

Measurement of Depression in Individuals with Post-stroke Aphasia: A Systematic Review

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Major depression is a pervasive mood disorder that negatively influences many different populations. According to the National Institute of Mental Health (NIH) and data from the National Survey on Drug Use and Health from 2020, 8.4% of adults have experienced at least one major depressive episode (U.S. Department of Health and Human Services, 2022). Major depressive disorder, also known as clinical depression, is defined as having a distinct change in mood with feelings of sadness or irritability that lasts for at least two weeks and negatively impacts one's activities of daily living (Belmaker & Agam, 2008). Changes in mood are often accompanied by additional psychophysiological changes such as diminished appetite, decreased feelings of pleasure, and sleep disturbance. These psychophysiological symptoms can be categorized as psychological or somatic. Psychological symptoms may include mood, anxiety, interest in items or tasks, and emotional distress. Somatic symptoms, on the other hand, may include changes in functions such as sleep, appetite, and digestion. In general, somatic symptoms are commonly reported by patients experiencing depression (Kapfhammer, 2006).

There are several potential pathophysiological abnormalities associated with depression, including an imbalance in monoamine neurotransmitters such as serotonin in the central nervous system (Delgado, 2000) or a decreased neurotransmitter binding efficiency at neurotransmitter reuptake transporter channels (Laures-Gore et al., 2020). Other theories posit that the immune system plays a role due to increased amounts of inflammatory cytokines found in people with depression (Laures-Gore et al., 2020). As we learn more about the potential causes of depression, it is also critical to examine the impact of depression in different clinical populations including individuals who have had a stroke.

Depression Post-stroke

Depression has been studied in stroke survivors to examine its prevalence and impact on health outcomes. De Man-van Ginkel et al. (2015) assessed depression in patients from several primary care practices and patients diagnosed with intracerebral hemorrhage, ischemic infarction, or symptomatic atherosclerotic diseases from three different hospitals in the Netherlands. They found a 14.1% incidence of depression amongst the stroke survivors 6-8 weeks post stroke onset. In their comparison of depression symptoms across all patients, de Man-van Ginkel and colleagues found that individuals experienced similar types of symptoms (e.g., loss of energy, sleep disturbances), but the individuals diagnosed with depression post-stroke experienced these symptoms more frequently and severely than the individuals from the non-stroke clinical populations who were diagnosed with depression (2015). This is noteworthy because the symptoms stroke survivors experienced (e.g., loss of energy, sleep disturbances) may impact rehabilitation effectiveness (Ahn et al., 2015; Sinyor et al., 1986).

In general, depression has been shown to increase mortality risk (Gilman et al., 2017). For stroke survivors, depression has the added impact of influencing rehabilitation outcomes and medical care costs. More specifically, it has been shown to have a negative effect on patients' functional outcomes, continuation of social activities, and quality of life (Ahn et al., 2015). Patients have also been shown to participate less in therapy which then influences the expectations and outcomes of rehabilitation (Sinyor et al., 1986). Given the demonstrated impact of depression on quality of life, it is important to identify potential predictors of depression within and across medical conditions.

For individuals who have had a stroke, prediction of possible depression offers clinically applicable insights into treatment timeline and strategies. In their systematic

review, Kutlubaev and Hackett (2014) evaluated factors that are either associated with or predictive of depression and concluded that the predictors of greatest significance include pre-stroke depression, more severe neurological deficit, and physical disability. This information helps inform behavioral interventions, for example, cognitive behavioral therapy (Lee et al., 2020; Medeiros et al., 2020), which can reduce the severity of depression symptoms and help patients develop coping skills. These studies highlight the impact that depression can have on individuals who have had a stroke and why it is important to continue to study depression in this population. Furthermore, they emphasize the importance of including depression as a variable to be assessed in stroke outcome studies.

Depression and Aphasia

Many individuals with communication disorders report higher levels of depression due to factors such as difficulty expressing their thoughts and needs, limited social participation from ongoing communication barriers, and limited ability to implement coping strategies (Briley, Gerlack, & Jacobs, 2021; Chandrasekhar & Sikich, 2015). Individuals with post-stroke aphasia lie at the cross section of stroke and communication disorders. Aphasia is a communication disorder that is caused by damage to the language areas of the brain (U.S. Department of Health and Human Services, n.d.). This damage often results from an acquired brain injury, such as a stroke. People with aphasia can have impairments across language modalities, including oral expressive language, auditory comprehension, reading, and writing. These impairments can impact the individual's ability to communicate with family and friends at home and in the community. Similar to other stroke survivors, individuals with post-stroke aphasia may present with depression. Some studies have attempted to determine the prevalence of depression in individuals with aphasia. Kauhanen et al. (2000) examined patients with ischemic brain infarcts to assess the prevalence and course of post-stroke aphasia and found that 70% of people with aphasia have a diagnosis of

depression three months post-stroke, and 62% continue to report symptoms of depression after 12 months. Additionally, Pompon and colleagues (2022) report that depression symptoms in individuals with chronic aphasia did not significantly diminish over time when comparing participants 12 months post-stroke to participants at least 2 years post-stroke. Thus, depressive symptoms tend to persist or develop over time in people with aphasia (Pompon et al., 2022).

However, the reported prevalence of depression in individuals with aphasia may be under-reported because the diagnosis may be missed due to the communication impairment. Most measures of depression assume participants have adequate language abilities and have not been normed for populations with communication difficulties. A measure's demands on the language system may influence an individual with aphasia's ability to accurately respond to the test items. For example, self-assessment instruments of depression are widely used, and these types of assessments often require that the participant understand and respond to spoken language, interpret pictures, and understand the varied rating scales that are used across measures (de Man-van Ginkel., 2017). Additionally, during a psychosocial assessment, the individual with aphasia must converse with an unfamiliar examiner, which adds another layer of difficulty.

While depression has been shown to have a potential negative impact on individuals with aphasia due to stroke (e.g., poorer rehabilitation outcomes, increased mortality, decreased quality of life) (Laures-Gore et al., 2020), research is limited on how depression can be accurately measured in this population. In fact, most studies of depression post stroke exclude people with aphasia due to their language difficulties. Townend et al. (2007a) conducted a systematic review that examined studies of depression post-stroke and the different criteria used to include or exclude participants with aphasia. They noted that 71% of the studies reported selection criteria that excluded people with aphasia to some degree

(Townend et al, 2007a). In a parallel study, Townend et al. (2007b) reviewed measures of depression for individuals with post-stroke aphasia, specifically, and described the adaptations made to these measures to improve reliability. They defined the modifications as any change to the method of diagnosis of depression, including use of an informant/proxy, simplifying questions to Y/N question format, and using visual analogue mood scales. Results indicated that 48% of the included studies reported adaptations. These data further highlight how this population is underrepresented in the literature and why there is limited understanding of the prevalence of depression in aphasia and a lack of knowledge on how to properly assess depression in people with aphasia.

In 2016, van Dijk et al. conducted a systematic review in which they analyzed six instruments used to assess depression in people with aphasia. Their inclusion criteria (i.e., patients with stroke, instruments that are used to assess and identify depression in patients with aphasia, studies that focused on the psychometric properties of these instruments, and studies published in English) yielded only 15 articles. From the 15 articles, the researchers identified four observer rated scales: the Aphasia Depression Rating Scale (ADRS), the Clinical Global Impression-Scale (CGI-S), the Stroke Aphasic Depression Questionnaires (four versions: SADQ-21, SADQ-H, SADQ-10, and SADQH-10), and the Signs of Depression Scale (SODS); and two self-assessments: the Visual Analogue Mood Scale (VAMS; three versions: 8 items, single item, and revised) and the Visual Analogue Self Esteem Scale (VASES). While VASES was not specifically designed to diagnose depression, it includes one item that assesses depression. The goal of the review was to illustrate the qualities of the assessments currently being used to assess depression and of the psychometric studies that have been conducted for these assessments.

To analyze the studies, the properties of each measure were examined based on several factors, including the COSMIN taxonomy (reliability, validity, and responsiveness),

feasibility (based on features), whether studies that used the assessments had similar findings, and the number of psychometric studies available for the assessments. After reviewing the studies, van Dijk and colleagues (2016) identified some key weaknesses in methodology of reliability and validity testing across all studies. Weaknesses in reliability testing, included small sample size (ADRS, VAMS 8 items), exclusion of individuals with aphasia (SADQ all versions), and selection Bias (SADQ-10, VAMS-R). Similar weaknesses were identified in validity testing of the assessments, including small sample sizes (ADRS, VAMS-8, VASES), exclusion of individuals with aphasia (SADQ all versions, VAMS-8), and selection bias (SADQH-10, VAMS-R). Regarding psychometric properties, so trends identified included positive ratings of internal consistency (SADQ-21, SADQ-H, SADQ-10, VAMS-8, VASES), inconsistent ratings of internal consistency (SADQH-10), and negative ratings of test-retest reliability (ADRS, VAMS-8, SADQ-10) (van Dijk et al., 2016).

Van Dijk et al. (2016) concluded that none of the six instruments had been sufficiently validated and that the methodological quality of the studies was low. In the absence of a validated measure of depression in post-stroke aphasia, the authors recommended the use of the SADQ-10 (Sutcliffe & Lincoln, 1998), SADQH-10 (Lincoln et al., 2000), and the SODS (Hammond et al., 2000) for clinical practice solely based on feasibility, considering factors such as administration time, training requirements, and accessibility to assessment (van Dijk et al., 2016). Clearly, more research is needed on the measures currently used to assess depression in individuals with post-stroke aphasia.

As research on depression in aphasia gains traction, it is critical to address fundamental limitations, thereby maximizing the impact of future studies on this topic. A lack of consistency in assessments and inclusion criteria across studies threatens comparison, aggregation, and application of results. Some of the different measures used include the ADRS, SADQ-10, SODS, CGI-S, and VAMS. This lack of consistency makes it hard to

compare results across studies to generalize the results to the population. There is a need for more consistent methodological considerations (e.g., assessments, diagnostic processes) that can be used to measure depression accurately and reliably in individuals with aphasia due to stroke.

Improving how depression is measured in aphasia is critical, because depression can have a significant influence on people and their quality of life. It can influence a person's relationships with their family and friends, interfere with their ability to work, and change their ability to concentrate on goals (de Man-van Ginkel et al. 2015). Thus, this systematic review is designed to fill in the gaps in the literature that remain after the previously published systematic reviews in 2007 and 2016. In comparison to Townend et al. (2007b), the present study provides an updated review of the literature about depression in aphasia and includes an additional 15 years of research studies. Additionally, we defined modification of the assessment more narrowly as a change that increased the participation of individuals with aphasia in the measurement of depression, rather than include modifications that may remove the patient from the assessment process (e.g., use of a proxy). Compared to van Dijk et al. (2016), which only examined the psychometric properties of assessments used to identify depression in people with aphasia, the current study examined additional factors such as the standardization sample, whether the assessments were specifically designed for individuals with aphasia, and the methodology of the studies included in the review. Thus, this review will answer the following research questions:

1. What measures are currently being used to assess depression in people with aphasia?
2. Were the measures created specifically for individuals with aphasia or were individuals with aphasia included in the standardization sample?

3. Were measures modified to meet communication needs of people with aphasia? If yes, what methods were used to meet the communication needs of people with aphasia?

Methods

This systematic review was conducted using the guidelines from the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA). PRISMA 2020 includes a checklist with 27 items that help ensure that systematic reviews are transparent, complete, and accurate.

We searched the databases PubMed and PsycInfo, using the keywords “Aphasia [Title/Abstract]” AND “Depression [Title/Abstract] OR Mood Disorder [Title/Abstract] OR Adjustment Disorder [Title/Abstract] OR Emotion [Title/Abstract] OR Affect [Title/Abstract] OR Affective Disorders [Title/Abstract]” AND “Communication OR Speech OR Language”. The term Aphasia was used as this was the population of interest. Depression was chosen because it is the psychiatric condition being examined. Emotion was also added as there are some studies that assessed depressive symptoms but may have not specifically labelled them as such. Other terms such as mood disorder, adjustment disorder, affect, and affective disorders were included in addition to emotion to reduce the likelihood of omitting relevant articles. These terms were identified through an article by Laures-Gore (2020). No additional articles were identified by including the terms mood disorder and adjustment disorder. Lastly, the terms communication, speech, and language were used as these are key words related to aphasia. Additionally, reference lists from relevant review articles identified through the initial screening were hand-searched to identify related articles that were not identified in the initial database search.

The papers that were included were empirical, peer-reviewed articles (inclusive of case studies). Master's and doctoral theses that did not go through the peer review process, review papers, book chapters, commentaries, etc. were excluded. Papers were also excluded if they focused on mania or bipolar disorder or were not written in English. Papers were included if a) depression symptoms were measured (e.g., depression assessment/screener, patient/caregiver measure), b) at least some participants were diagnosed with aphasia due to stroke and c) data from participants with post-stroke aphasia was distinct from data from those without aphasia.

After identifying the list of papers to be included in the final analysis, the principal investigator was responsible for pulling the data from each manuscript. The variables pulled included the assessments used, the modalities of the assessments, whether modifications were used, demographic statistics, and whether the psychometric properties of the assessments were reported. Reliability for data collection was calculated using three binary variables: the presence of an aphasia assessment, a depression assessment, and modifications. Interrater reliability was assessed at each level of screening and evaluation. At each level, 30% of the papers were screened by another researcher, which is a conservative number when looking at the percentages used in previous studies. For any discrepancies during the reliability checks, a consensus meeting took place.

Results

Results of the search

Using the above-mentioned search criteria and databases, 1,247 articles were identified for review. After duplicates (306 articles) were removed, 941 articles remained for the abstract screening. For the abstract screenings, reliability and discrepant screening decisions were reviewed after each quarter of abstracts. After the first quarter of abstracts,

reliability was found to be 88.1%. Due to the quarterly discrepancy meetings, inter-rater reliability improved to 91.8% on the final quarter. Overall, the two raters achieved a total reliability of 91.5% on the abstract screenings. Through the abstract screening, 717 articles were excluded. From the 224 articles that remained, two articles were not able to be retrieved due to unavailability of a full-text article, so 222 were screened at the full text/article level. Full articles were excluded if they were published in a language other than English (n = 7), excluded individuals with aphasia (n = 4), did not include post-stroke aphasia (n = 2), had no clear aphasia diagnosis (n = 3), did not assess depression (n = 83), assessed depression in caregivers (n = 4), did not differentiate data for people with aphasia from data for individuals without aphasia (n = 22), reviewed protocols (n = 7), and were not peer reviewed/empirical studies (n = 12). The calculated reliability for the full article screening was 91.2%. Of the full articles that we reviewed and passed to the data round, the second coder completed a data pull about aphasia assessment, depression assessment, and presence of modifications. We achieved a reliability of 93.7% on the data pull. In total, 78 studies met all inclusion criteria and were included for review and analysis. Refer to Figure 1 for a PRISMA diagram outlining the systematic review process.

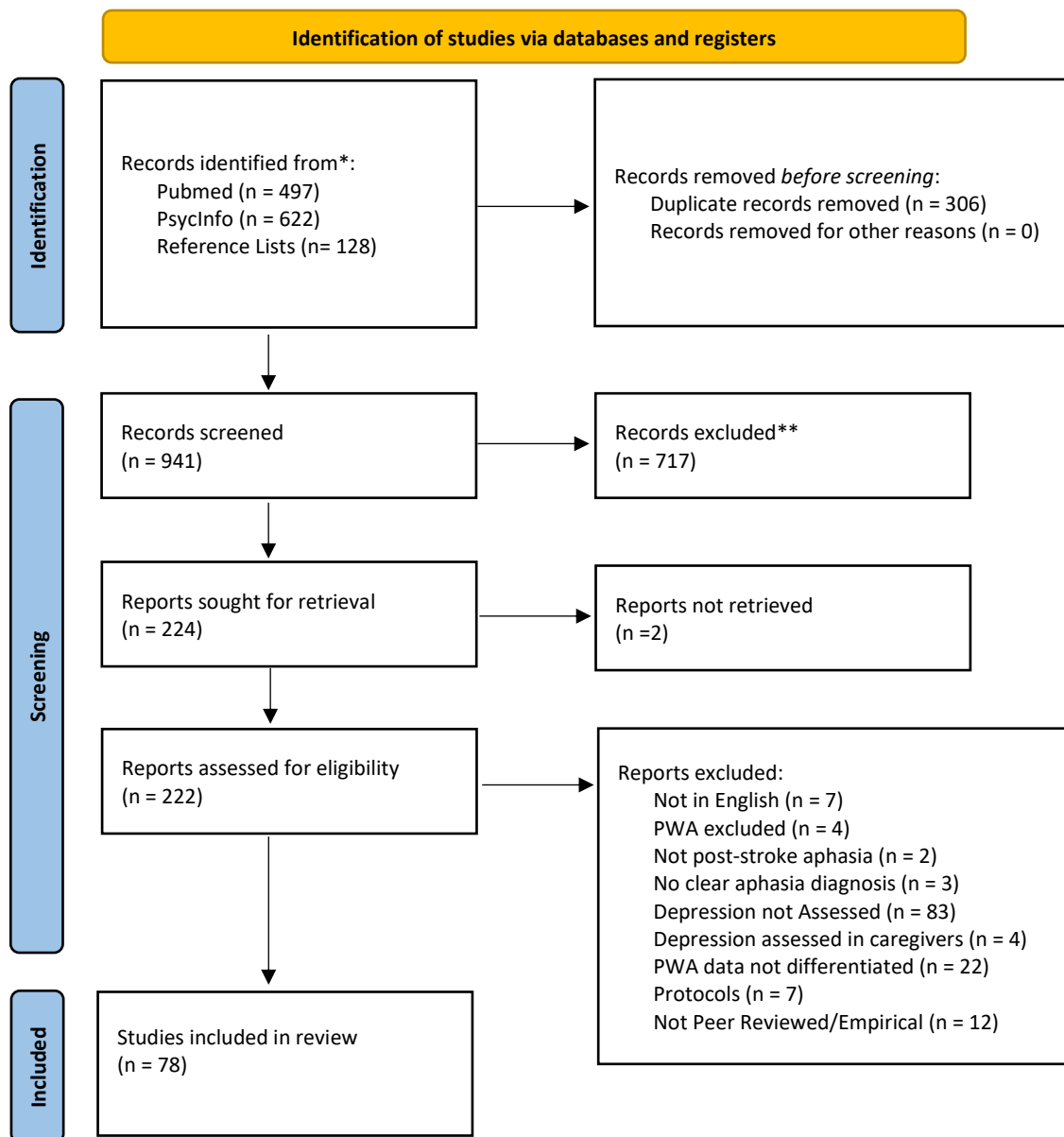
Measures currently used to assess depression in aphasia

The research studies utilized five unique methods to measure depressive symptoms in their participants. These included proxy questionnaires (observer rated questionnaires), self-reported questionnaires, behavioural observation, interview, and determination based on other criteria (e.g., DSM-5) by different researchers and clinicians. As shown in Figure 2, the most frequently used methods were self-reported questionnaires (47%) followed by proxy questionnaires (35%). Within these two types of questionnaires, 24 different assessments were used. The most frequently used proxy questionnaires included the SADQs (17 studies) and ADRS (7 studies), and the most frequently used self-reported questionnaires, included

the Geriatrics Depression Scale (GDS; 11 studies), Hospital Anxiety and Depression Scale (HADS; 8 studies), Patient Health Questionnaires (PHQ; 7 studies), and Beck's Depression Inventory (BDI; 5 studies). Refer to Table 1 for more information on the 24 assessments identified.

Figure 1

PRISMA Flow Diagram of Search Strategy



Two percent of papers reported using other criteria to determine the presence of depression. Frequently, these studies did not describe the criteria in sufficient detail nor how they were applied to determine presence or absence of depression. For example, Herrmann and colleagues (1993) reported classifying patients for depressive disorders based on the RDC-classification but did not provide additional information regarding the criteria.

Depression measures designed for aphasia

Of the 24 different assessments used across all studies, three were created specifically for individuals with aphasia or included individuals with aphasia in the standardization sample. These assessments include all versions of the SADQ, ADRS, and the Stroke and Aphasia Depression Scale (SAD). The SADQ was developed specifically for people with aphasia but was originally validated with a sample of stroke patients without aphasia. Since then, the 10-question short-form of the SADQ (SADQ-10), the hospital version of the SADQ-10 (SADQH-10), and the original version (SADQ-21) have been studied with samples of people with aphasia. The SADQ-10 and SADQH-10 were shown to have high internal consistency, 0.793 and 0.77, respectively (Laures-Gore et al., 2016; Cobley et al., 2011). The ADRS was validated with a sample of people with aphasia and was found to have good internal consistency (0.671) and a positive correlation with SADQ-10 scores (Laures-Gore et al., 2016). The SAD was developed specifically for people with aphasia and intentionally included visual drawings, multiple question formats (auditory and visual stimuli), and a visual analogue scale to meet their communication needs. These supports were employed because they have been shown to enhance comprehension and response accuracy in people with reading and writing difficulties (Smollan & Penn, 1997).

Table 1. Descriptions of the depression assessments identified through the review

Depression Assessment Type	Versions	# of Studies Used In	Modality	Standardized for PWA (Y/N)	Question Type	Number of Questions
Stroke Aphasic Depression Questionnaire (SADQ)	1. SADQ-21 (n=7) 2. SADQ-H (n=1) 3. SADQ-10 (n=6) 4. SADQ-H10 (n=3)	17	Proxy Questionnaire	Y	Rating Scale	SADQ-21 & SADQ-H: 21 SADQ-10 & SADQ-H 10: 10
Geriatric Depression Scale (GDS)	1. Shortened (n=3) 2. Full (n=8)	11	Self-Reported Questionnaire	N	Y/N	Shortened: 15 Full: 30
Hospital Anxiety and Depression Scale	N/A	8	Self-Reported Questionnaire	N	Rating Scale	Total 14 questions 7 for each subscale (Depression & Anxiety In the name
Patient Health Questionnaire	1. PHQ-8 (n=3) 2. PHQ-2 (n=1) 3. PHQ (n=1) 4. PHQ-9 (n=2)	7	Self-Reported Questionnaire	N	Rating Scale	
Aphasia Depression Rating Scale (ADRS)	N/A	7	Proxy Questionnaire	Y	Rating Scale	9
Beck's Depression Inventory	N/A	5	Self-Reported Questionnaire	N	Rating Scale	21
Depression Intensity Scale Circles (DISC)	N/A	3	Self-Reported Questionnaire	N	Rating Scale with graphics	1

Table 1. (Continued)

Depression Assessment Type	Versions	# of Studies Used In	Modality	Standardized for PWA (Y/N)	Question Type	Number of Questions
Center for Epidemiologic Studies Depression Scale	1. CESDS (n=3) 2. CESDS-R (n=1)	4	Self-Reported Questionnaire	N	4 point Rating Scale	20
General Health Questionnaire (GHQ)	N/A	2	Self-Reported Questionnaire	N	Rating Scale	30
Signs of Depression Scale (SODS)	N/A	2	Proxy Questionnaire	N	Y/N	6
Cornell Scale for Depression in Dementia (CSDD)	N/A	2	Proxy Questionnaire	N	2 point Rating Scale	19
Comprehensive Psychopathological Rating Scale (CPRS)	N/A	1	Self-Reported Questionnaire	N	Rating Scale	65
Hamilton Rating Scale for Depression (HRSD)	N/A	3	Proxy Questionnaire	N	4 point Rating Scale	21
Brief Symptom Inventory - 18	N/A	1	Self-Reported Questionnaire	N	Rating Scale	18
Visual Analogue Self-Esteem Scale (VASES)	N/A	1	Self-Reported Questionnaire	N	Visual Analogue Scale	10
Stroke Impact Scale - Emotional Domain	N/A	1	Self-Reported Questionnaire	N	5 point Rating Scale	9

Table 1. (Continued)

Depression Assessment Type	Versions	# of Studies Used In	Modality	Standardized for PWA (Y/N)	Question Type	Number of Questions
Mini-International Neuropsychiatric Interview Questionnaire (INIQ)	N/A	1	Self-Reported Questionnaire	N	Y/N	130
Stroke and Aphasia Depression Scale (SAD)	N/A	1	Self-Reported Questionnaire	Y	Visual Analogue Scale	30 close-ended questions
Zung Self Rating Depression Scale (ZSRDS)	N/A	1	Self-Reported Questionnaire	N	4 point Likert Scale	20
Visual Analog of Mood Scales (VAMS)	N/A	1	Mood Scales	N	Visual Analogue Scale	8 distinct mood scales
Montgomery-Asberg Depression Rating Scale (MADRS)	N/A	1	Proxy Questionnaire	N	Rating Scale	10
Clinical Global Impressions Rating Scale for Severity (CGI-S)	N/A	1	Proxy Questionnaire	N	7 point Rating Scale	1
Profile of Mood States (POMS)	N/A	1	Self-Reported Questionnaire	N	5 point Rating Scale	65
Wakefield Self-Assessment of Depression Inventory (WSADI)	N/A	1	Self-Reported Questionnaire	N	4 point Rating Scale	12

The 21 other assessments of depression used in the included studies were standardized using samples of healthy individuals, people with dementia, elderly individuals, stroke survivors, and/or individuals with traumatic brain injuries. Some studies deemed an assessment suitable for individuals with aphasia because the assessment used Y/N questions. Additionally, most papers that reported the validity of an assessment only reported detached validity rather than the validity of the assessment based on the participant sample in the study. The papers that measured validity in their study were ones that were reporting on the development of an assessment. The high percentage of studies reporting detached validity data could be due to depression not being the main variable of interest. Thus, the researchers relied on the detached reliability and validity of the measure.

Methods used to make depression assessments aphasia friendly

Regarding meeting the communication needs of people with aphasia, 24% of studies reported making modifications to depression assessments. These modifications included reading questions aloud, repetition of questions as needed, multimodal presentation (e.g., visual drawings, symbols, gestures), large font and questions on separate pages, response flexibility (e.g., speaking vs pointing), no time limits, and simplifying questions (e.g., editing to be Y/N questions). Seventy-six percent of studies either did not use or report assessment modifications to support the communication needs of people with aphasia. Some studies allowed a proxy to assist or complete the self-reported questionnaire, but these questionnaire data were not included in the final analysis of their respective studies. Additionally, authors of one study acknowledged that the modifications they used (i.e., simplified syntax) were not validated for the depression assessment used in the study.

Figure 2

Breakdown of the Modalities Used to Assess Depression

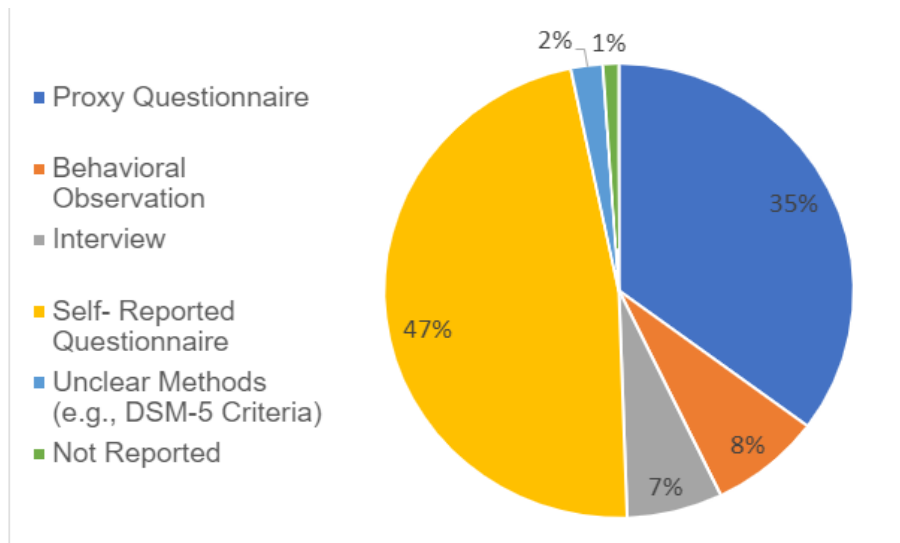
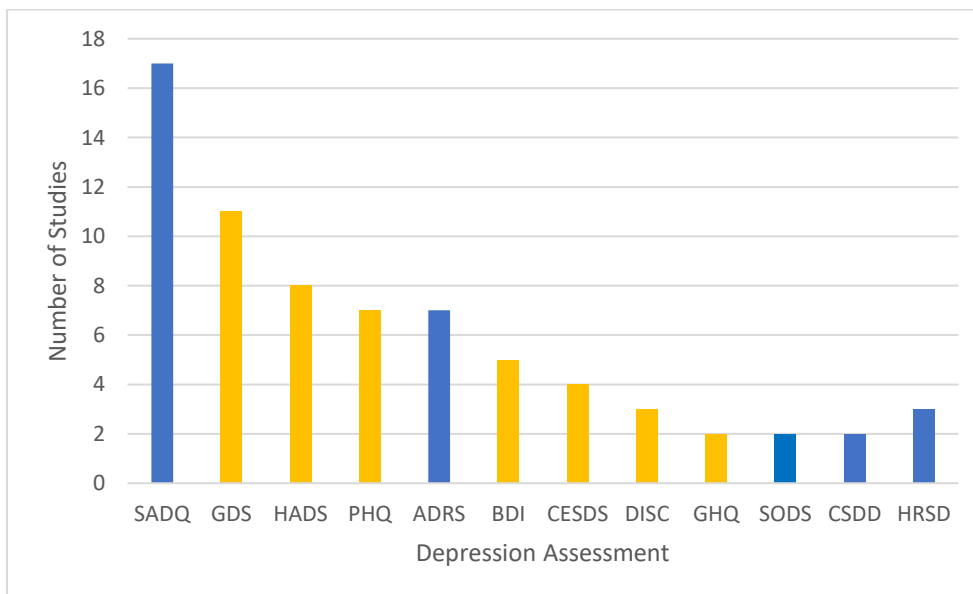


Figure 3

Frequency of Assessments Utilized in 2 or More Studies



Note. The remainder of these assessments were utilized in only one study. All versions of individual assessments are grouped together. The colors correlate with Figure 2.

SADQ: Stroke Aphasic Depression Questionnaire; GDS: Geriatric Depression Scale; HADS: Hospital Anxiety Depression Scale; PHQ: Patient Health Questionnaire, ADRS: Aphasia Depression Rating Scale; BDI: Beck's Depression Inventory; CESDS: Center for Epidemiologic Studies Depression Scale; DISC: Depression Intensity Scale Circles; GHQ: General Health Questionnaire; SODS: Signs of Depression Scale; CSDD: Cornell Scale for Depression in Dementia; HRSD: Hamilton Rating Scale for Depression.

Discussion

Through this review, we examined various measures that have been and are currently being used to assess depression in people with aphasia due to stroke. The 78 articles included in the review used 24 different assessments of depression. Of the 24, only three measures were designed specifically for people with aphasia. Additionally, only 24% of the 78 studies attempted to meet the communication needs of individuals with aphasia via modifications of the assessment. Thus, there is great variability in the measures used to assess depression in individuals with aphasia and most of studies do not consider the communication needs of these individuals when assessing depression. Additional work is needed to identify or create the measures that should be incorporated into standard practice and increase awareness of the need to screen for depression in individuals with aphasia.

The variability in assessment tools used to assess depression in individuals with aphasia is a striking result. Of the 24 assessments included across all studies, 12 assessments were used in only a single study, seven assessments were used in two to five studies, and five assessments were used in more than five studies (Figure 3). The lack of consistency of measurement across studies may influence the ability to compare results across studies and generalize results to the larger population of individuals with aphasia due to stroke. Increased consistency across studies will aid researchers and clinicians in understanding the impact of depression in people with aphasia and how it should be assessed and treated.

One variable contributing to the inconsistency in measurement across studies is the method used to assess depression. Across the 78 studies, researchers used five different methods to assess depression, including proxy questionnaires, self-rated questionnaires, behavioural observation, interview, and DSM-5 criteria. The most common assessment methods were self-assessment and proxy questionnaires, and the SADQ was the most frequently used measure (included in 17 studies) overall. The SADQ is a proxy assessment

that was created specifically for people with aphasia. Family members of individuals with aphasia complete SADQ questionnaires based on their observations of the individual (Cobley et al., 2011). Therefore, the assessment for depression is based on the nature, frequency, and quality of the family's and/or caregiver's experiences with the individual with aphasia. It stands to reason that the questionnaire method is used most frequently due to the ease of administration (e.g., reduced durations and costs), the structure of a questionnaire (e.g., order of questions, language used), and the greater control over the context of a questionnaire (e.g., same questions for each participant, choice of qualitative or quantitative data).

Proxy measures, such as the SADQ, may play a role in the assessment of depression in aphasia, but it is important that individuals with aphasia be able to respond for themselves. From the analysis of the depression measures used across the studies in this review, it is clear that modifications are needed to adapt the measure to meet the communication needs of the individual. Of the 78 studies reviewed, 24% of the protocols discussed meeting the communication needs of individuals with aphasia via modifications to the assessments used. Some of the modifications used are ones commonly incorporated in supported conversation for adults with aphasia (SCA), which is a multi-modal approach. SCA emphasizes speaking with a normal tone, writing key words, producing drawings and gestures, and asking yes/no (Y/N) questions. The aim of SCA is to acknowledge an individual with aphasia's communicative competence and to help them demonstrate this competence (Kagan, 1998). Revealing and acknowledging the communication competence of an individual with aphasia is critical to valid and reliable assessment. Other strategies that were utilized in the 78 studies include reading questions aloud, repeating questions, and printing items/questions in large fonts. While these strategies may be beneficial and some are known to support people with aphasia, they have not been studied in the context of adapting an existing depression measure for use with an individual with aphasia. For example, Griffin-Musick et al. (2020)

acknowledged that no research has been done on the impact of the modifications they incorporated into their study, such as simplifying syntax, on the psychometric properties of the GDS. Thus, we must question whether these modifications are adequate to bolster communication sufficiently in order to accurately assess depression.

While modifications, in general, may be beneficial, it is important to understand that a single modification may not be enough to adequately support an individual with aphasia in completing an assessment. Instead, a combination of modifications may provide the necessary support to make a measure aphasia friendly, valid, and reliable. For example, regarding the use of Y/N questions, Votruba et al., (2013) determined a depression assessment was aphasia friendly because they translated the Brief Symptom Inventory -18's (BSI-18) questions into Y/N questions as needed to assist with comprehension. When presenting Y/N questions though, it is important to consider whether the questions are written in simple language and consider factors such as length and syntactic complexity due to difficulties with comprehension. These considerations are necessary when establishing that an individual with aphasia has a reliable Y/N response. Aphasia assessments such as the Western Aphasia Battery-Revised (Kertesz, 2006) and the Quick Aphasia Battery (Wilson et al., 2018) measure Y/N responses to questions that vary in length and syntactic complexity. Future studies may incorporate these measures to receive insight into an individual's general ability to respond accurately and reliably to Y/N questions, but other variables could still impact their responses (e.g., the complexity of mental health questions vs general Y/N in general language assessments).

Unlike self-report questionnaires such as the SAD, proxy questionnaires do not require modifications. However, other variables must be considered to ensure valid and reliable measurement. With proxy questionnaires, the accuracy of a proxy's observations compared to the individual's own thoughts and emotions is critical. Studies have determined

that, in general, proxy reports are less accurate than self-report (Ashaie & Cherney, 2021). In depression, several studies have revealed that the proxy's own emotions related to carer burden can influence how they rate the patient's mood. At the same time, proxy reports of somatic symptoms are said to be more reliable (Townend et al., 2007). Another factor to consider in using a proxy report is the potential loss of autonomy on the part of the individual with aphasia to report on their own experiences and moods. To combat this, researchers recommend using both proxy and self-reported questionnaires. Ashaie and Cherney (2021) suggested the use of both the Center for Epidemiologic Studies Depression Scale Revised (CESD-R), a self-reported measure of depression, and the SADQ-10 to collect measurement information from both perspectives. If the SADQ is used in isolation, more reliable information may be collected in one area, such as somatic symptoms, but at the expense of another. Additionally, proxy questionnaires have a role in measuring depression symptoms in individuals with aphasia, but solely relying on this method takes away agency from these individuals and the importance of their participation in their own healthcare. Based on this research, we recommend that standard practice should include both a proxy questionnaire and a self-reported questionnaire.

When considering what should be included in standard practice, we decided to focus on the three questionnaires that were designed specifically for individuals with aphasia, including the SADQ, ADRS, and SAD. The other assessments were originally created for other populations such as individuals with traumatic brain injury, the elderly, and stroke survivors.

The SADQ is a proxy questionnaire used to assess depression specifically in individuals with post-stroke aphasia. There are four different versions of the SADQ: SADQ-21, SADQ-10, SADQ-H, and SADQH-10. The original version is SADQ-21 with 21 questions, and it was then shortened to 10 questions (SADQ-10) to improve the validity and

for clinical use. The hospital versions of both the SADQ-21 and SADQ-10, SADQ-H and SADQH-10, respectively, were then developed with the intention that hospital staff member could serve as proxies for individuals with aphasia in the hospital setting (Rose et al., 2022). For this assessment, some psychometric properties have been studied using a sample of individuals with aphasia and others have not. Regarding reliability, the internal consistency of SADQ-21, SADQ-10, and SADQH-10 as well as the test-retest reliability of SADQ-21 and SADQ-10 have been examined in individuals with aphasia. Reliability of the SADQ-H's reliabilities has been studied in general samples of stroke survivors but not with individuals with aphasia only. Sutcliffe and Lincoln (1998) found that the internal consistency and test-retest reliability of the SADQ-21 were 0.82 and 0.72 respectively. They found that the internal consistency and test-reliability for the SADQ-10 were 0.80 and 0.69, respectively. Cobley et al., (2011) found that the SADQH-10's internal consistency was 0.77. When considering validity of the assessments, the SADQ-21's and SADQ-10's construct validity was assessed with the HADS and used a sample of individuals with aphasia (Sutcliffe & Lincoln, 1998). The researchers found that the SADQ-21 was poorly correlated with the HADS depression subscale ($r = 0.22$), and the SADQ-10 had an adequate correlation with the HADS depression subscale ($r = 0.32$). The SADQ-H and SADQH-10 were only studied in a general sample of individuals with stroke (Lincoln et al., 2000). Sensitivity, specificity, and content validity were studied in samples of individuals without aphasia or a general sample of individuals with stroke. Some strengths of this assessment include that it is a proxy questionnaire, has strong reliability (SADQ-10, SADQ-21, and SADQH-10), and has different versions depending on setting. The main weakness is that there are gaps in the measurement of validity and reliability depending on the version. These data suggest that, although the SADQ was created with people with aphasia in mind and has some strengths,

more work needs to be done to thoroughly understand its psychometric properties and how it should be implemented in clinical practice and research.

The ADRS is another proxy questionnaire that was developed specifically to assess depression in individuals with aphasia who are in the subacute stage of stroke recovery. It was created by incorporating questions from the Hamilton Depression Rating Scale (HDRS), the Montgomery and Asperg Depression Rating Scale (MADRS), and the Salpetriere Retardation Rating Scale (SRRS). ADRS's reliability, both test-retest ($r = 0.89$) and inter-rater ($r = 0.89$), were assessed using a sample of individuals with subacute aphasia (Benaim et al., 2004). To assess construct validity, Benaim et al. (2004) compared the ADRS to ratings of depression made by psychiatrists and members of the rehabilitation team and the HDRS. The patients they assessed were characterized as having a right hemisphere stroke or a left hemisphere stroke. They determined how many of the individuals with left hemisphere stroke had aphasia, but the analysis that followed combined all the participants data. The ADRS and SADQ have also been shown to be positively correlated as well (Laure-Gore et al., 2016). The strength of this assessment is that the reliability has been assessed specifically with individuals with aphasia and it has a high construct validity when comparing to the ratings from psychiatrists and rehabilitation team members ($r = 0.60$) and the HDRS ($r = 0.78$) (Benaim et al., 2004). The weaknesses are that it is specifically for the subacute stage of recovery, and validity has not been established specifically for individuals with aphasia. The ADRS, once again, demonstrates that there are reasonable measures to assess depression in individuals with aphasia, but more research is needed to fully understand the psychometric properties of these tools.

Finally, the SAD is an assessment that was created specifically for Smollan & Penn (1997) with people with aphasia in mind; however, the psychometric properties of the assessment have not been studied. This assessment is a visual analogue scale that was created

based on the Zung Self Rating Depression Scale (ZSRDS), the BDI, the HDRS, and research from post-stroke studies. The researchers used a visual analogue scale because of the reading and writing difficulties as well as impaired comprehension that can be present after a stroke. Additionally, they incorporated pictures because they believed this would help improve the comprehension of sentences for individuals with aphasia. While the authors incorporated the use of multiple modalities to compensate for reading and writing difficulties, studies have reported that visual analogue scales may be difficult for individuals with aphasia to use. Bennett et al. (2006), as cited in van Dijk et al. (2016), states that these individuals have difficulty understanding the scales accurately due to the polarity of the options. For example, in the VAMS, the options range from Happy-Neutral to Sad-Neutral (Kontou et al., 2012). Individuals may have trouble comprehending where their emotions would land on the scale and how the scale transitions from one option to the other (van Dijk et al., 2016). The SAD's strengths include that it was created for people with aphasia and that the authors incorporated modifications to meet the communication needs of this population. Its weaknesses are that its psychometric properties have not been studied and that a visual analogue scale may cause more difficulties for this population. More research needs to be done on this assessment before it can be considered for standard practice.

Previous systematic reviews, Townend et al. (2007b) and van Dijk et al. (2016), have examined the literature on the assessment of depression in individuals with aphasia due to stroke, and this systematic review addresses some of the gaps in these initial works. First, we provided an updated literature search by adding 15 years of research which yielded 27 more studies to review and included 17 new measures compared to Townend et al. (2007b). Additionally, while Townend and colleagues found 48% of studies included modifications, we found that 24% of studies included modifications. This is likely due to the different definitions of modifications used in each study. Townend et al. (2007b) included the use of

informants as a modification for interviews which led to the higher percentage of studies that included modifications. Our focus was on modifications that addressed the person with aphasia and increased their participation in the process. While a proxy informant can reduce the impact of the communication difficulties these individuals have with assessments, it can also lead to reduced participation in their healthcare. Additionally, it may not be as reliable (Ashaie & Cherney, 2021). Given the finding that only about one quarter of studies utilized modifications to meet the communication needs of individuals with aphasia, there is a need to use measures for which modifications have been developed. Van Dijk et al. (2016) focused primarily on the psychometric properties of assessments but did not examine the totality of assessments currently being used across studies nor how researchers modify assessment procedures to accommodate for communication challenges in aphasia.

The data collected via this systematic review shows that there are many measures being used to assess depression in aphasia and a lack of standardization in which measures are used and how they are implemented. It is important that we identify the measures that are best designed for individuals with aphasia so that speech language pathologists are using the appropriate tools to help improve assessment and treatment of depression in individuals with aphasia. Ideally, a new aphasia friendly measure with the appropriate modifications would be created intentionally. However, given the current data available for measures of depression, we recommend utilizing a self-reported measure with the appropriate modifications to meet the communication needs of the individuals with aphasia and a proxy measure, the SADQ or ADRS. Although proxy measures are not ideal, they can serve as a nice adjunct to the self-reported measure. This recommendation is for both a clinical and research settings so that comparisons can be made across studies. While this is the current recommendation, additional work needs to be completed to determine what modifications would best support an individual's ability to understand and respond accurately to an assessment.

Limitations

With a systematic review, one inherent limitation is the risk of omitting studies that fit the criteria. For this review, we utilized the PubMed and PsycInfo search engines; however, it is possible we failed to capture articles that are in other search engines. Additionally, articles may have been omitted due to the search terms used and accidentally excluding captured articles that should have been included.

Future Directions

In the future, it would be interesting and useful to complete a systematic review of related topics in the aphasia literature such as quality of life and life participation. These papers were not included in this review because they did not explicitly measure symptoms of depression. Since quality of life and life participation are related to depression, examining these outcome variables may provide complementary information to the assessment of depression in this specific population. Additionally, other methods for identifying and diagnosing depression may be investigated. For example, given the association between vocal prosody and severity of depression (Wang et al., 2023), a systematic review of the literature, to date, would provide important information regarding the potential utility of acoustic measures in aiding depression diagnosis. Also, given researchers are using criteria from the DSM-V to determine the presence of depression, it would be important for research teams to describe how the criteria were applied to make this diagnosis.

Beyond reviews of the literature, future research on depression in aphasia may incorporate methods from the pediatric literature for ensuring successful administration of assessment procedures. For example, there are measures of depression that have been developed for children as young as four-years-old (e.g., pictorial instruments, behavioural observations) (Patra, 2019). As four-year-olds have only developed limited communication

skills (Luinge et al., 2006; Patra, 2019), these measures include procedures for communication with the child to elicit valid and reliable responses. Example procedures include the use of child semi-structured interviews, pictures, and a visual analogue scale. It is possible that these assessments could be used for individuals with aphasia. The measures might include the communication strategies that would support individuals with aphasia.

It would also be beneficial to examine the potential differences in the assessment of depression via measures of objective symptoms (e.g., sleep, appetite) vs. subjective symptoms (e.g., mood, anxiety). It may be more valid and reliable to assess depression in individuals with aphasia via objective symptoms because they can be measured via tools like polysomnography and activity monitors that do not require language for measurement. On the other hand, subjective symptoms require patient report/response, which places a larger burden on language. Subjective symptoms require individuals to be able to understand and respond reliably to the questions. However, a challenge in using objective symptoms to assess depression is how the primary diagnosis impacts these variables. For example, studies have identified sleep disturbances in stroke survivors (Wallace et al., 2012). Therefore, report of sleep difficulties could be due to the stroke rather than depression which then impacts the accuracy of a depression diagnosis.

Lastly, we believe it would be important to do a deeper dive into the modifications that are used to meet the communication needs of individuals with aphasia. Specifically, it is important to know how these modifications impact the validity of the assessments given. Additionally, more research can be done on what other strategies may be used to meet the communication needs of individuals with aphasia in other settings and how that may carryover to assessment. These communication strategies could be tested to determine which provides the most support to individuals with aphasia during assessments. This could help

provide guidance for whether an existing self-reported measure should be modified or if a new self-reported measure should be developed.

Conclusions

This study aimed to analyse how depression is being assessed in individuals with aphasia due to stroke. It is clear from the literature that there is great variability in the measures used to assess depression and whether modifications are employed to meet the communication needs of these individuals. We must standardize how to assess depression in this population to improve assessment and treatment of depression in individuals with aphasia. We recommend utilizing the SADQ or the ADRS along with a self-reported measure, but more work needs to be done to ensure these measures are given in a reliable manner.

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