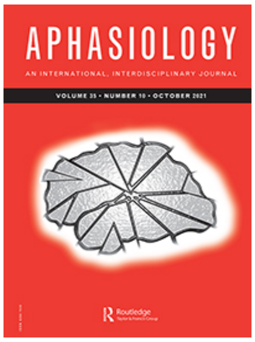

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Comparing patterns of familiar language use across spontaneous speech contexts in individuals with nonfluent aphasia and healthy controls

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ABSTRACT

Background: It is well-established that individuals with nonfluent aphasia produce proportionally more familiar or non-propositional language than neurotypical adults. Much less is known about the types of familiar language used or about the effects of either language context or impairment on usage patterns.

Aims: The purpose of this study was to identify and compare types of familiar language across several spontaneous speech contexts in individuals with and without aphasia in order to refine models of familiar language use for clinical application.

Methods & Procedures: Language transcripts from Aphasiabank of 154 individuals with moderate to severe post-stroke Broca's aphasia and gender- and age-matched controls were coded to identify and classify nine types of familiar language. Language samples included a story-telling task and three conversational topics. Non-parametric comparisons and Spearman's correlations were used to analyze usage patterns.

Outcomes & Results: Individuals with aphasia produced significantly higher proportions of formulaic expressions (context-bound, stereotyped utterances) as compared to controls, but proportions of lexical bundles (connotation-free, multi-word utterances) did not significantly differ. Familiar language usage varied by language contexts and level of severity for individuals with aphasia, whereas production patterns of healthy controls were remarkably stable.

Conclusions: This study offers insights into patterns of familiar language usage affected by linguistic ability and language context. A theoretical framework for conceptualising familiar language will result in improvements to existing interventions.

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Familiar language; formulaic; nonfluent aphasia; spontaneous speech

Introduction

Although the distinction between propositional versus non-propositional language in aphasia was proposed by Hughlings Jackson (1878) over a century ago, the understanding and therapeutic potential of non-propositional, or familiar language, for individuals

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Supplemental data for this article can be accessed here.

struggling with language expression has yet to be fully realized. Familiar language (also commonly referred as formulaic language; e.g., *in order to, sure thing!*), in contrast to novel language, refers to pre-packaged utterances that are holistically stored and retrieved (Conklin & Schmitt, 2012; Wray, 2001). The proposed purpose of familiar language in discourse is to decrease the cognitive burden (Wray, 2017); speakers benefit from well-rehearsed motor sequences, whereas listeners benefit from predictability.

If the role of familiar language as identified by Wray (2017) is correct, it would be expected that people with nonfluent aphasia (PWA) who struggle with fluent speech production would rely on proportionally more familiar than novel language. A number of studies have substantiated this claim; evidence has consistently shown high incidences of familiar language by PWA, especially as compared to typical controls (TCs; Bruns et al., 2018; Code, 1994; Wray, 2008; Zimmerer et al., 2018). A few researchers have also documented distinct neurological bases of familiar versus novel language (i.e., subcortical structures and right hemisphere versus left inferior frontal gyrus involvement) to explain different usage patterns observed in not only aphasia but also a number of other acquired communication disorders such as right hemisphere disorder, Alzheimer's disease, and Parkinson's disease (Marangolo et al., 2008; Sidtis et al., 2018; Van Lancker Sidtis et al., 2015; Van Lancker Sidtis & Postman, 2006; Zimmerer & Varley, 2016).

Variables affecting patterns of familiar language use

The incidence of familiar language in spoken and written samples of typical English-native speakers varies widely from 20% to as high as 75% (Van Lancker Sidtis & Rallon, 2004), and the incidence for PWA is similarly variable (e.g., Van Lancker Sidtis & Postman, 2006; Zimmerer et al., 2018). Aside from discrepancies in inclusionary criteria of familiar language items, which will be addressed in the next section, linguistic competence, and language context likely contribute to the large reported differences in overall usage.

Evidence for the influence of linguistic competence on familiar language production is suggested across a number of disciplines. Generally, as linguistic proficiency increases, so does the processing and production of familiar language as observed in second language learners (e.g., Ellis et al., 2008; Yuldashev et al., 2012). Wray (2001) cites evidence of increased production of specific types of familiar items, which offer predictability to facilitate processing, by professional speakers such as sports casters and auctioneers whose work demands unnaturally rapid, fluent speech. Currently, there is limited evidence in the aphasia literature, although a study by Lum and Ellis (1999) did observe relationships between the severity of linguistic deficits and non-propositional language use in certain tasks. In sum, findings suggest the utility of examining individual language ability rather than solely group differences in familiar language usage among PWA.

A second factor that likely affects familiar language production patterns is language context. In addition to quantitative and qualitative differences in familiar language usage in discourse versus written samples of neurotypical individuals (e.g., Conrad & Biber, 2005), there are differences across spoken language contexts. For instance, results from advanced second language learners demonstrated near-native production in a simulated phone conversation in comparison to a story-telling task where their familiar language production was far less than in native-language speakers (Erman et al., 2015). In research with PWA, Bruns et al. (2018) compared familiar language usage in natural conversation from home-recorded videos versus semi-structured interviews from Aphasiabank and found more familiar language in the latter context. Other studies have examined familiar versus novel language production for PWA on constrained speech production tasks such as sentence completion, counting, repetition, and naming (Lum & Ellis, 1999; Van Lancker Sidtis & Yeun, 2017). Combined, these findings indicate the importance of considering language context in familiar language usage patterns.

Operationalisation, types, and conceptualization of familiar language

Before familiar language can be usefully translated to assessment and treatment practices for PWA as well as other clinical populations, consensus must first be reached on how best to operationalize and conceptualize it, a challenging task that requires an interdisciplinary perspective. Van Lancker Sidtis and colleagues have emphasized that the majority of familiar language items are non-literal, relatively frozen in terms of prosody and syntax, and easily recognized by native speakers (Van Lancker Sidtis & Rallon, 2004; Van Lancker Sidtis & Yeun, 2017). Criteria for membership proposed by the sociolinguist Wray (2017, p. 592) include the following seven features:

> (1) frequent and familiar, (2) semantically opaque or irregular in form, (3) easy to produce and understand, (4) longer than one word, (5) has an additional semantic or pragmatic role, (6) signals the speaker's group identity, and (7) preestablished in form.

Notably, some but not all criteria must be present to be identified as a familiar item (Wray, 2017). For instance, Wray's criteria could exclude easy to produce, single-word utterances such as "yep" and "right?", but these items are justifiably counted as familiar or automatic by aphasiologists because of their frequent usage and pragmatic role in turn-taking (Code et al., 2009; Conrad & Biber, 2005; House, 2013; Van Lancker Sidtis & Rallon, 2004). In another example, frequency is sometimes prioritized to identify familiar language as used in automated, frequency-based methods (Bruns et al., 2018; Zimmerer et al., 2018), but a number of familiar language types are low in frequency; idioms and proverbs, song lyrics, and trending slang are all low frequency items and yet easily recognized by native speakers and used to signal group membership (Hallin & Van Lancker Sidtis, 2017; Rammell et al., 2017; Van Lancker Sidtis, personal communication, April 5, 2021). Automated methods are both efficient and objective in identifying high-frequency, familiar items, but humans are sensitive to the broader range of considerations proposed by Wray (2017).

In order to operationalize familiar language for purposes of identification, Gholami et al. (2017) described a series of confirmatory statements used for coding. Each statement begins with "by my judgment" followed by a brief description such as "this word string is associated with a specific situation, register and/or genre" (Gholami et al., 2017, p. 81). These statements function as a checklist to determine familiarity and include atypical grammatic constructions, semantic non-transparency, association with a particular context, functional role, linguistic markedness indicating that the word string is a single unit, and likelihood that the item has been previously encountered. Importantly, Gholami et al.'s list (Gholami et al., 2017) also includes "although this word string is novel, it is a clear derivation, deliberate or unintentional, of something that can be demonstrated to be formulaic in its own right" (pp.81), which is essential in identifying errorful familiar language often found in discourse of PWA.

Beyond operationalising familiar language as a whole, further specification is necessary for clinical utility. As mentioned, it has been demonstrated that PWA use more non-propositional than novel language compared to TCs (Bruns et al., 2018; Code, 1994; Van Lancker Sidtis & Rallon, 2004; Wray, 2008; Zimmerer et al., 2018), but exactly what types of familiar language do PWA find easier to produce or not produce? Analysing production patterns of familiar language could be used for 1) determining site of lesion (e.g., impaired serial item production, prayer recitation, and idiom completion may be associated with subcortical damage; Marangolo, 2008), 2) targeting specific types of familiar language to promote functional communication (e.g., treating sentence frames such as "I'd like a . . . "), or 3) devising scripts that require less cognitive effort (e.g., interspersing propositional utterances with preserved familiar items).

It is worth noting that a number of existing language interventions take advantage of familiar language processes, although they are not always marketed as such. Melodic Intonation Therapy (MIT; Albert et al., 1973) and the Sentence Production Program for Aphasia (SPPA; Helm-Estabrooks & Nicholas, 2000) target then build upon short, functional phrases such as *How are you?* Scripts used in script training, which are developed on behalf of the patient, often contain familiar language (Goldberg et al., 2012). Intensive Language-Action Therapy (ILAT), a recent methodology by Stahl and Van Lancker Sidtis (2015), treats common multi-word expressions (e.g., *you're welcome, here you are*) in partner training to capitalize on the strong association between familiar phrases and social interaction. Other approaches such as Voluntary Control of Involuntary Utterances (VCIU; Helm-Estabrooks et al., 2014) seek to build upon preserved automatic utterances. Ultimately, a more systematic understanding of familiar language and its subtypes can be used to enhance these and other practices.

To date, a large number of inter-disciplinary studies has examined specific types of familiar items in discourse and text of neurotypical speakers. Some easily recognizable types include idioms and proverbs (e.g., *she fell head over heels*), phrasal interjections (e.g., *holy cow*), greetings and farewells (e.g., *see you later*), variants of yes/no responses (e.g., *not really*), pause fillers (e.g., *uh, I mean*) and speech formulas (e.g., *no way!*; Ameka, 1992; Clark & Foxtree; Fuller, 2000; Goffman, 1978; Springer et al., 2006; Ward, 2004; Van Lancker Sidtis & Rallon, 2004). Utterance-initial discourse markers (or vocatives; MacWhinney, 2000) such as *well* . . . or *so* . . . are more difficult to identify because they are less defined in the literature and may be included in other familiar language subtypes such as phrasal interjections, speech formulas, or even pause fillers (e.g., Crible & Pascual, 2020; Fuller, 2000). Two types of multi-word utterances that are considered connotation-free have also been distinguished: formulaic sequences (e.g., *first of all*), which are structurally complete with a unitary semantic meaning, and lexical bundles (e.g., *that depends on*), which span phrasal boundaries to perform a bridging function (e.g., Conrad & Biber, 2005; Jeong & Jiang, 2019; Nekrasova, 2009). Although there are other less described familiar language types in the literature, the current study includes the above-mentioned nine types as reviewed in the methods section.

A limited number of theoretical models has been proposed to explain how these and other types of familiar items are conceptually organized. Dr. Van Lancker Sidtis, a speech-language pathologist who has spent her career studying familiar language production in patients with various communication disorders and healthy controls, has developed not one but two models with potential clinical utility. In her earlier work, Sidtis (2004) viewed familiar language as a continuum from the most emotive, overlearned language on one end (e.g., *oh my God!, help!*) to habitual, conventionalized language on the other end (e.g., *I think that . . ., it just so happened . . .*). In this model, familiar language types from reflexive to near-novel include: "vocal gestures, cries, pause fillers, expletives, speech formulas, song lyrics and titles, proverbs and idioms, conventional speech, proper nouns, clichés, collocations, schemata, indirect requests, and sentence stems" (Sidtis, 2004, p. 4).

Although the early model is intuitively appealing, Sidtis (2018) recently shifted to a more complex model designed to account for familiar language usage patterns that correspond to neurological profiles in neurogenic communication disorders. Rather than a one-dimensional continuum, types of familiar language fall into three categories that vary on several linguistic and sociolinguistic dimensions: degree of context-boundedness, cohesiveness, connotation/affection, compositionality, frequency, and literal versus figurative meaning. The three categories include formulaic expressions (i.e., situationally-bound, stereotyped, complete utterances such as *you bet!* including idioms), lexical bundles[1] (i.e., neutral connotation, highly cohesive templates such as *I'm not sure if . . .*), and collocations (i.e., loosely connected, context-free constructions such as *absolutely ridiculous*). Because familiar items can vary across a range of dimensions, categories are not considered discrete; some items may be classified in up to three categories as illustrated in *have a nice day* (Sidtis, 2018, p. 6), which is a multi-word utterance that has little to no nuance (i.e., lexical bundle), is context-bound (i.e., formulaic expression), and includes the words *nice* and *day* that frequently co-occur (i.e., collocation). Although this overlap may initially appear problematic, the three-category model considers a number of factors that might explain familiar language usage patterns in individuals with neurogenic communication disorders.

Importantly, both models allow for testable predictions of familiar language production. In the case of Broca's aphasia, individuals often depend on a set of well-rehearsed, frozen items (Code, 1994), a pattern that likely varies by severity and language context. Thus, for the continuum model (Sidtis, 2004), we would predict that PWA would use higher proportions of familiar language on the emotive/reflexive end of the continuum as compared to typical controls (TC). For the three-category model (Sidtis, 2018), the prediction would be that PWA rely on the category of formulaic expressions, because these situationally-bound items are generally less variant (e.g., *how's it going?*). Conversely, it would be predicted that items that are on the conventionalized (closer to novel language) end of the continuum *and* are members of lexical bundles or collocations, would be less proportionally represented in the spontaneous speech of PWA compared to TCs because these items require retrieval of syntactic templates (e.g., *in the process of . . .*) and/or greater flexibility of use in less-constrained language contexts (e.g., *a welcome change*).

Research questions and hypotheses

The current study was designed to test these predictions in PWA by offering well-defined search procedures and operational definitions to identify familiar language and its subtypes. Production patterns from a large number of individuals with nonfluent aphasia and healthy controls were analyzed according to linguistic competence and language context.

The goal of this study was to extend previous work on patterns of familiar language use to establish a framework for therapeutic application. Although a number of treatments target familiar language (e.g., script training, MIT, SPPA), a more purposeful approach has the potential to enhance interventions. The research questions and hypotheses were as follows:

(1) Are there differences in the types of familiar language used by individuals with Broca's aphasia versus TCs? We hypothesized that PWA would produce greater percentages of fixed, reflexive, situationally-based familiar items (i.e., formulaic expressions such as phrasal interjections and speech formulas) as compared to TCs who would produce more conventionalized language used in more complex linguistic structures (i.e., lexical bundles).

(2) If so, do these differences vary by severity of language impairment? We hypothesized that PWA with more severe linguistic deficits, as determined by standardized language scores and quantity of output, would demonstrate a greater percentage of items on the reflexive end of the continuum compared to those with milder impairments or typical language.

(3) Does the percentage of familiar language in individuals with and without aphasia differ across language contexts (i.e., story-telling versus various conversational topics)? We predicted differences across contexts, but did not hypothesize directionality.

(4) Are there interactions observed between types of familiar language, linguistic competence, and language context? Again, we expected to find across-group differences in familiar patterns, but offered no specific predictions.

Methods

Participants

This project used spoken language samples from Aphasiabank, an online repository that includes data from speakers with and without aphasia (MacWhinney et al., 2011). Research participants were administered established testing protocols, which included Institutional Review Board consent, standardized assessments, and several spontaneous speech tasks. Data from 77 PWA were selected based on a Western Aphasia Battery-Revised (WAB-R; Kertesz, 2007) diagnosis of Broca's aphasia along with 77 TCs that were individually paired by gender and age.

Procedures

Using the Computerized Language Analysis Software (CLAN; MacWhinney, 2000), four separate files were created for each participant (by using the GEM command) to extract specific language contexts from the full transcript of spontaneous language tasks. The language contexts examined in this study included the Cinderella narrative and three conversational topics that varied by participant group: PWA were asked to describe memories of their stroke, how they felt their speech was currently, and an important life event. TC conversational contexts included a description of a personal illness or injury, experiences communicating with an individual with a language disorder, and a memory of an important or scary life event.

For this project, only the participants' main line of the language transcript was analyzed (i.e., excluding prompts or interviewer responses, morphology tier in CLAN, etc.). The coders were the first author as well as two master's level graduate students in speech-language pathology (one was the second author) who received at least 3 hours of training that included demonstrating consistency with the first author in identifying familiar items in transcripts from TBIbank and classifying practice items by type. Below is a description of the coding process:

1) Coders created a list of familiar language items in each file according to established criteria (Gholami et al., 2017).

2) Identified items were searched in the Corpus of Contemporary American English (Davies, 2008-) to confirm frequency of usage. Based on previous literature, all items except idioms and proverbs met criteria of at least 10 per million (Nekrasova, 2009), whereas idioms and proverbs had frequencies of less than 100 per million (with the exception of *life goes on*, which met the operational definition, but was an outlier due to higher usage).

Table 1. List of familiar language categories in order of Sidtis's (2004) continuum from most reflexive to most conventionalised, operational definitions, and exemplars.

Category	Operational definition	Examples
1 Pause fillers (Fuller, 2000; Clark & Fox Tree, 2002)	Five recognized, grammatically optional word and non-word items generally used during word retrieval or reformulation; annotated by "&" in CLAN	*um, uh, like, I_mean, you_know*
2 Interjectional phrases (Ameka, 1992; Goffman, 1978; Wilkinson & Kitzinger, 2006)	Response cries with emotional valence that reflect state of mind such as surprise, disgust or sympathy including expletives, and not directed to a listener (i.e., not in 2nd person)	*For Christ sakes! Oh man! Thank goodness!*
3 Vocatives (MacWhinney, 2000)	Utterance-initial discourse markers annotated in CLAN by "‡" that are not phatic interjections or parts of interjectional phrases	*well, so, okay, alright, anyway, yeah*
4 Phatic interjections Stivers, 2019; Ward, 2004)	Responses to direct or implied polar questions and statements requiring a variant of yes/no (including dialogue within story-telling), but excluding non-lexical sounds	*Nope. I'd say. Yes ma'am.*
5 Greetings and farewells (Ameka, 1992)	Conversational routines used specifically in the beginning or end of an interaction	*How've you been? Happy to see you. Gotta go.*
6 Speech formulas (Van Lancker Sidtis & Rallon, 2004)	Context-bound, able to stand alone, purposeful (i.e., realizing a pragmatic function)	*I have no idea. Just go with it. Thanks so much!*
7 Idioms and proverbs (Van Lancker Sidtis & Rallon, 2004)	Idioms: largely non-transparent, contextually-free expressions. Proverbs: expressions intended to make a point and may be non-transparent or literal.	*Pours out her heart. He cleans up well. The time has come and gone. We're gonna whip this thing.*
*8 Formulaic sequences (Jeong & Jiang, 2019; Nekrasova, 2009)	Structurally complete multi-word expressions (grammatically optional) with a unitary but neutral semantic representation and are relatively fixed	*that kind of thing, as a matter of fact, at that time, first of all, or whatever*
*9 Lexical bundle (Conrad & Biber, 2005; Jeong & Jiang, 2019)	Multi-word utterances with relatively neutral meanings that are structurally incomplete (spanning phrasal boundaries) and may perform a bridging function; includes sentence stems	*to the point where, that depends on, kind of like a, in the process of, I'm not sure if*

* indicates lexical bundle category in Sidtis's (2018) three-category model, whereas all other items are categorized as formulaic expressions.

3) Once identified, the two authors independently classified items by type. Table 1 summarizes the nine familiar language types that were examined in this study. Items in the table are ordered along Van Lancker Sidtis' continuum model (Sidtis, 2004) from highly reflexive to propositional. The first seven types are considered formulaic expressions, whereas the last two are categorized as lexical bundles in Van Lancker Sidtis' three-category model (Sidtis, 2018).

4) The two authors compared classifications then adjudicated coding differences through a consensus process by comparing individuals' responses to the relevant operational definition (Van Lancker Sidtis & Rallon, 2004). In most cases, discrepancies were due to lack of context. For example, the item *I would say* could either be classified as a speech formula ("I would say!") or lexical bundle ("I would say that he . . . "). In such cases, the item was included in more than one category (e.g., both speech formula and lexical bundle), the significance of which will be discussed in step 7.

5) Searchable lists for each of the nine item types were created in CLAN. Familiar items on these lists were occasionally modified to include errorful productions (i.e., the formulaic sequence *a long time ago* was searched as [long time *] and [long * ago] to catch cases where "time" or "ago" were omitted).

6) For each language context and participant group, CLAN commands were run to search familiar language items by type. The output of these searches included the total number of productions per item for each participant (e.g., TC, Cinderella, pause fillers, Wright95: 7 *like*, 4 *uh*, 4 *um*, 0 *I mean*, 0 *I know*).

7) As referenced in step 5, for those items that could be classified as more than one type, coders examined the relevant transcript to determine the item type based on context. For example, if the output for Capilouto40 noted three occurrences of *I would say*, upon examining the context of each occurrence, the coder adjusted values to accurately reflect that two tokens were used as speech formulas and one token was used as a lexical bundle.

8) The first author reviewed data to verify that cross-listed items were not counted twice and to adjudicate any items of concern marked by the research assistants. During this process, the decision was made to remove the item *oh* from further analyses unless it was part of an interjectional phrase (e.g., *oh man*) because of low agreement in classification.

In addition to coding familiar language, two proxy measures were selected from the available data to examine the influence of linguistic competence on familiar language usage. The measures included Aphasia Quotient (AQ), which was used as a global score of language ability, and total words per sample (i.e., for all four language contexts). These measures were highly correlated as discussed below.

Analyses

For each participant's language sample, the number of tokens was summed for each familiar language type. Because there was significant variation in the length of participants' language samples, productive output was controlled by using percentages (i.e., number of tokens divided by total words in the language sample) rather than raw number of familiar items. Total tokens by category and percentages were calculated for each language context. To examine the research questions, nonparametric statistics were used because the groups' distributions did not meet assumptions of normality. Kruskal–Wallis tests were run to analyze the main effects of group on familiar language categories and contexts. Spearman rank correlations compared differences based on severity of language impairment.

Results

Participant demographics

Demographic information for the 154 Aphasiabank participants is provided in Supplementary materials including identification number, gender, age, years of education, and AQ from the WAB-R (Kertesz, 2007). AQ scores for PWA diagnosed with Broca's aphasia on the WAB-R were in the moderate to severe range (mean = 50.31, SD = 15.73, range = 10.8–77.6). Participants had acquired aphasia due to cerebral vascular accident with the exception of two individuals (one open head injury, one post-encephalitis). PWA were matched with TCs by age and gender as confirmed by independent samples t-test and Fisher's exact test respectively (PWA age mean = 58.5, SD = 12.54; TC age mean 59.5, SD = 13.44; $t(152) = -0.479$, p = n.s.; PWA male = 51; TC male = 52; Fisher's exact = 1.00, n.s.). Three substitutions were made for the TC group because the originally selected participants were missing the three conversational contexts. The mean number of years of education was slightly higher in TCs as compared to PWA (PWA mean = 14.85, SD = 2.68; TC mean = 15.70, SD = 2.40; $t(148) = -2.057$, $p = 0.041$).

Between-group comparisons of types of familiar language

Mean total percentages of familiar language for each of the nine types were compared across participant groups (see Figure 1). As predicted, there were several subtypes of formulaic expressions in which group means for PWA were significantly higher than for TCs. Pause fillers were by far the most prevalent category of familiar language produced by participants, and PWA used far more fillers than TCs as indicated by the large difference in group means (PWA: mean = 17.76%, SD = 1.05%; TC: mean = 4.60%, SD = 2.69%; H(2) = 73.19; P = <0.001, $\eta^2 = 0.475$). PWA also demonstrated significantly higher percentages of phatic interjections (PWA: mean = 5.98%, SD = 7.55%; TC: mean = 0.14%, SD = 0.14%; H(2) = 99.98; P = <0.001, $\eta^2 = 0.651$) and speech formulas (PWA: mean = 3.40%, SD = 3.79%; TC: mean = 0.30%, SD = 0.20%; H(2) = 59.43; P = <0.001, $\eta^2 = 0.384$). The group difference in phatic interjections is a reflection of PWA's responses to interlocutors who provided relevant content (e.g., Investigator: "Did Cinderella go to the ball to meet the prince?" PWA: "Yes".) in contrast to TCs who did not require prompts to accomplish the task. Although higher percentages of interjectional phrases and greetings/farewells were also seen in PWA as compared to TCs, these statistically significant differences had small effect sizes likely because overall usage patterns were low (interjectional phrases PWA: mean = 0.530%, SD = 0.830%; TC: mean = 0.016%, SD = 0.044%; H(2) = 22.42; P = <0.001, $\eta^2 = 0.141$; greetings/farewells PWA: mean = 0.152%, SD = 0.506%; TC: mean = 0.010%, SD = 0.042%; H(2) = 5.51; P = <0.019, $\eta^2 = 0.030$). Finally, mean percentages of vocatives were slightly greater for PWA than TCs, but these results were

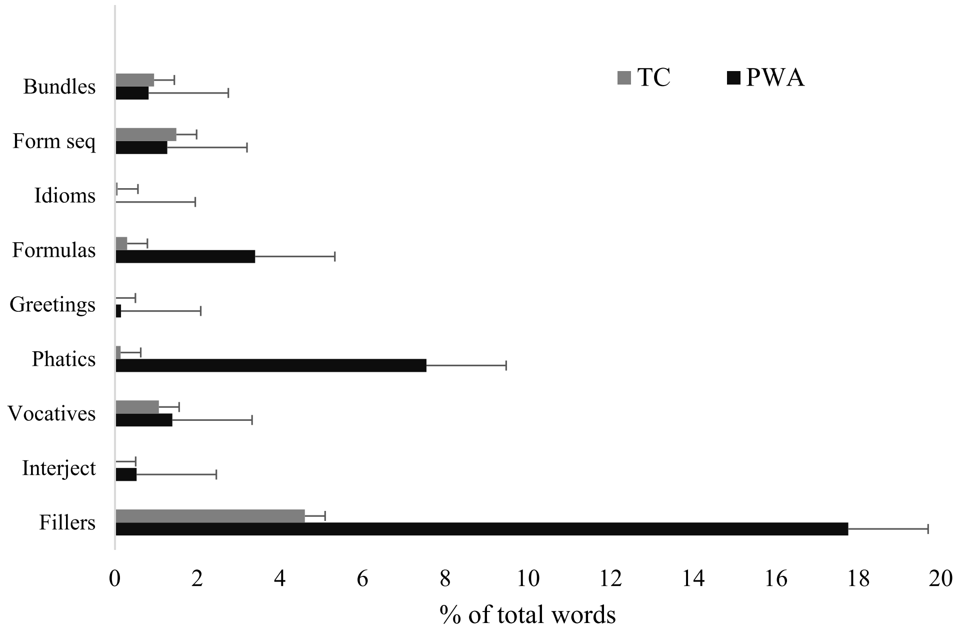

Figure 1. Mean percentages of familiar language types by participant group out of the total number of words across language samples. Lex bundles = Lexical bundles; Form seq = Formulaic sequences; Idioms = Idioms and proverbs; Formulas = Speech formulas; Greetings = Greetings and farewells; Phatics = Phatic interjections; Interject = Interjectional phrases; Fillers = Pause fillers.

not statistically significant (PWA: mean = 1.394%, SD = 1.517%; TC: mean = 1.068%, SD = 0.547%; H(2) = 0.01; P = n.s.).

For three types of familiar language, TCs' usage was higher than PWA's as demonstrated by statistically significant differences in group means. Idioms and proverbs – which are considered formulaic expressions in the three-category model – were a small percentage of the overall sample, yet group means for TCs were higher than those of PWA (PWA: mean = 0.02%, SD = 0.07%; TC: mean = 0.07%, SD = 0.01%; H(2) = 28.97; P = <0.001, η^2 = 0.184). Of the two types of more conventionalized familiar language that were examined, formulaic sequences represented a higher percentage in the language samples than lexical bundles (formulaic sequences PWA: mean = 1.272%, SD = 1.581%; TC: mean = 1.492%, SD = 0.644%; H(2) = 9.39; P = 0.002, η^2 = 0.055; lexical bundles PWA: mean = 0.820%, SD = 1.045%; TC: mean = 0.953%, SD = 0.461%; H (2) = 9.38; P = 0.002, η^2 = 0.055). Contrary to predictions, there were minimal differences between groups in usage patterns for these two categories; group means were higher for TCs than PWA, but the effect sizes reflecting these differences were negligible.

Familiar language usage by language ability

In order to further understand patterns of differences in familiar language use, Spearman's rank correlations examined relationships between types of familiar language and linguistic competence. Table 2 summarizes relationships between categories as well

Table 2. Results of Spearman's rank correlations showing relationships between familiar language types, total word count for each participant, and aphasia quotient.

	1	2	3	4	5	6	7	8	9	10	11
1-Phatics	-	0.24 *	0.03 n.s.	0.50 **	−0.46 **	−0.39 **	−0.25 *	0.59 **	−0.62 n.s.	−0.81 **	−0.80 **
2-Interject	0.24 *	-	0.32 **	0.33 **	−0.09 n.s.	0.00 n.s.	0.02 n.s.	0.31 **	0.20 n.s.	−0.20 n.s.	−0.34 **
3-Greeting	0.03 n.s.	0.32 **	-	0.23 *	0.01 n.s.	0.10 n.s.	−0.11 n.s.	0.17 n.s.	0.12 n.s.	−0.02 n.s.	−0.13 n.s.
4-Formulas	0.50 **	0.33 **	0.23 *	-	−0.27 n.s.	−0.92 n.s.	−0.79 n.s.	0.41 **	0.03 n.s.	−0.50 **	−0.58 **
5-Idioms	−0.46 **	−0.09 n.s.	0.01 n.s.	−0.27 **	-	0.22 *	0.24 *	−0.30 **	−0.03 n.s.	0.45 **	0.44 **
6-Form seq	−0.39 **	0.00 n.s.	0.10 n.s.	−0.09 n.s.	0.22 *	-	0.34 **	−0.12 n.s.	0.16 n.s.	0.39 **	0.31 **
7-Bundles	−0.25 **	0.02 n.s.	0.11 n.s.	−0.08 n.s.	0.24 *	0.34 **	-	−0.23 *	−0.06 n.s.	0.30 **	0.25 *
8-Fillers	−0.59 **	0.31 **	0.17 n.s.	0.41 **	−0.30 **	−0.12 n.s.	−0.23 *	-	−0.03 n.s.	−0.63 **	−0.62 **
9-Vocative	−0.06 n.s.	0.20 n.s.	0.12 n.s.	0.03 n.s.	−0.03 n.s.	0.16 n.s.	−0.06 n.s	−0.03 n.s.	-	0.10 n.s.	0.02 n.s.
10-Words	−0.81 **	−0.20 n.s.	−0.02 n.s.	−0.50 **	−0.45 **	0.39 **	0.30 **	−0.63 **	0.09 n.s.	-	0.85 **
11-AQ	−0.80 **	−0.34 **	−0.13 n.s.	−0.58 **	0.44 **	0.31 **	0.25 *	−0.62 **	0.18 n.s.	0.85 **	-

Statistical significance is denoted by * = < 0.01; ** = < 0.001; AQs for TCs are entered as 100.

as the two proxy measures of language ability. The correlation between total word count and AQ was high (0.845, $p < 0.001$, $r^2 = 0.714$) suggesting that these measures represent similar underlying constructs. Because of the chance of error due to running multiple correlations, alpha was lowered to < 0.01.

The findings yielded interesting patterns of familiar language use across individuals. Strong negative correlations were found between word length and phatic interjections ($\rho = -0.812$, $p < 0.001$, $r^2 = 0.659$), speech formulas ($\rho = -0.499$, $p < 0.001$, $r^2 = 0.250$), and pause fillers ($\rho = -0.626$, $p < 0.001$, $r^2 = 0.392$). AQs were also inversely related to phatic interjections speech formulas, and pause fillers. In addition, higher percentages of interjectional phrases were correlated with larger percentages of phatic interjections ($\rho = 0.235$, $p = 0.003$, $r^2 = 0.055$), greetings/farewells ($\rho = 0.316$, $p < 0.001$, $r^2 = 0.100$), speech formulas ($\rho = 0.325$, $p < 0.001$, $r^2 = 0.101$), and pause fillers ($\rho = 0.312$, $p < 0.001$, $r^2 = 0.097$). Combined, these findings suggested that individuals with reduced output and lower AQ scores produced greater numbers of responses to polar questions, pause fillers, and more reflexive familiar language structures such as speech formulas, greetings and farewells, and interjections. Conversely, findings demonstrated that participants with higher word counts produced more idioms and proverbs ($\rho = 0.449$, $p < 0.001$, $r^2 = 0.202$), formulaic sequences ($\rho = 0.387$, $p < 0.001$, $r^2 = 0.150$), and lexical bundles ($\rho = 0.298$, $p < 0.001$, $r^2 = 0.089$) suggesting a relationship between productive output and structures with more flexibility in spontaneous speech.

Between-group comparisons of familiar language use by language context

To explore effects of language context, Kruskal–Wallis tests compared mean percentages of total familiar language use across groups. For this and consecutive

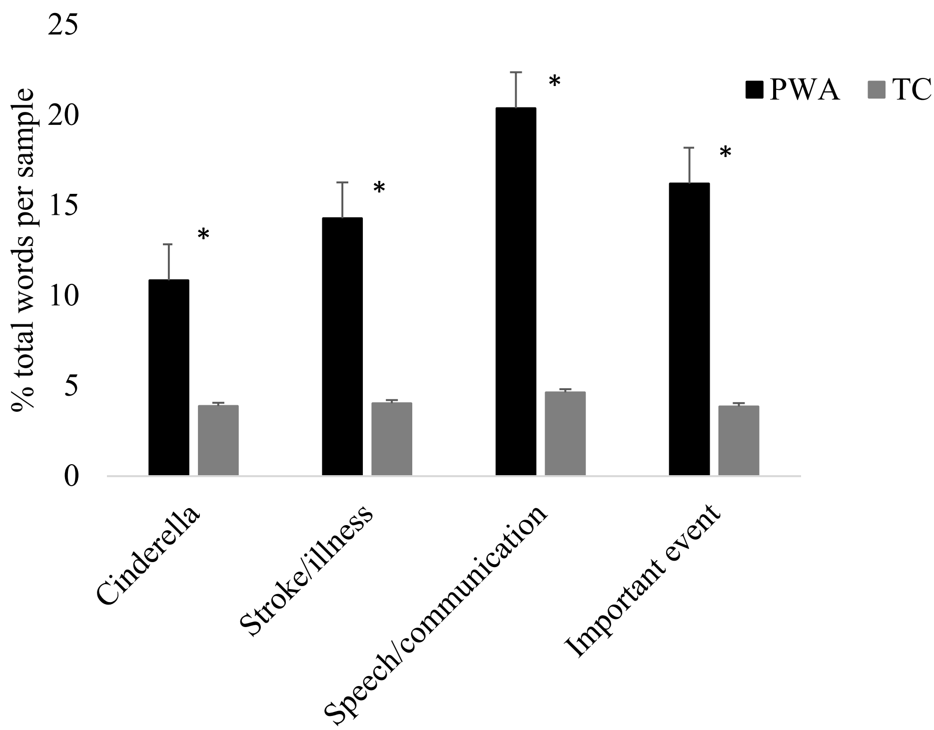

Figure 2. Group mean percentages of familiar language by language context out of the total number words per sample. * indicates statistical significance; pause fillers are excluded from mean percentages.

analyses, pause fillers were excluded from total familiar language percentages for two reasons: (1) these five items were disproportionately represented in the samples particularly for PWA, and (2) the transcription program CLAN did not include pause fillers in the total word count, thus these items should not technically be included in proportional values.

Statistically significant results were found between groups for all four language contexts: Cinderella story (PWA mean = 10.84%, SD = 11.80%; TC mean = 3.87%, SD = 1.56%; H(2) = 29.60; P = < 0.001, η^2 = 0.188), Stroke or Illness (PWA mean = 14.27%, SD = 9.96%; TC mean = 4.03%, SD = 1.98%; H(2) = 76.285; P = < 0.001, η^2 = 0.499), Speech or Communication (PWA mean = 20.37%, SD = 31.05%; TC mean = 4.62%, SD = 2.36%; H(2) = 27.89; P = < 0.001, η^2 = 0.179), and Important or Scary event (PWA mean = 16.20%, SD = 13.94%; TC mean = 3.85%, SD = 1.93%; H(2) = 59.533; P = < 0.001, η^2 = 0.395). Of note, the mean percentage of familiar language was quite stable for TCs across the four language contexts, around 4%, in striking contrast to the mean percentages for PWA, which ranged from 10.8–20.4% (see Figure 2). This range suggested that PWA were more affected by language context than TCs. Specifically, the Speech /Communication context had the highest percentage of familiar language for PWA even without pause fillers, yet with significant variability across participants as indicated by the standard deviation.

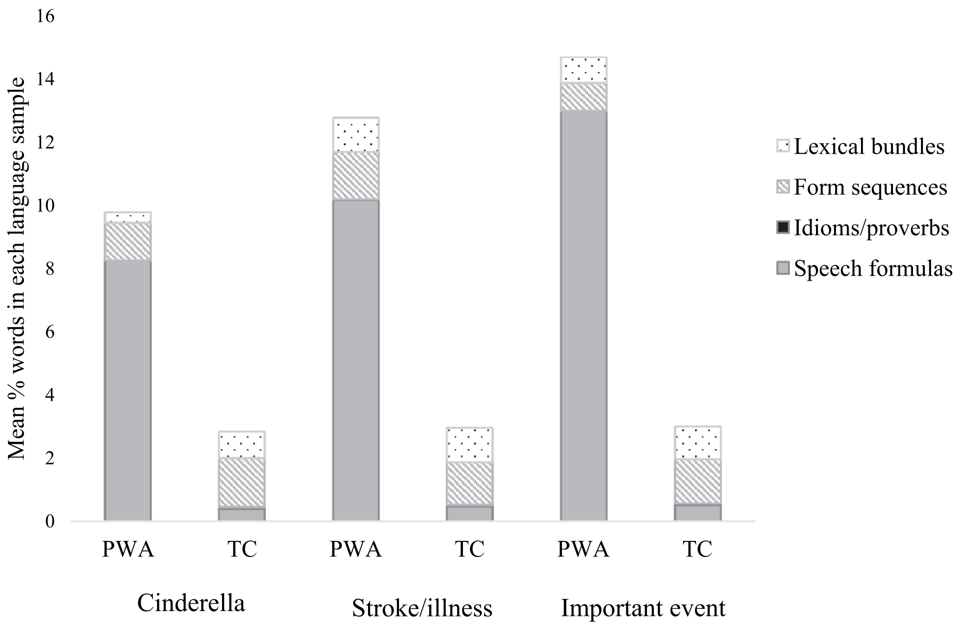

Figure 3. Familiar language usage patterns by participant group, type of familiar language, and language context.

Mean word counts for this language context were also far lower than for other contexts (Speech = 19, Cinderella = 97, Stroke = 98, Important event = 58).

Interactions between familiar language type, group, and language context

The final analysis explored how PWA's familiar language patterns compared to TCs' according to language context (see Figure 3). Because there is no available omnibus non-parametric test for analysing interactions, Kruskal-Wallis tests were run as post-hoc pairwise comparisons. Several steps were taken to reduce the dataset for these analyses. First, the Speech/Communication context was excluded because the prompt elicited considerably smaller samples for PWA than TCs largely consisting of single-word responses (e.g., Investigator: "How do you feel your speech is these days?" PWA: "Good".). Second, phatic interjections, interjectional phrases, and greetings/farewells were added to the category of speech formulas since (1) they individually represented low numbers, and (2) were included as speech formulas in Van Lancker Sidtis and Rallon (2004). And third, vocatives and pause fillers were excluded from analysis because of the following rationales: (1) no significant between-group differences were found for vocatives (addressed in the discussion), and (2) pause fillers were atypical for reasons discussed previously. In summary, for the two groups, mean percentages of four familiar language categories – speech formulas, idioms and proverbs, formulaic sequences, and lexical bundles – were compared across three language contexts. See Table 3 for a summary of data, statistical significance, and effect sizes.

Table 3. Mean group percentages, standard deviations, and statistical results for four familiar language types across three language contexts.

Familiar language category	Languagecontext	PWAMean %	PWASD %	TCMean %	TCSD %	H-statistic	P	η^2
Speech formulas	Cinderella	8.23	12.00	0.38	0.29	47.975	< 0.001	0.311
	Stroke/Illness	10.15	10.40	0.46	0.53	99.734	< 0.001	0.654
	Importantevent	12.95	14.09	0.50	0.74	72.552	< 0.001	0.483
Idioms/proverbs	Cinderella	0	0	0.07	0.14	21.149	< 0.001	0.133
	Stroke/Illness	0.03	0.14	0.05	0.15	4.446	0.035	0.022
	Importantevent	0	0	0.05	0.19	8.165	0.004	0.048
Formulaicsequences	Cinderella	1.20	1.74	1.55	0.09	14.593	< 0.001	0.090
	Stroke/Illness	1.50	1.88	1.35	1.04	0.958	0.328	0.006
	Importantevent	0.89	2.04	1.40	0.96	29.635	< 0.001	0.193
Lexicalbundles	Cinderella	0.34	0.62	0.84	0.69	34.886	< 0.001	0.224
	Stroke/Illness	1.08	2.22	1.09	0.94	12.131	< 0.001	0.074
	Importantevent	0.83	1.54	1.03	0.87	14.578	< 0.001	0.092

Beginning with speech formulas, there were highly significant differences between group means across the three language contexts. Although the TC group demonstrated fairly consistent mean percentages, the PWA group means for the two conversational language contexts were high in comparison to the story-telling context. All between-group differences for this familiar language type were statistically significant, but the effect size was greatest for the Stroke/Illness context.

The difference between group means for the category of idioms and proverbs across contexts was not as robust as for speech formulas, but was nonetheless remarkable. For the PWA group, participants produced no tokens for the Cinderella story and Important events contexts, and only three tokens (percent mean = 0.03%) for the Stroke/Illness context. The TC group percent means for all three contexts were significantly higher even though effect sizes were small.

Interesting interactions were observed in the formulaic sequences category. TC group means across language contexts were limited in range, whereas the PWA means were more dissimilar. Notably, for Stroke/Illness, the mean percentage for PWA was actually greater than the TC group's mean, but this difference was not statistically significant. For the other two contexts, in which the TC group produced more formulaic sequences than the PWA group, differences were statistically significant with small effect sizes.

Finally, the category of lexical bundles also showed some interesting patterns according to language context. Although all between-group differences were statistically significant, the largest difference in group means was in the Cinderella story context where PWA produced significantly lower percentages of lexical bundles than the TC group. The conversational speech contexts demonstrated similar results to previous categories in that TC percentage means were consistent, whereas PWA usage patterns varied.

To summarize, in contrast to TCs, speech formulas (e.g., *That's that.*) represented the largest percentage of familiar language for PWA across contexts with greater usage in conversational contexts than in story-telling. Production of idioms and proverbs (e.g., *out of the clear blue*) was fairly consistent across language contexts for both groups: PWA produced close to no tokens, whereas TCs produced these items albeit sparingly. Percentages of formulaic sequences (e.g., *that kind of thing*) were fairly similar across contexts with small group differences observed for one conversational topic and the story-telling context. The PWA group produced proportionally fewer lexical bundles (e.g., *it just so happened . . .*) than the TC group for all contexts, but the story-telling task showed the largest effect.

Discussion

In order to gain more nuanced insights into familiar language use in individuals with nonfluent aphasia and healthy controls, this study considered production of nine types of familiar language in four spontaneous language contexts for a large participant pool of two groups corresponding in age and gender. The main effects found for familiar language types and language contexts as well as interactions among variables not only provide a baseline for familiar language in typical spontaneous speech, but further quantify an over-reliance on certain structures in individuals with nonfluent aphasia. The discussion below will address how these findings contribute to models of familiar language and ultimately to clinical application.

Familiar language models

The design of this study was intended to test two proposed familiar language models that would be useful for clinical translation by examining typical and atypical usage patterns. In terms of the continuum model (Sidtis, 2004), the predicted between-group differences on the reflexive end of the continuum largely held true, whereas the converse prediction regarding the near-novel end of the continuum did not. Specifically, PWA did produce proportionally more pause fillers, interjectional phrases and speech formulas than TCs, which was further confirmed by the negative association between both AQs and word counts and these context-bound, more reflexive items (i.e., the lower the AQ and word count, the higher the percentage of reflexive language). On the other hand, there were minimal mean usage differences between groups in formulaic sequences and lexical bundles, which are on the other end of the continuum.

Overall, these findings adhere more closely to Van Lancker Sidtis's three-category model (Sidtis, 2018): individuals who struggle with propositional language rely heavily on formulaic expressions, whereas typical speakers may have a more balanced representation of familiar language items at their disposal. Idioms and proverbs were the one category that did not particularly fit with the model. Although Sidtis (2018) includes idioms and proverbs under formulaic expressions, the results of this study suggest that PWA rarely produce them. Idioms and proverbs are unique for a number of reasons that are beyond this study, but they may need reconsideration in models of familiar language (Carrol & Conklin, 2019). Notably, these analyses demonstrate how infrequently idioms and proverbs occur in spontaneous speech implying they should be considered less functional familiar language targets for intervention.

Future studies should also more closely examine the 2018 model's categories of lexical bundles and collocations, which were under-represented in this study. Work on collocations is particularly well-suited, and in fact the focus, for frequency-based methods (Bruns et al., 2018; Zimmerer et al., 2018) that automate searches by identifying word combinations in language samples. To date, these studies suggest that PWA may produce more collocations than TCs, although – as noted by Sidtis (2018) – there is considerable overlap between categories, which may confound results. For example, the phrase *I don't care* is a collocation because these words frequently co-occur, but it is also either a speech formula/formulaic expression or lexical bundle when used with a complement. Although frequency-based methods avoid this problem by circumventing the need to identify familiar language types, the three-category (2018) model provides a framework for examining various linguistic and sociolinguistic dimensions that might influence usage patterns, work that is currently underway in our lab.

Another recent study examined a type of collocation known as binomials (e.g., up and down) that are used clinically in sentence completion tasks for PWA (Torrington Eaton & Newman, 2018). Findings from this study suggested that TCs were more influenced by frequency than PWA in binomial completion, which is potentially problematic for the prediction that PWA use more collocations than TCs. On the other hand, such conclusions should be drawn with caution because of differences in language context, which will be discussed next.

Effects of language context

Similar to results by Bruns et al. (2018), this study found familiar language differences across two types of spontaneous speech (see also Lum & Ellis, 1999; Van Lancker Sidtis & Yeun, 2017). Findings from the current study indicated that for PWA, the story-telling context elicited the least amount of familiar language as compared to conversational contexts, while the mean percentages for TCs across all four contexts were rather stable. PWA also produced proportionally fewer speech formulas and lexical bundles in story-telling compared to conversational contexts; interestingly, similar effects were seen in TCs for these two categories as well. The fact that patterns of familiar language use differ when individuals recite a well-known story versus a personal event is intriguing, and would certainly benefit from further study.

It is also important to note differences in familiar language production between conversational contexts. When PWA were asked how they felt about their speech, familiar usage was considerably higher than for other topics, which was likely a reflection of the highly automated responses elicited for this particular prompt (as compared to the three other prompts that elicited a narrative structure). A growing body of literature indicates that functional, interactive contexts, which differ from narratives, are essential considerations for assessing and treating language abilities in individuals with aphasia (e.g., Armstrong & Ferguson, 2010; Doedens & Meteyard, 2019; Leaman & Edmonds, 2020; Mcelduff & Drummond, 1991; Nykanen et al., 2013; Stahl et al., 2017). These considerations should also apply to interventions that target familiar language as will be discussed.

Limitations

There were a number of coding decisions for familiar language categories that likely affected the outcomes of this study. Vocatives was a category that was essentially identified by external transcribers. It was noted that some transcribers rarely or never annotated these utterance-initial, turn-taking items, while others used them extensively. The token "oh" was largely removed from the analysis, because it was inconsistently marked as a vocative in transcripts. Although there was no difference found between groups in this category, it is possible that this result was affected by transcription artefacts.

Other familiar language types, despite attempts to refine operational definitions, may have been less clean than desired. For example, a decision was made to include verbal phrases such as "hope for the best" and "get along fine" in the category formulaic sequences, whereas it could be argued that such items belong in either a new category altogether or as collocations. The token *a little/a little bit* was difficult to distinguish as a formulaic sequence (e.g., "I exercise a little bit") or a lexical bundle (e.g., "She's in a little bit of a pickle"). These items were not numerous, but highlight the difficulty in classification. While the consensus process - as adopted from previous studies - seems effective in addressing inconsistencies, future studies should explore alternate methods of reporting such as calculating inter-rater reliability.

Clinical significance

The study of familiar language has tremendous potential to influence aphasia intervention. Stahl and Van Lancker Sidtis (2015) justifiably argued that many established interventions (e.g., SPPA, VCIU, MIT, ILAT, and script training) can and should be recognized as targeting familiar language. These and other therapies would benefit from a more purposeful approach to familiar language. For example, formulaic expressions can be systematically integrated in scripts to lessen cognitive demands and increase generalizability across language contexts. An established familiar language framework can be used to design more effective treatment progressions for building on preserved automatic speech such as in VCIU and ILAT. Targeting high frequency lexical bundles can challenge patients to formulate more complex sentence structures. These suggestions are intended to illustrate the potential for how our understanding of familiar language can reframe strength-based approaches to language intervention.

Note

1. To address a potential point of confusion, the label "lexical bundle" is used both as one of the three categories in Van Lancker Sidtis' model (Sidtis, 2018) and as a type of familiar language. In other words, lexical bundles are a type of item included in the category lexical bundle.

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