) evaluated the evidence for speech–language interventions in persons with moderate to severe dementia and retrieved two AAC interventions that improved conversation. Morello *et al.* (2017) systematically reviewed studies on language and communication interventions for persons with Alzheimer's disease and found two studies that used memory cards in conversation. In two other systematic reviews on communication skills training programmes in dementia (Eggenberger *et al.* 2013) and cognitive interventions for persons with DAT (Hopper *et al.* 2013), each review found one study that used memory books to support interactions. Although important aspects of communication have been reviewed (albeit from different perspectives), none of the current reviews focused specifically on the range of AAC that could be on offer. As a result, studies of AAC in dementia are scattered across different reviews and a more systematic approach is required towards synthesizing the current knowledge in AAC for persons with dementia.

This research review, therefore, makes a unique contribution to the field of dementia by addressing the following question: What is the current nature of AAC used for communication in persons with dementia? To answer it, four sub-questions were formulated to guide the review:

- What types of AAC strategies and techniques are used for communication in persons with various dementia subtypes?
- With whom do persons with dementia use AAC to interact?
- What outcome measures are used?
- What are the communication outcomes for persons with dementia?

Materials and methods

The aim of this research review is to provide an overview of current AAC strategies and techniques used for supporting communication in dementia. The objectives entail, first, surveying the literature of AAC and dementia in a systematic manner; second, synthesizing the findings; and third, highlighting trends and gaps required for future research. It is anticipated that such a review could be a resource with practical and clinical relevance for both speech–language therapists and researchers. This review is differentiated to a literature review due to its degree of systematicity; yet, it does not involve an appraisal of research evidence as performed in a systematic review or meta-analysis (Grant and Booth 2009).

Search terms

The search terms used were relevant to the review question and were adapted for each database using keywords related to: '*dementia*' or *Alzheimer** ***'AND'*** '*augmentative and alternative communication*' or '*AAC '* or *augment** or '*communication support*' OR *communication aid** OR '*communication system**' OR '*speech generating device**' OR '*voice output communication aid**' OR *gesture** OR *sign** OR '*graphic symbol '* OR *total communication* OR *Vocal** ***'AND'*** *communicat** or '*interaction*' or *conversat**. Piloted exploratory searches and the input of librarians were sought in order to refine the search terms.

Data sources

Nine electronic databases were searched for published studies and dissertations, that is, Cumulative Nursing and Allied Health Literature (CINAHL), PsycINFO, PsycARTICLES, Academic Search Complete, MEDLINE, Linguistics and Language Behaviour Abstracts (LLBA) and ProQuest Dissertations and Theses Global, Scopus and IEEE Xplore digital library. The database searches were restricted to temporal (1990–2018), linguistic (English) and source type (academic journals and dissertations) limiters. Further searches included hand searching the journals of *Augmentative & Alternative Communication* and *Communication Disorders*, an ancestral search of studies that met the inclusion criteria, and forward citations on Google Scholar.

Study selection

To initiate a streamlined study selection process, electronic studies were exported to Covidence via an e-mailed Research Information Systems (RIS) link. Covidence is a web-based software application tool that enables efficient production of systematic reviews (Veritas Health Innovation n.d.).

Selected criteria were predefined and agreed upon by all reviewers (i.e., the authors of this review). Once exported to Covidence, screening of studies was conducted independently by two reviewers at title and abstract level, and at full text. Studies had to the meet the following eligibility criteria to be included in this review:

- Reporting on adult participants, 18 years and older, with a degenerative dementia, for example, Alzheimer's dementia, vascular dementia, dementia with Lewy bodies, frontotemporal dementia (primary progressive aphasia (PPA)/semantic dementia). PwPPA (without dementia) before 2013 were also included (APA 2013).
- Reporting on primary research of AAC strategies, techniques or technologies to support receptive or expressive language and memory for interaction purposes.
- Having a quantitative, qualitative or mixed-method design (including single-case studies).
- Published either in academic journals, master's theses or doctoral dissertations. Studies were excluded if they included persons with other clinical diagnoses (e.g., cognitive impairment) and if data could be not isolated for persons with dementia.

Based on the aforementioned eligibility criteria, a 'yes', 'no' or 'maybe' response was selected at title and abstract level in Covidence. If both reviewers selected 'no', the study was excluded. If a reviewer selected 'yes' or 'maybe', the study was included at full text. At full text, a reason was selected from a list of drop-down options in Covidence to substantiate the exclusion of a study. A consensus-building process was followed in the event of screening disagreement. This component of the review was undertaken between September and November 2018.

Data extraction

The first author developed a data extraction template on Microsoft Excel® 2016 and independently extracted detailed data from the included studies according to the following parameters: participants; research design; data-collection method; setting; instructional format and administration of AAC technologies; description of AAC systems; outcome measures; communication outcomes; reported AAC benefit; and key findings. The remaining authors independently checked 52% of the extracted data. Aligned to the review sub-questions, studies were synthesized within four categories: (1) communication partners; (2) AAC strategies and techniques; (3) communication measures; and (4) communication outcomes.

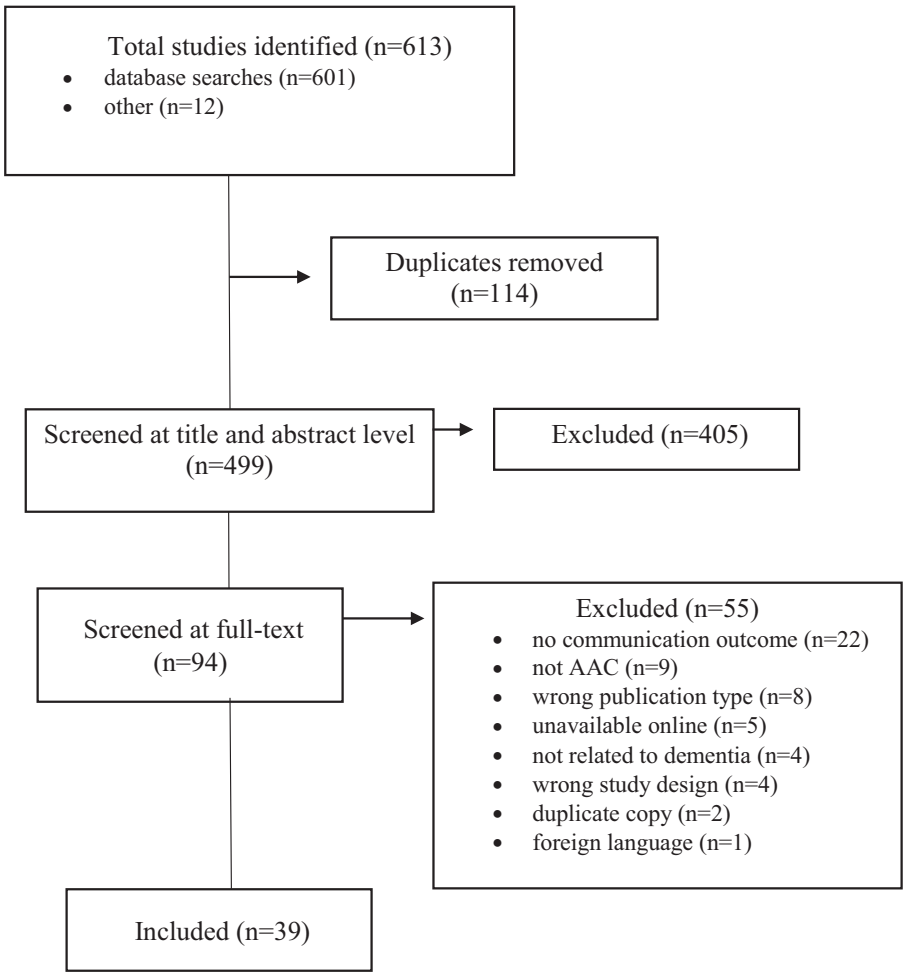

Figure 1. Flow diagram of the study selection process.

In this study, standardized measures are defined as: (1) instruments or tests used to measure communication outcomes that have reported psychometric properties (e.g., validity and reliability) or (2) communication behaviours with well-defined codes to enable reliable interrater scoring. Non-standardized measures are defined as: (1) questionnaires or checklists developed by the researcher for the specific study or (2) communication patterns that emerge from transcribed data (e.g., conversational analysis).

Results

Figure 1 outlines a flow chart of the study selection process. Overall, 613 studies were identified. At full text, the majority of the studies were excluded on account of the following: not having a communication or interaction outcome ($n = 22$); not relating to AAC ($n = 9$); incorrect publication type ($n = 8$); unavailable online ($n = 5$); did not focus on persons with dementia ($n = 4$); incorrect study design ($n = 4$); duplicated copy of study ($n = 2$); and foreign language ($n = 1$). A corpus of 39 studies that met the inclusion criteria are summarized in table 1.

General characteristics

Studies included were published in the past 28 years, between 1990 and 2018, and the majority ($n = 20$) were conducted in the United States, seven in the UK, three in Canada, two in Sweden and one each in Australia, New Zealand, Spain, the Netherlands, Puerto Rico and South Africa. Of the 39 studies included, 33 were published across journal articles, four master's theses and two doctoral dissertations. The majority of the studies ($n = 23$) sampled participants with DAT, dementia with an unspecified subtype ($n = 13$) and vascular dementia ($n = 4$). Persons with frontotemporal dementia, that is, PPA or semantic dementia, were researched in five studies, while some samples included persons with two dementia subtypes (e.g., DAT and vascular dementia). Persons with Lewy body dementia were not encountered in any of the studies.

Table 1. Summary of reviewed studies

Study and country	Design	Participant diagnosis, severity, age, communication partner (CP)	AAC description	Communication focus	Communication outcome measures	Communication outcomes
			Unaided AAC systems			
Ellis and Astell (2017) UK	Single-subject design	DAT, severe ($n = 5$) 77–89 years CP: researcher	Eye gaze, gestures, vocalizations, facial expressions	Non-verbal communication repertoires	Standardized: (1) Direct observation of behaviour (2) Communicative behaviours coded and counted	Increased reciprocity when participants' communication behaviours were imitated by the researcher. Increased enjoyment and laughter in the interaction
Hydén (2011) Sweden	Case study	DAT, severe ($n = 1$) 85 years CP: familiar CP ($n = 2$)	Vocalizations, body movements, gaze direction	Non-verbal vocalizations in social interaction	Non-standardized: (1) Non-verbal vocalizations identified and described guided by conversational analysis	Participant attempted to initiate interaction using non-verbal cues and vocalizations
Kindell *et al.* (2013) UK	Case study	Semantic dementia, mild ($n = 1$) 71 years CP: various ($n = 3$)	Enactment using body posture, pointing, facial expressions	Everyday conversations	Non-standardized: (1) Conversational patterns observed via conversational analysis	Participant used enactment strategy to contribute to conversations. Reciprocal laughter within dyad
			Electronic AAC systems (high-technology)			
Aitken (2015) New Zealand	Single-subject design	DAT, VD, mild–moderate ($n = 4$) 61–88 years CP: family member ($n = 4$) and researcher	Digital memory book	Quality and quantity of conversations	Standardized: (1) Conversational utterances and statements coded and counted Non-standardized: (1) Family questionnaire	No increase in quality and quantity of utterances with AAC use. Total on-topic statements increased between PWD and family members during follow-up. AAC facilitated easier conversation between the CPs and PWD
Alm *et al.* (2004) UK	Quantitative group comparisons	Dementia*, moderate ($n = 9$) 65–95 years CP: caregiver/care staff ($n = 9$)	CIRCA	Interest and involvement of the PWD in interaction	Non-standardized: (1) Evaluation questionnaires	Increased choice of conversational topics for the PWD, enjoyment of interaction
Astell *et al.* (2010) UK	Observational study (qualitative)	DAT, mixed severity ($n = 11$) 65–95 years CP: caregiver/care staff ($n = 11$)	CIRCA	Nature of dyadic interaction	Non-standardized: (1) Checklist of interactional activity	PWD showed independence in choosing conversational topics. Increased laughter within the dyad

Continued

Table 1. Continued

Study and country	Design	Participant diagnosis, severity, age, communication partner (CP)	AAC description	Communication focus	Communication outcome measures	Communication outcomes
Crete-Nishihata *et al.* (2012) Canada	Case study	DAT, moderate ($n = 1$) 75 years CP: familiar CP ($n = 2$)	Digital life history aid	Sharing life stories	Non-standardized: (1) Interviews with CP	Independence of the PWD to share stories and enjoyment in identity-supporting conversations
Davis and Shenk (2015) USA	QUANT-qual	DAT, moderate ($n = 10$) Age unspecified CP: researcher ($n = 8$)	Multimedia videos	Engagement that promotes talking	Standardized: (1) Observational measure of engagement (2) Language patterns identified from transcriptions using predefined codes	More comments and smiles with personal videos, greater diversity of language with generic videos
Dynes (2018) Canada	Within-participants, prospective design	DAT, mild–moderate ($n = 7$) 52–86 years CP: family member ($n = 7$)	Electronic conversational memory aid	Person-centred communication (PCC)	Standardized: (1) Utterances coded as per adapted PCC coding chart	Interactions became more person-centred and enjoyable. CPs supported the PWD's preferences
Ekström *et al.* (2017) Sweden	Case study	DAT, severity unspecified ($n = 1$) 52 years CP: family member ($n = 1$)	Digital communication book	Communication characteristics	Standardized: (1) Conversation initiation identified and counted (2) Conversational length recorded Non-standardized: (1) Communication domains identified from interaction analysis	Increased conversational length and time spent on talking about the device. AAC did not generate new topics within the interaction
Fried-Oken *et al.* (2009) USA	Quantitative group comparisons	DAT, moderate ($n = 30$) 50–94 years CP: researcher	Digitized voice output	Conversational behaviours with digitized voice output	Standardized: (1) Utterances counted and coded	Paucity of language, fewer elaborations, overall quantity of utterances reduced
Fried-Oken *et al.* (2012) USA	Quantitative, group comparisons	DAT, moderate ($n = 30$) pilot 1 CP: researcher	Pilot 1: Digitized voice output	Conversational performance (with and without AAC aid, and voice output)	Standardized: (1) Conversations coded using a social communication framework	No improvement in quantity and type of utterances. Voice output reduced conversational performance

Continued

Table 1. Continued

Study and country	Design	Participant diagnosis, severity, age, communication partner (CP)	AAC description	Communication focus	Communication outcome measures	Communication outcomes
Hamel *et al.* (2016) USA	Mixed-methods design	DAT, severity unspecified ($n = 18$) Mean 84 years CP: familiar CP ($n = 14$)	Mobile reminiscence aid	Feasibility and utility of a reminiscence aid in interaction	Non-standardized: (1) Checklists (2) Themes from semi-structured interviews and direct observation	Device was a focal point to share experiences and enhance conversations. Increased enjoyment of interaction
Mooney *et al.* (2018b) USA	Single-subject design	PPA, severity unspecified ($n = 6$) 62–80 years CP: familiar CP ($n = 6$)	Mobile technology	Lexical retrieval skills during activity retell in conversation	Standardized: (1) Number of target words recorded and counted Non-standardized: (1) Direct user feedback	Improved lexical retrieval skills and conversational confidence (PWD). CPs scaffolded conversations
Purves *et al.* (2015) Canada	Observational study (qualitative)	Dementia*, moderate ($n = 3$) 81–90 years CP: caregiver/care staff ($n = 1$)	CIRCA	Regionally adapted programme for dyadic interaction	Non-standardized: (1) Interactions transcribed to describe features of the adapted programme	AAC used to initiate and maintain topics. Companionable silences within interaction
			Non-electronic AAC systems			
Andrews-Salvia *et al.* (2003) USA	Single-subject design	DAT, dementia*, severe ($n = 4$) 90–94 years CP: researcher	Memory book	On-topic facts in severe dementia	Standardized: (1) On-topic facts coded and counted	Increased on-topic facts. Reduction in non-productive communicative behaviours
Bourgeois (1990) USA	Single-subject design	DAT, moderate ($n = 3$) 59–66 years CP: familiar CP ($n = 3$)	Communication wallet	Quality of conversational content	Standardized: (1) Utterances coded and counted Non-standardized: (1) Satisfaction rating	Improved factual statements and fewer ambiguous utterances. No changes in conversational behaviours noted by CPs
Bourgeois (1993) USA	Single-subject design	DAT, moderate–severe ($n = 6$) 74–88 years CP: another PWD ($n = 6$, i.e., three dyads)	Memory wallet/book	Conversational content and social skills of dyad	Standardized: (1) Utterances and social behaviours coded and counted Non-standardized: (1) Social validation rating scale	Some participants increased on-topic statements, elaborations and turn-taking. CPs reduced ambiguous utterances
Bourgeois and Mason (1996) USA	Single-subject design	DAT, mixed severity ($n = 4$) 74–80 years CP: volunteer staff ($n = 3$)	Memory wallet	Conversational content (PWD), conversational behaviours (CP)	Standardized: (1) Utterances coded and counted Non-standardized: (1) Satisfaction rating	PWD increased appropriate statements, decreased repetitive statements. Conversational behaviour of CP improved

Continued

Table 1. Continued

Study and country	Design	Participant diagnosis, severity, age, communication partner (CP)	AAC description	Communication focus	Communication outcome measures	Communication outcomes
Bourgeois *et al.* (2016) USA	Within-subjects design	Dementia*, moderate–severe ($n = 37$) 67–96 years CP: nursing aide ($n = 33$)	VoiceMy Choice™	Preference and choice-making in interaction	Non-standardized: (1) Preference Assessment Questionnaire (PAQ)	PWD able to communicate preferences. Nursing aides' understanding of the PWD's preferences improved
Bourgeois *et al.* (2001) USA	Quantitative group comparisons	Dementia*, moderate ($n = 66$) Mean 85 years CP: nursing aide ($n = 66$)	Memory book	Quality and quantity of naturalistic interaction	Standardized: Utterances and statements coded and counted Duration of verbalizations, memory book use	Increased duration of speaking time, number of utterances, and conversational topics. CP reduced number of prompts
Bourgeois *et al.* (2004) USA	Quantitative (pre-test–post-test)	Dementia*, moderate ($n = 125$) 75–86 years CP: nursing aide ($n = 126$)	Memory book	Communication skills training programme	Non-standardized: (1) Frequency of memory book use by nursing aides calculated	Low frequency of memory book use during care interactions
Chang (2011) USA	Single-subject design	Dementia*, mixed severity ($n = 3$) 82–88 years CP: researcher	Memory book	Quality and quantity of conversations	Standardized: (1) Utterances coded and counted	Increased on-topic statements of facts, decreased ambiguous, unintelligible, and perseverative utterances
Chang (2015) USA	Within-subjects design	DAT, Dementia* mild–moderate ($n = 20$) 76–97 years CP: researcher	Decisional (visual) aid	Quality of verbal statements to demonstrate decisional capacity	Standardized: (1) Utterances coded and scored as per predefined types of vignette statements (2) Adapted decisional-capacity Non-standardized: (1) Social validation rating	Increased vignette statements (e.g., rewording and exact statements) with AAC. Participants increased their understanding of treatment options. Improved clarity of statements
Fried-Oken *et al.* (2012) USA	Quantitative, group comparisons (pilot study)	DAT, moderate ($n = 11$) Pilot 2, 50–94 years CP: researcher	Pilot 2: Communication board (without voice output)	Topical vocabulary and references to AAC	Standardized: (1) Utterances coded for topical vocabulary (2) Number and percentage of target words (3) References to AAC device	AAC priming with spaced retrieval training increased references to device, and the number of target words used

Continued

Table 1. Continued

Study and country	Design	Participant diagnosis, severity, age, communication partner (CP)	AAC description	Communication focus	Communication outcome measures	Communication outcomes
Fried-Oken *et al.* (2015) USA	QUAL-quant	DAT, PPA, mild–moderate ($n = 109$) Mean 75 years CP: familiar CP ($n = 109$), researcher	Communication board	Conversational topics selected by PWD	Standardized: (1) Structured conversations with PWD. Topics coded according to themes	Selected conversational topics related to life experiences and personal narratives. Gender and age differences noted for topic selection
Gómez-Taibo *et al.* (2014) Spain	Single-subject design	DAT, mixed severity, ($n = 3$) 86–87 years CP: researcher	Memory book	Quantity of conversational content, quality of conversational skills	Standardized: (1) Utterances coded and counted	Increased positive statements about participants' identity; reduced ambiguous statements, improved quality of conversations
Hoerster *et al.* (2001) USA	Single-subject design	DAT, VD, severe ($n = 4$) 83–90 years CP: nursing aide ($n = 4$)	Memory book	Conversational content (PWD), communication behaviours (CP)	Standardized: (1) Utterances coded and counted Non-standardized: (1) Social validation rating scale (2) Post-interview questions	PWD increased their factual statements. Nursing aides' communicative behaviour improved post-training
Johnson (2003) USA	Single-subject design	Dementia*, mild–moderate ($n = 5$) 73–88 years CP: nursing aide ($n = 1$)	Sensory cues	Quality and quantity of conversations	Standardized: (1) Utterances coded and counted Non-standardized: (1) Social validation rating scale	No increase in the quantity or quality of conversations, which correlated with unfamiliar judgments
McPherson *et al.* (2001) USA	Single-subject design	DAT, VD, severe ($n = 5$) 73–90 years CP: caregiver/care staff ($n = 5$)	Memory aids	Quality of conversations	Standardized: (1) Topic-related and non-topic-related conversation coded and calculated	Some participants spent a higher percentage of time on topic-related utterances
Murphy *et al.* (2010) UK	Quantitative group comparisons	Dementia*, mixed severity ($n = 31$) 54–90 years CP: researcher	Talking Mats™	Expression of views related to well-being	Standardized: (1) Effectiveness framework of functional communication (2) 'On-task' behaviour (3) Perseverations (4) Interview time	Increased on-task behaviours, involvement and conversational length. Perseverative behaviours decreased
Murphy and Oliver (2013) UK	QUALI-quant	Dementia*, mixed severity ($n = 18$) 60–86 years CP: family member ($n = 18$)	Talking Mats™	Discussions on managing activities of daily living	Non-standardized: (1) Involvement measure (2) Satisfaction questionnaire	PWD increased their involvement in decision-making. The dyad felt satisfied with the discussion

Continued

Table 1. Continued

Study and country	Design	Participant diagnosis, severity, age, communication partner (CP)	AAC description	Communication focus	Communication outcome measures	Communication outcomes
Reitz and Dalemans (2016) Netherlands	Cross-over design	DAT, mild–moderate ($n = 6$) 84–90 years CP: family member ($n = 6$)	Talking Mats™ (Dutch version)	Shared decisions and language use	Standardized: (1) The OPTION Scale (2) Utterances coded and counted	PWD increased involvement in decision-making, CP understood the PWD. No improvement in language use
Ruiz (2015) Puerto Rico	Pre-test–post-test	DAT, moderate ($n = 1$) 75 years CP: family member ($n = 1$), researcher	Memory book	Quantity of conversational content	Standardized: (1) Utterances and use of grammar coded and counted	PWD increased on-topic responses. AAC did not improve the use of grammar
Spilkin and Bethlehem (2003) South Africa	Case study	DAT moderate–severe ($n = 1$) 85 years CP: family member ($n = 1$)	Memory book	Quality of interaction structure	Standardized: (1) Interaction structure coded (topic management, repair) Non-standardized: (1) CP quality of interaction rating scale	CP scaffolded the interaction. The PWD improved topic maintenance, decreased topic perseveration
Combined AAC systems (unaided, non-electronic and electronic)						
Broughton *et al.* 2011 (Australia)	Pre-test–post-test	Caregiver/care staff ($n = 52$)	Unaided + non-electronic AAC	Memory and communication strategies	Non-standardized: (1) Knowledge of support strategies test (2) Post-training survey	Staff's knowledge of communication strategies improved. Staff self-reported greater respect and empathy for the PWD
Cress and King (1999) USA	Case study	PPA, severity unspecified ($n = 2$) 59–60 years CP: family member ($n = 4$)	Unaided + non-electronic AAC	Cued comprehension and augmented expression	Non-standardized: (1) Comprehension of symbols tallied by CP	Cued comprehension ineffective with unfamiliar listeners. Familiar CPs increased success in cueing new topics
Mooney *et al.* (2018a) USA	Pre-test–post-test	PPA, severity unspecified ($n = 5$) 63–73 years CP: familiar CP ($n = 6$)	Unaided, non-electronic + electronic AAC	Multimodal communicative interactions	Non-standardized: (1) Modes of Communication Survey	Dyads learned to match AAC strategy to their communication needs
Trahan *et al.* (2014) USA	Single-subject design	Dementia*, VD, mild–moderate, ($n = 3$) 85–87 years CP: researcher	Unaided + non-electronic AAC	Picture-based communication responses and skill maintenance	Standardized: 1) Frequency of independent card exchanges and vocal responses calculated	Participants learned to exchange a picture card for a highly preferred activity

Continued

Table 1. Continued

Study and country	Design	Participant diagnosis, severity, age, communication partner (CP)	AAC description	Communication focus	Communication outcome measures	Communication outcomes
Wong *et al.* (2009) USA	Case study	Semantic dementia, mild ($n = 1$) 61 years CP: family member ($n = 1$)	Unaided + non-electronic AAC	Communicative effectiveness	Standardized: (1) Modified communication effectiveness framework (2) Codified ideas (verbal and nonverbal) and communicative functions	PWD showed improvement in expressing opinions. The CP scaffolded interactions with verbal and nonverbal support

Note: DAT, dementia of Alzheimer's type; Dementia* = dementia with unspecified subtype; CP, communication partner; CIRCA, Computer Interactive Reminiscence and Conversation Aid; PPA, primary progressive aphasia; PwPPA, person with primary progressive aphasia; PWD, person with dementia; VD, vascular dementia.

Communication partners

The studies involved 573 persons with dementia and 500 communication partners, which included nursing aides ($n = 230$); familiar communication partners (e.g., friends) ($n = 142$); close family members (e.g., spouse) ($n = 41$); caregivers or care staff ($n = 78$); another person with dementia (PWD) ($n = 3$); volunteer staff ($n = 3$); and various (a combination of partners described) ($n = 3$).

AAC strategies and techniques

Overall, 12 studies used electronic AAC systems to interact with persons with dementia are outlined in table 2. Four studies used tablet computers with specific applications (e.g., Pictello™ or GoTalk NOW) that included uploaded, personally relevant family photographs with or without audio-recorded sentences (Aitken 2015, Dynes 2018, Ekström *et al.* 2017). Similarly, Mooney *et al.* (2018b) used a specific AAC research application, CoChat, by employing features of natural language processing (NLP), just-in-time principles and social media. Six studies focused on reminiscence-based activities with multimedia content by using mobile technology with interactive games, Memory Matters (Hamel *et al.* 2016) or Computer Interactive Reminiscence and Conversation Aid (CIRCA) for conversation and engagement with persons with DAT (Alm *et al.* 2004, Astell *et al.* 2010, Purves *et al.* 2015). PowerPoint videos with personal and general content (Davis and Shenk 2015) and a multimedia digital life history consisting of past memories and wearable computing technology (SenseCam) (Crete-Nishihata *et al.* 2012) were components of two studies.

Two studies piloted digitized voice output that was embedded into customized communication boards, in which a label was spoken out each time a person with DAT touched a picture (Fried-Oken *et al.* 2009, 2012). Fried-Oken *et al.* (2012) also reported the use of AAC priming with spaced-retrieval exercises as a training technique to facilitate learning and encourage persons with DAT to use their customized communication board more frequently during conversation.

In 19 studies, non-electronic memory or communication aids were used in interactions with persons with dementia. Of these, 12 studies included memory books or communication wallets with generic or personal photographs, combined with autobiographical sentences (Andrews-Salvia *et al.* 2003, Bourgeois 1990, 1993, Bourgeois *et al.* 2001, 2004, Bourgeois and Mason 1996, Chang 2011, Gómez-Taibo *et al.* 2014, Hoerster *et al.* 2001, McPherson *et al.* 2001, Ruiz 2015, Spilkin and Bethlehem 2003). In three studies, the Talking Mats™ communication framework with line drawings on a visual scale was used to assist the PWD in expressing their views (Murphy *et al.* 2010, Murphy and Oliver 2013, Reitz and Dalemans 2016).

Three studies used visually based picture and text as communication boards (Fried-Oken *et al.* 2015), communication cards (VoiceMyChoice™; Bourgeois *et al.* 2016) and decisional aids (Chang 2015). One study included a printed story with clip-art pictures and associated real objects as part of a group story activity (Johnson 2003). Four studies adapted the content of memory books (Chang 2011, Gómez-Taibo *et al.* 2014, Ruiz 2015) or computer-based multimedia (Purves *et al.* 2015) to be culturally, linguistically or socially relevant to persons with dementia who are from Chinese, Hispanic or multicultural backgrounds.

Table 2. AAC strategies and techniques

Reference	Description
Electronic AAC systems	
Aitken (2015), Dynes (2018)	iPad™ (Pictello™ application (app) with scanned personally relevant photographs or audio-recorded sentences)
Ekström *et al.* (2017)	Tablet computer (GoTalk NOW app, personally relevant pictures and films with accompanying speech)
Hamel *et al.* (2016)	Tablet computer ('Memory Matters' interactive game with text, audio clips and photographs)
Mooney *et al.* (2018b)	iPad™ (CoChat app, word list placed around the visual scene display, using just-in-time principles, social media)
Alm *et al.* (2004), Astell *et al.* (2010), Purves *et al.* (2015)	CIRCA operated on Apple G4 laptop, presented through a touch screen monitor with multimedia (videos, music, real-life and generic photographs)
Davis and Shenk (2015)	Multimedia videos (personal and generic content) via PowerPoint
Crete-Nishihata *et al.* (2012), Fried-Oken *et al.* (2009, 2012 (pilot 1))	Digital life history using Multimedia Biographies with SenseCam; a wearable camera to capture everything in the user's line of sight. Communication board with digitized one- to two-word voice output using Flexiboard™ app
Non-electronic AAC systems	
Andrews-Salvia *et al.* (2003), Bourgeois (1990, 1993), Bourgeois and Mason (1996), Bourgeois *et al.* (2001, 2004, Chang (2011), Gómez-Taibo *et al.* (2014), Hoerster *et al.* (2001), McPherson *et al.* (2001), Ruiz (2015), Spilkin and Bethlehem (2003)	Memory/communication books and wallets containing photographs, drawings or graphics combined with sentences with biographical/factual information, and/or real objects
Bourgeois *et al.* (2016)	VoiceMyChoice™: 25 colour pictures from Google Images printed on cards with corresponding text
Fried-Oken *et al.* (2015)	Communication board with personal or generic photographs with accompanying word/phrases related to conversational topic
Fried-Oken *et al.* (2012) (pilot 2)	Communication board (Flexiboard™) with colour photographs and printed labels, space retrieval training preceded communication board use
Murphy *et al.* (2010), Murphy and Oliver (2013), Reitz and Dalemans (2016)	Talking Mats™: Line drawings placed on a textured mat to allow the PWD to express their feelings about a topic
Chang (2015)	Picture–text decisional aids with colour pictures from Google Images and corresponding sentences
Johnson (2003)	Story-telling with real objects and pictures using auditory, tactile and visual cues
Unaided AAC systems	
Ellis and Astell (2017)	Eye gaze, gestures (pointing, nodding, shaking), vocalizations (laughter, silence), facial expressions (neutral, frowning, smiling, surprise)
Hydén (2011)	Non-verbal cues (eye rubbing) and signals (gaze, body and head movement and direction)
Kindell *et al.* (2013)	Enactment: Direct reported speech with paralinguistic features (pitch and loudness) and non-verbal communication (body posture, pointing and facial expression)
Combined AAC systems	
Broughton *et al.* (2011)	DVD-based training programme included the use of visual aids, gestures, pictures, objects, photographs and memorabilia
Cress and King (1999)	Use of facial expressions and gestures within natural communicative contexts; maps and photographs to elicit conversational topics
Mooney *et al.* (2018a)	Augmented input through keywording and/or written choice; PPA wallet cards and communication book, remnants, scripts (written cues), mobile technology and built-in apps
Trahan *et al.* (2014)	Two-dimensional picture communication cards with printed text exchanged across verbal and gestural, gestural-only and delayed prompt conditions
Wong *et al.* (2009)	Intervention included the use of expressive language combined with written output, gestures, head nods, facial expressions, personal photographs and props and caregiver training

Note: PPA, primary progressive aphasia; PWD, person with dementia; CP, communication partner; CIRCA, Computer Interactive Reminiscence and Conversation Aid.

In all three studies using unaided AAC systems, the basis of interaction focused on the unique set of non-verbal communicative behaviours of persons with severe DAT and semantic dementia. These included imitated communication behaviours termed 'adaptive interaction' (e.g., eye gaze) (Ellis and Astell 2017); non-verbal vocalizations and non-verbal cues (e.g., eye rubbing) (Hydén 2011); and 'enactment' as a compensatory strategy that includes direct reported speech with body posture, pointing and facial expressions (Kindell *et al.* 2013).

Of the five studies with combined AAC systems, four focused on the use of unaided AAC and non-electronic aids (Broughton *et al.* 2011, Cress and King 1999, Trahan *et al.* 2014, Wong *et al.* 2009). The remaining study reported on a group training programme that included the combined use of various non-electronic aids (PPA wallet cards and communication book), and high-technology (mobile technology) as well as AAC strategies (augmented input through keywords and/or written choice; scripts as written cues; remnants as tactile and visual cues) (Mooney *et al.* 2018a).

Outcome measures

The majority of studies used different types of standardized measures to evaluate communication outcomes. Twelve studies relied on standardized, quantitative measures to measure conversational content (e.g., ambiguous utterances, on-topic statements, repetitions, target vocabulary) that was coded according to predetermined criteria and counted (Aitken 2015, Andrews-Salvia *et al.* 2003, Bourgeois *et al.* 2001, Chang 2011, Dynes 2018, Fried-Oken *et al.* 2009, 2012, Gómez-Taibo *et al.* 2014, McPherson *et al.* 2001, Mooney *et al.* 2018b, Reitz and Dalemans 2016, Ruiz 2015). The specific aspects of conversational content that were measured depended on the communication focus of each study. Six studies used similar standardized, quantitative measurements, but included a subjective social validation procedure or satisfaction rating scale by means of which persons unfamiliar to the intervention detected functional changes in the targeted communicative behaviours (Bourgeois 1990, 1993, Bourgeois and Mason 1996, Chang 2015, Hoerster *et al.* 2001, Johnson 2003).

Standardized outcome measures further included the following three instruments: *Observational Measure of Engagement* (Cohen-Mansfield *et al.* 2009) to measure engagement that promoted talking in a PWD (Davis and Shenk 2015); *Direct Observation of Behaviour* (Bowie and Mountain 1993) to measure nonverbal communicative behaviours of PWD (Ellis and Astell 2017); and *The OPTION Scale* (Elwyn 2003) to measure shared decision-making skills in the PWD and their communication partners when using a communication aid (Reitz and Dalemans 2016). In addition to the standardized measures in the aforementioned studies, natural interactions were transcribed, coded and described according to predetermined categories or themes (Davis and Shenk 2015, Ellis and Astell 2017).

Seven other studies used qualitative or quantitative judgements of conversation to code, count and describe different features of natural communication. Four of these studies followed principles of conversational analysis. These included observations to identify communication initiatives (i.e., introducing a new topic without a partner prompt or topic initiation after a lapse of silence) and conversational length (Ekström *et al.* 2017), frequency and types of non-verbal vocalizations (Hydén 2011), recurring conversational patterns (Kindell *et al.* 2013) and interaction structure (e.g., topic maintenance and repair strategies) (Spilkin and Bethlehem 2003). One study performed a line-by-line descriptive analysis of interaction to identify specific themes related to the content and format of an adapted programme (Purves *et al.* 2015). In the remaining two studies, semi-structured interviews or conversations with participants were thematically coded via a process of consensus building by the researchers (Fried-Oken *et al.* 2015, Murphy and Oliver 2013).

In three studies, modified or adapted functional communication frameworks were used to code interactions according to utterance types, communication functions or conversational behaviours (e.g., engagement during interviews) (Fried-Oken *et al.* 2012, Murphy *et al.* 2010, Wong *et al.* 2009).

Additionally, communication partners and the therapist counted the number of picture symbols on a communication board that were either modelled, correctly understood or successfully used within an interaction by a PwPPA (Cress and King 1999), while researchers calculated the frequency rate at which a PWD exchanged communication cards for a preferred activity (Trahan *et al.* 2014).

In 10 studies, the researchers developed non-standardized outcome measures for the specific study, that is, Preference Assessment Questionnaire (PAQ) (Bourgeois *et al.* 2016); evaluation questionnaires; interaction checklists; and questions for family interviews (Alm *et al.* 2004, Astell *et al.* 2010, Crete-Nishihata *et al.* 2012, Hamel *et al.* 2016). An Involvement Measure (Murphy and Oliver 2013) and decisional capacity questionnaire (Chang 2015) were developed to measure decision-making skills in interactions by adapting questions from other tools. Within training programmes, non-standardized tests and pre-post-training surveys or questionnaires were used to measure nurses' knowledge of memory and communication support strategies (Broughton *et al.* 2011) and the use of multimodal communication strategies by PwPPA and their commu-

nication partners (Mooney *et al.* 2018a). Conversely, Bourgeois *et al.* (2004) measured the frequency at which memory books were used during nursing care interactions following a multi-component communication skills training programme to nursing aides.

Communication outcomes

Social participation associated with the interpersonal behaviours of a dyad was noted in the primary outcomes of five studies using computer technology (Alm *et al.* 2004, Astell *et al.* 2010, Davis and Shenk 2015, Hamel *et al.* 2016, Purves *et al.* 2015), three studies on unaided AAC systems (Ellis and Astell 2017, Hydén 2011, Kindell *et al.* 2013), and one study using a combination of AAC systems (Wong *et al.* 2009). In all these studies, social participation outcomes were expressed as laughter, smiles, enjoyment of interaction, feelings of social closeness, increased engagement (e.g., eye contact) or an expressed desire to interact with others (e.g., imitation of communication behaviours). The role of the communication partner in supporting the interaction, for instance encouraging the PWD to make independent choices in selecting conversational topics, was an equally important outcome of these studies.

In four studies, social participation outcomes related to the intrapersonal behaviours of the PWD or communication partner. These were noted in the self-reported increase in confidence of PwPPA when interacting with others (Mooney *et al.* 2018a, 2018b), and affirmation of self-identity in a PWD (Crete-Nishihata *et al.* 2012, Gómez-Taibo *et al.* 2014). Furthermore, in three studies, outcomes related to communication partners' enhanced awareness of person-centred communication (e.g., nurses' respect and validation of personhood towards the PWD) (Bourgeois *et al.* 2016, Broughton *et al.* 2011, Dynes 2018).

Language-based outcomes were encountered across the majority of studies and pertained to non-electronic, memory and communication aids in which the primary outcomes related to the quantity and quality of conversational content (e.g., increased on-topic statements, and decreased ambiguous, unintelligible and repetitive utterances) (Andrews-Salvia *et al.* 2003, Chang 2011, Gómez-Taibo *et al.* 2014, McPherson *et al.* 2001, Ruiz 2015).

Seven of the studies included different types of training formats for communication partners within dyadic interactions. Communication partners were trained to make communication wallets (Bourgeois and Mason 1996), family caregivers were trained to teach persons with DAT to use a memory book in conversations with others (Bourgeois 1990), and nursing aides received brief instruction before using memory aids in conversation as part of the study (Hoerster *et al.* 2001). Communication outcomes for both partners were noted within the scope of these studies (e.g., balanced turn-taking, increased duration of speaking time, and improved facilitative behaviours such as acknowledgments by communication partners). However, these outcomes were not consistently observed as functional communication changes based on judgements of individuals unfamiliar to the intervention (Bourgeois 1990, 1993, Bourgeois and Mason 1996, Chang 2015, Hoerster *et al.* 2001, Johnson 2003). In a pilot study reported by Fried-Oken *et al.* (2012), persons with DAT received a training procedure before interacting with a communication board, and as a result, increased references to the aid and a greater use of targeted vocabulary were evident.

Across three studies, interactive coaching and modelling of communication strategies or use of AAC techniques was conducted with communication partners. Communication outcomes included improved caregiver topic elaborations (which in turn improved topic maintenance and decreased perseverations by the PWD) (Spilkin and Bethlehem 2003) and communication partners' improved use of cued comprehension strategies for PwPPA (Cress and King 1999, Mooney *et al.* 2018a).

In two other studies, nursing aides were trained to use a memory book in conversations in care and non-care situations. While communication in care interactions became more personalized, there was no evidence of the memory book having been used during these interactions (Bourgeois *et al.* 2004). On the other hand, nursing aides used the memory book content to increase conversational topics and positive statements in non-care-related interactions (Bourgeois *et al.* 2001).

In five of the studies, the involvement of the PWD in decision-making conversations related to their well-being, expression of personal views and preferences, and comprehension of options and choices in activities of daily living, was stated as a communication outcome (Bourgeois *et al.* 2016, Chang 2015, Murphy *et al.* 2010, Murphy and Oliver 2013, Reitz and Dalemans 2016). Two of the remaining studies showed no improvement in the use of language (i.e., on-topic statements) when sensory cues were used in a group story-telling activity (Johnson 2003) or in conversations with persons with dementia using a communication framework (Reitz and Dalemans 2016).

Across five studies that focused on conversations with electronic AAC systems, the language-based outcomes were varied. The quantity of utterances, topic initiations and elaborations were reduced when a digital memory book (Aitken 2015) or communication board programmed with an embedded voice output (Fried-Oken *et al.* 2009) was used in conversations with persons with mild to moderate DAT. Conversely, PwPPA

increased their lexical retrieval skills when using mobile technology (Mooney *et al.* 2018b) and persons with DAT increased their conversational time when interacting with a digital communication or memory book (Dynes 2018, Ekström *et al.* 2017). While most of the conversational time focused on the usage of the digital communication book or its content, there was no evidence that the electronic aid supported the initiation of new conversational topics (Ekström *et al.* 2017).

Discussion

The purpose of this research review was to search systematically the literature on dementia as it relates to AAC strategies and techniques, and to synthesize the findings in an attempt to highlight trends and gaps in the current knowledge base. This was achieved by grouping the included studies according to communication partners, description of AAC strategies and techniques, outcome measures, and communication outcomes.

In summary, with the advent of technology and mobile computing, researchers from the United States, Canada and UK have piloted and provided preliminary evidence on the use of various AAC system options to support interactions in persons with dementia. In fact, research on dementia-related communication that includes AAC was pioneered and continues to be conducted primarily within these three countries. Furthermore, considering that approximately 60% of persons with dementia live in non-Westernized, low- and middle-income countries (WHO 2017), a significant paucity of AAC research, albeit only in English, exists for persons with dementia in these contexts. It is imperative to fill this gap in the literature base, as a research trend that appears to be emerging in the reviewed studies aims to adapt AAC strategies to reflect the cultural and linguistic diversity of persons with dementia and their caregivers of different ethnicities. In this regard, studies on cultural and linguistic adaptations for persons with dementia from various ethnic backgrounds, as well as the integration of their social histories into AAC strategy use, are not only encouraging, but urgently needed.

The majority of studies have focused on non-electronic memory and communication aids for persons with DAT, as reported in more than half of the studies. This is plausible seeing that DAT is the most common dementia subtype. The reviewed studies revealed that non-electronic memory and communication aids have predominantly focused on supporting conversational topics and on improving the quantity and quality of conversational content in persons with DAT.

Interestingly, there is a trend towards developing AAC technologies, tools and strategies to support the interactions of persons with other dementia subtypes (i.e., semantic dementia/PPA) (Kindell *et al.* 2013, Mooney *et al.* 2018a, 2018b). Providing training to persons with semantic dementia/PPA together and their communication partners on a range of AAC strategies in the early stages of the disease may provide the dyad with greater opportunities to maintain participation in social interactions as the disease progresses. Moreover, it may be beneficial to identify the unique unaided AAC strategies of each person with semantic dementia/PPA. In this regard, it may be speculated that greater use of qualitative measures (e.g., conversational analysis) could increase identification of salient features of interaction that may be missed by quantitative measures alone.

Across the reviewed studies, memory books and communication wallets positively aided and improved language-based outcomes within a research focus. However, these outcomes were not consistently translated as functional communication outcomes as perceived by independent raters of the communication outcomes. As such, this underscores the ecological validity of AAC-supported interactions and highlights the need for continued research focus on communication outcomes that extent into everyday life settings of persons with dementia.

The reviewed studies indicated that nursing aides and family members were the main communication partners with whom persons with dementia interact. Furthermore, this review suggests that structured training programmes with content on AAC were considered to a limited extent only, and in existing programmes the implementation of trained AAC strategies was only partly validated in post-training surveys or not clearly evident in post-training observations. This suggests that there is a need to measure the outcomes of training programmes by including the direct observation of dyadic interaction.

In preliminary studies of high-technology interactions, the potential of persons with dementia to learn how to use technology, the influence of their previous exposure to electronic devices, along with the significance of their inclusion in training with caregivers, appear to be avenues to explore in future studies. Overall, given that communication is a collaborative process (Kindell *et al.* 2017), and in alignment with a person-centred care model, it may be essential to include, depending on the aims of the training programme, the individualized needs of persons with dementia and/or their communication partners into the development of training programmes and determining outcomes.

Person-centred communication within AAC-supported interactions appears to be a small yet emerging trend in recent studies (Bourgeois *et al.* 2016, Broughton *et al.* 2011, Davis and Shenk 2015, Dynes 2018). The use of picture communication cards (e.g., VoiceMyChoice™) and communication frameworks

(e.g., Talking Mats™) have enabled persons with dementia not only to participate in important conversations about their personal well-being and daily life but also to reveal their independence in making choices and expressing their opinions and preferences. Additionally, in a small number of studies, the direct inclusion of persons with dementia in selecting conversational topics and authoring their own life stories (Crete-Nishihata *et al.* 2012) resonates a shift towards a person-centred approach within AAC-supported interactions.

Future directions

A number of key areas for future research have been highlighted by this research review. For instance, there is a need for further research to focus on using AAC strategies to support the interactions of persons with a range of dementia subtypes who present with a different communication profile to those with Alzheimer's disease. Further exploration of how persons with severe dementia or PwPPA/semantic dementia can use their personal and unique set of communication behaviours as a currency for meaningful interaction with their communication partners, is an important priority for future research.

Methodologically, mixed-method research designs that include standardized measures and qualitative data (such as conversational analysis) have the potential to provide greater detail of the nature of interactions in persons with dementia who use AAC. Furthermore, research focusing on the direct involvement of persons with dementia using participatory designs may present valuable insights. Future studies that include social participation and person-centred communication outcome measures may also be beneficial to develop goals with functional communication outcomes.

Dyadic training programmes with content related to different types of AAC support and with interactive teaching methods for communication partners that target communication outcomes for both partners, pose a gap for future research to fill. Further exploration into training persons with dementia on the use of electronic AAC systems before they use them in real-time interaction settings is needed. Lastly, we propose research to develop AAC-informed materials that reflect the ethnic diversity of persons with dementia, especially those who live in non-Western countries.

Limitations

Publication and language biases are acknowledged as primary limitations of this review, as only published studies, theses and dissertations in English were accepted for inclusion. As such, other current and relevant non-English publications conducted in various parts of the world were excluded. Therefore, the findings of this review should be interpreted cautiously as studies that could not be accessed online or those published in other languages could otherwise have contributed to the results of this review.

Conclusions

This review presented a research overview of AAC strategies and techniques that are used to support communication in persons with dementia. A systematic approach was adopted in searching the literature and synthesizing the available studies to highlight research trends and gaps. The majority of these studies focused mainly on supporting the interactions of persons with DAT by using non-electronic memory and communication aids. The use of AAC strategies was shown to support receptive and expressive language, social participation, decision-making, and reminiscence-based interactions. While great strides have been made in using various types of AAC support for persons with dementia, important priorities for future research are suggested here to extend the current knowledge base.

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