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Thought, Language, and Communication Interplay in Persons with Aphasia and Neurotypical Individuals - A Preliminary study

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Abstract: Background: Stroke affects language, and language affects thoughts and the ability to communicate. Language has the primary function of enhancing communication, and enhancing thought as the secondary function. This explains the interlink between Thought, Language, and Communication (TLC), thus creating the need to explore TLC parameters in Persons with Aphasia (PWA) for a holistic perception of communication impairment. This study aimed to assess the TLC in PWA and to compare it with Neurotypical individuals (NTI). Method: A total of 10 participants (5 PWA and 5 NTI) were recruited for the present study. The conversational discourse samples on the neutral topic were collected and subjected to a perceptual 5-point rating based on domains of the Thought Language Communication Assessment Scale for Persons with Aphasia (TLCAS-PWA). Results and Discussion: The mean score was high in the communication domain, emphasizing that communication is affected among the domains of TLCAS - PWA. The comparison of TLC parameters between PWA and NTI was assessed using the Mann-Whitney U test, and the results showed a significant difference between PWA and NTI. The parameters of TLC exhibited by PWA were similar to Persons with Thought Disorder (PWTD), as there is an overlap of TLC. The parameters of TLC exhibited by PWA and PWTD were similar due to the linkage of TLC. Conclusion: PWAs should undergo TLC assessment in their routine clinical evaluation for a holistic perception of Communication impairment.

Keywords: Thought, Language and Communication, Persons with Aphasia, Persons with Thought Disorder

1. Introduction

Aphasia is a language disorder that can lead to difficulties in organizing thoughts and ideas, which affects the ability to communicate effectively. In persons with aphasia, cognitive impairment is frequently observed (Helm-Estabrooks, 2002). Cognition is the process of understanding and acquiring knowledge through thought, experience, and the senses (Dhakal & Bobrin, 2023). Thought is considered the central process involving semantic and syntactic facts, and language is a peripheral process (Moravcsik, 1981). The greatest storehouse of 'thought' is language and the primary function of 'language' is to enhance communication and the secondary function of language is the thought enhancement. It implies that language is considered an "instrument of thought" (Jackendoff, 2002). Formulation of thought is the underlying process for language production. Language production begins once the speaker formulates the thought. For 'thought' and 'communication' language is the semiotic system (Zlatev, 2015) showing the interlink of Thought, Language, and Communication.

The interrelation between thought and language is also supported by radiological reports showing a decreased volume of the left posterior temporal gyrus in people with thought disorder (PWTD) (Shenton et al., 1992). In patients with schizophrenia with thought disorder, 'Left superior temporal gyrus, the planum temporale, and orbital frontal cortex' showed structural abnormalities. Based on positron emission tomography and fMRI, the correlations between 'thought disorder and the left superior temporal gyrus' are reported (Radanovic et al., 2012). Functional neuroimaging on formal thought disorders with different language and speech-processing aspects showed deficits in the 'left superior temporal gyrus and superior and inferior frontal brain regions' (Wensing et al., 2017).

Persons with Aphasia experience difficulty in expressing their thoughts and feelings with words (Benson, 1973). With reference to the language characteristics at the word level, the Research evidence showed that the language characteristics exhibited were observed to be similar between Thought and Language disorders. The overlapping characteristics were 'perseveration, echolalia, neologism and paragrammatism and word salad' (Benson, 1973). Persons with thought disorder (PWTD) exhibited intermittent aphasia and similar language characteristics were found in fluent aphasia (Wernicke's aphasia). The common characteristics experienced were 'increased fluency in spontaneous speech, paraphasias, impoverishment of content and idiosyncrasies in the use of words, associative loosening, and incomprehensible and meaningless speech' (Jilani et al., 2019).

From this review of the literature, it becomes apparent that there are notable similarities in language characteristics and lesion locations between thought disorder and aphasia. If the language features exhibited by individuals with thought disorders closely resemble those found in aphasia, it is plausible that individuals with aphasia might also exhibit thought disorder characteristics. This underscores the importance of conducting further research in this area. It is crucial to recognize that the primary objective of both thought and language is to facilitate successful communication. By gaining a more profound understanding of the relationship between thought and language in aphasia, it becomes possible to develop a comprehensive protocol for assessment and intervention. Incorporating both thought disorder and aphasia characteristics into intervention strategies may lead to more effective outcomes. The present study is an attempt to assess thought, language, and communication in persons with aphasia (PWA) using the Thought, Language, and Communication Assessment Scale for Persons with Aphasia (TLCAS-PWA) since there is an interaction between language, thought, and communication. The overlapping character of language and thought makes the speech-language pathologist treat them together and cannot be treated separately (Lupyan, 2012). The impairment of one (either Thought or Language) will have an impact on communication. Thus, the current study hypothesizes that people with language disorders also exhibit thought disorder characteristics. Therefore, there is a need to assess the thought, language, and communication in persons with aphasia and compare the TLC parameters with neuro-typical individuals.

2. Material and Method

2.1 Material used for analyzing Thought, Language, and Communication

The Thought, Language, and Communication Assessment Scale for Persons with Aphasia (TLCAS–PWA) was developed by reviewing the literature and selecting the parameters related to Thought, Language, and Communication that suit PWA. The steps adapted for the selection of parameters and their operational definition were based on a similar study, A rating scale for the assessment of objective and subjective formal Thought and Language Disorder (TALD) (Kircher *et al.,* 2014). The scale consisted of 14 parameters related to Thought, Language, and Communication, divided into three domains. The three domains of TLCAS–PWA were classified based on the parameters: 1. Communication disorders, 2. Language disorders, and 3. Thought disorders. The parameters of 'communication disorders' were 'poverty of content of speech', 'distractible speech', 'tangentiality', 'loss of goal', 'perseveration', 'echolalia', 'blocking', 'self–reference', and 'circumstantiality'. The parameters of 'language disorders' were 'incoherence', 'clanging', and 'neologism'. The parameters of 'thought disorders' were 'poverty of speech' and 'illogicality'. Apart from the rating of each parameter under the domains of Communication, Language, and Thought, a Global rating was also given. The global rating is the investigator's overall perception of the participant's TLC impairment observed during the conversation. The thought was assessed based on the judgment of the participant's speech (Thomas, 1995). Scores were given based on the frequency of occurrence of parameters of communication, language, thought disorders, and global rating using a 5-point perceptual rating scale. The rating scale consisted of a uniform rating where '0' represented the absence of the occurrence of the TLC parameter, '1' represented mild (occurrence of the parameter of TLC for one time during the conversation), '2' represented moderate (occurrence of TLC parameter for two to four times during the conversation), '3' represented severe (occurrence of TLC parameter for five to ten times during the conversation), and '4' represented extreme (occurrence of TLC parameter for more than ten times during the conversation). The total score was calculated using the formula: Total score = Communication parameters + Language Parameters + Thought parameters. The selected parameters were subjected to content validation by two experienced Speech-Language Pathologists and one Psychologist based on relevance, comprehensibility of the operational definition, and coverage of parameters that suit PWA. All the professionals

accepted the inclusion of all the parameters, and modifications were suggested for operational definitions. Appropriate suggestions were incorporated, and final TLCAS-PWA was developed.

2.2 Participants

The present study followed a standard group comparison design. A total of 10 participants were considered for the present study. Five were persons with aphasia (PWA) and 5 were neurotypical individuals (NTI). The diagnosis of aphasia was confirmed by the administration of Western Aphasia Battery – R (Kertesz, 2007) by using Tamil as the language of administration. Additional confirmation by the Speech-Language Pathologist and the neuroradiologist based on the neuroimaging was done. All the participants were right-handed, native Tamil speakers, with normal or corrected vision. Both monolingual and bilingual were considered; L1 was Tamil, and L2 and/ or L3 were English or other Indian languages. The age range of the participants of the current study was 42 to 65 years. The participants were recruited from Hospitals, Speech and Hearing Institutes, and Private clinics from Tamilnadu and Pondicherry. The Persons with Aphasia were selected based on the AQ scores of WAB (Kertesz, 2007), by assessing for spontaneous speech, auditory verbal comprehension, repetition, and naming domains of WAB. Both fluent and non-fluent types of aphasia, with severity ranging from mild to severe based on the AQ scores of WAB, were considered for the study. Participants were AQ scores of 0 – 25 (Very severe aphasia) on WAB were excluded from the study as they had minimal verbal response, as it was difficult to make an inference from the limited speech output.

The neurotypical individuals were free from any neurological or psychological illness as per the administration of the General Health Questionnaire (Golderberg & Williams, 1988). The participants' demographic details are shown in Table 1.

Table 1. Demographic details of the clinical participants (Persons with Aphasia)

S. No	ID	Age	Gender	Language known	Handedness	Type of Aphasia	TPO	MRI/ CT
P1.	AA1	45	M	T, E	Right	Anomic	1	Left MCA
P2.	BA1	61	M	T, E	Right	Broca's	8	Left internal capsule
P3.	AA2	51	F	T	Right	Anomic	12	Left gangliocapsular
P4.	AA3	42	M	T, E	Right	Anomic	7	Left MCA
P5.	BA2	65	M	T	Right	Broca's	9	Left MCA

*TPO – Time Post Onset, M – Male, F – Female, T – Tamil, E – English, MCA – Middle Cerebral Artery, AA – Anomic Aphasia, BA – Broca's Aphasia

2.3 Ethical considerations

The present study was carried out after approval by the Ethical Committee for Bio-Behavioral Research involving human subjects. Informed consent was obtained from all the participants as per the ethical guidelines for bio-behavioral research involving human subjects (Reference code: No DOR.9.1/Ph.D/LSM/928/2021-22). The need, aim, and procedure with the approximate duration were explained to the participants and their caregivers by assuring the safety during testing and confidentiality regarding their details.

2.4 Procedure

The semi-structured interview was carried out by asking the participants to talk about themselves (self-introduction) and engage in conversation on a neutral topic such as present 'COVID-19 PANDEMIC condition' or 'OUR COUNTRY INDIA'. Pre-defined questions from the spontaneous task of WAB – R were used as they include general information that is of more personal relevance and familiarity as it involves organizing thoughts and maintaining coherence. Also, it consists of open-ended questions where the participants generate spontaneous speech involving language production abilities beyond simple repetition and naming. Conversational samples on the above topics were obtained by asking the participants to sit comfortably in a quiet room. All the conversational samples were audio-recorded in a quiet room with no distractions during the recordings. For the clinical group, recordings were done in the presence of the caregiver to ensure the accuracy of the information provided. During the recording, verbal prompts were given to the clinical group by the examiner. The recordings were done in the absence of a caregiver

for the control group. During the conversations, the investigator provided minimal verbal prompts (e.g., *"Can you tell me more?"*, *"What happened next?"*) to facilitate continued discourse, particularly for the clinical group, without introducing content or leading responses. These prompts were standardized across participants to maintain consistency.

Data analysis of this study was carried out using the Statistical Package for Social Science (SPSS) version 26. TLCAS–PWA scores are presented with descriptive statistics including the mean, standard deviation, sum of ranks, and mean ranks. On the Shapiro-Wilk test, it was found that the scores were not normally distributed. Non-parametric test, the Mann-Whitney *U* test was done to find the difference between PWA and NTI based on the parameters of TLCAS-PWA. These analyses were discussed below with the null hypothesis stating that there is no significant difference in Thought, Language, and Communication parameters in Persons with Aphasia and Neurotypicals.

3. Results

The results of the present study are explained in two sections. Session A describes the descriptive analysis with reference to mean, median, and standard deviation for Thought, Language, and Communication parameters. Session B is the comparison of Thought, Language, and Communication parameters between PWA and NTI.

3.1 Section A

The results of descriptive statistics with reference to the mean, median, and standard deviation for the parameters of thought, language, and communication domain of TLCAS–PWA were found to be lower for PWA than NTI, as shown in Table 2.

Table 2. Mean, Median, and Standard Deviation of parameters of Thought, Language, and Communication Assessment Scale for Persons With Aphasia and Neuro-typical Individual.

TLCAS–PWA Domains	Parameters	Groups					
		PWA (N = 5)			NTI (N = 5)		
		Mean	Median	SD	Mean	Median	SD
Communication Disorders	PCS	2.2	2	0.83	0.6	1	0.54
	DS	0	0	0	0.2	0	0.44
	TGT	0	0	0	0	0	0
	LOG	0	0	0	0	0	0
	PSVT	0	0	0	0	0	0
	ELL	0	0	0	0	0	0
	BLK	1.8	2	0.44	0.4	0	0.54
	SR	1	1	1	0	0	0
	CIRCUM	1.8	2	0.44	0	0	0
Language disorders	IC	0.6	1	0.54	0.4	0	0.54
	CLG	0	0	0	0	0	0
	NLG	0	0	0	0	0	0
Thought disorders	POS	2	2	1	0.4	0	0.54
	ILGT	0.6	1	0.54	0	0	0
Global rating		1.6	2	0.54	0.2	0	0.44

*Note: PWA – Persons With Aphasia, NTI – Neuro-typical Individuals, PCS – Poverty of content of speech, DS – Distractible speech, TGT – Tangentiality, LOG – Loss of goal, PSVT – Perseveration, ELL – Echolalia, BLK – Blocking, SR – Self-reference, CIRCUM – Circumstantiality, IC – Incoherence, CLG – Clanging, NLG – Neologism, POS – Poverty of Speech, ILGT – Illogicality.

Since ratings were considered, median values are also given. The mean scores were higher for the parameters Poverty of Content of Speech (PCS) and Blocking (BLK) and global rating for the PWA Group than for the NTI Group. The mean scores were obtained for the parameter Distractible Speech (DS) in NTI, and it was

observed to be absent in PWA. The parameter Circumlocution (CIRCUM) was observed to be present in PWA and absent in NTI.

The mean, median, and standard deviation for the domains of TLCAS – PWA for both groups are shown in Table 3. The mean scores were higher for all the domains of TLCAS-PWA than NTI. Among the domains of TLCAS-PWA, the mean of the domain of parameters related to communication disorders is higher than that of parameters related to language disorders and thought disorders. Higher mean scores showed that there is greater impairment in the domain of parameters related to Communication disorders. With reference to the sum of rank and mean rank, both PWA and NTI had an equal sum of rank (15.00) and mean rank (3.00). Some of the illustrations of parameters of TLCAS-PWA is shown in Table 4.

Table 3. Mean, Median & standard deviation of domains of Thought, Language, and Communication Assessment Scale for Persons With Aphasia and Neuro-typical Individuals

Domains of TLCAS - PWA	Groups	N	Mean	Standard Deviation
Communication disorders	PWA	5	6.8	0.44
	NTI	5	1.2	0.83
Language disorders	PWA	5	1.2	0.44
	NTI	5	0.4	0.54
Thought disorders	PWA	5	2.6	1.34
	NTI	5	0.4	0.54
TLC Total	PWA	5	10.6	1.2
	NTI	5	0.4	0.54

*Note: TLCAS – PWA – Thought, Language and Communication Assessment Scale for Persons With Aphasia, PWA – Persons With Aphasia, NTI – Neuro-typical Individuals

Table 4. Some Illustrations for the parameters of TLC

Domains	Participant ID	Parameter	Definition	Example	Supporting evidence in PWA
Parameter related to Communication Disorder	AA1	Circumlocution	The pattern of speech that is indirect or delayed in reaching its goal.	*Investigator:* COVID-19 naala enna enna precautions eduthenga? (What precautions were taken during COVID-19?) *PWA:* face cover panna sonnaga (We were asked to cover face) *Investigator:* Endha vachi cover panna sonnaga? (With what everyone were asked to cover the face?) *PWA:* chinnadha kerchief maari irukum, vaai and kaadhu ah cover pannum. Rendu ears la	Present in Broca's aphasia (Nasrullah et al., 2021)

				poduvom…. White colour la irukum (Explanation given by PWA to describe Mask: The description was, that it will be small in size and used to close the mouth and nose, will wear in the ears, and white in color)	
Parameter related to Language Disorder	AA2	Incoherence	The usage of random words substituted at the semantic level changes the meaning of the sentence.	*Investigator:* Mask enga poduveenga? (Where do you put mask?) *PWA:* Face uh…mask uh…avanga katnanga (face….mask….they showed) *Investigator:* avanga enna katnaga? What did they show? *PWA:* Kizha vilum podhu katnanaga (they showed when I fall)	Anomic, Wernicke's, and Conduction aphasia (Linnik et al., 2016).
Parameter related to Thought Disorder	BA1	Poverty of Speech	The responses are brief, concrete, and unelaborated	*Investigator:* COVID-19 endha maasam endha varusham start aachi? (When did COVID-19 come in terms of month and year?) *PWA:* 2020 *Investigator:*enna enna precautions eduthenga? (what are the precautions taken?) *PWA:* Mask potom (Wearing the mask)	Non-fluent aphasics speaks in short sentences (Le & Lui, 2023).

3.2 Section B

Mann-Whitney U test was administered to find the difference in domains of TLCAS – PWA between Persons with Aphasia and Neuro-typical Individuals. The results showed a significant difference between PWA and NTI for the domain of parameters related to communication disorder total, language disorders, thought disorders, global rating, and the TLC total as shown in Table 5.

Table 5. Results of Mann – Whitney Test for the domains of TLCAS – PWA for comparison between PWA and NTI

Parameters related	/z/	p value
Communication disorders	2.712	0.007*
Language disorders	2.032	0.042*
Thought disorders	2.479	0.013*

TLC total	2.805	0.005*
Global rating	2.545	0.011*

*Note: Statistically significant at 5% level of significance

4. Discussion

The present study aimed to compare the Thought, Language, and Communication parameters of TLCAS – PWA in the PWA and NTI groups. The major findings of the present study showed higher scores in parameters related to Communication disorders, Language disorders, and Thought disorders for PWA in comparison with the NTI group. Among PWA, parameters related to communication disorders were found to be more impaired when compared to parameters related to Language and Thought disorders. The observation found that the parameters of Thought, Language, and Communication (TLC) exhibited by People with Aphasia (PWA) were similar to those of Persons with Thought Disorders (PWTD) where PWTD was not included in the study but served for comparison of with PWA. This indicates that the TLC parameters between PWA and PWTD were found to be overlapping as the language characteristics exhibited by PWA overlapped with PWTD (Benson, 1973).

4.1 Parameters related to Communication, Language, and Thought in Neurotypical Individuals

It was crucial to observe that some of the TLC parameters were present in neurotypical individuals. Parameters such as 'Poverty of content of Speech, Distractible Speech and Blocking' of parameters related to Communication Disorder, 'Incoherence' of parameters related to Language Disorder, and 'Poverty of speech' of parameters related to Thought Disorder. This finding is in support of the study in which 'Poverty of content of speech, Poverty of Speech, Distractible speech, and Blocking' were observed in normal individuals (Andreasen & Grove, 1986). Incoherence was also observed in the NTI of the present study and is supported by the study in which poor coherence was present in older people's speech resulting in tangential and off-topic speech (Hoffman *et al.,* 2018).

4.2 Parameters related to Communication, Language, and Thought in Persons with Aphasia

Out of nine parameters related to communication disorders in TLCAS – PWA, 'poverty of content of speech', 'self-reference', 'blocking', and 'circumlocution' were observed to be present in PWA in the current study. The poverty of content of speech refers to the 'speech with less elaboration even with two or more utterances' (Bearden *et al.,* 2011). In this current study, Broca's aphasia and anomic aphasia were the participants considered and Broca's aphasia is a type of non-fluent aphasia, the speech produced by these individuals were short phrases with less content and did not provide adequate information to the question posed in the semi-structured interview. Apart from Broca's aphasia, the anomic aphasia participants in the current study exhibited poverty of content of speech but the severity was less when compared to Broca's aphasia. It was supported by the study in which PWA produced a speech that was not long enough and conveyed only a little information (Andreasen, 1986), and in anomic aphasia, the information content during the conversational discourse was observed to be adequate and similar to the study showing propositional content of the speech in NTI (Andreetta *et al.,* 2012). It was similar to alogia, which is related to 'paucity of speech and impoverishment of speech content' in PWTD (Alpert et al., 1997) and this was also observed in persons with psychotic disturbances such as hebephrenic, paranoids (Andreasen & Grove, 1986). The 'Self-reference' in the conversation refers to "self during interaction" was the other parameter found to be present in the current study whenever the PWA has difficulty in finding and retrieving words. It was predominantly observed in anomic aphasia and is supported by a study in which Self-reference was present in PWA as they failed to continue the conversation or experienced difficulty in word retrieval. This self-reference is identified as a potential marker of psychosis. Similarly, self-reference was present in PWTD such as schizophrenia and psychosis (Fineberg *et al.,* 2016). Thought blocking is the 'sudden halting of speech or thinking' observed to be present in PWA of the current study where PWA suddenly stops the conversation while speaking. Research evidence also showed that it is found to be present in persons with thought disorders (Sass & Parnas, 2017). Circumlocution is another parameter observed to be present in Broca's aphasia as non-direct thinking or as word translation efforts which intend the meaning of the word (Nasrullah *et al.,* 2021) and is also observed to be present in PWTD including persons with mania (Andreasen & Grove, 1986).

Out of three parameters related to language disorder in TLCAS-PWA, only one parameter, 'incoherence', was observed in the participants of the current study. The coherence in a conversation is maintained based on the retrieval from long-term memory to the slot of phrases, ideas, and expressions. The deviance in the constant retrieval results in the production of incomprehensible speech and was found in PWA, predominately fluent aphasia like in anomia, Wernicke's Aphasia, and conduction aphasia (Linnik et al., 2016). As anomic aphasia one of the participants of the current study showed incoherence in the speech. this incoherence is due to word retrieval deficits of anomic aphasia which was supported by the research evidence. Evidence shows that Incoherence is also observed in persons with deficits such as mania, hebephrenic, and paranoid (Andreasen & Grove, 1986).

There are two parameters related to thought disorder in TLCAS-PWA, and both parameters (Poverty of Speech and Illogicality) were present in the present study where the participants produced short sentences predominately by Broca's aphasia and sentences of normal length were produced by Anomic aphasia. It was supported by the study that near-normal speech was produced by people with fluent aphasia and people with non-fluent aphasia speak in very short sentences (Le & Lui, 2023). Similar characteristics were also observed in persons with paranoid (Andreasen & Grove, 1986), where they have difficulty expressing themselves in detail. They predominately use short sentences with less complex words. Illogical thinking is another parameter related to thought disorder in TLCAS-PWA, which is observed in the current study participants where PWA concluded the conversation without following logical reasoning. Illogical thinking is the "failure to present the listener with appropriate reasoning in casual or non-casual utterances. Similar results were observed in youth at risk of developing psychosis (Bearden et al., 2011), sharing the characteristics of language between PWA and PWTD.

As discussed above, the parameters related to thought, language, and communication of TLCAS–PWA exhibited by PWA were observed to be similar to those with PWTD. This emphasizes the point that 'language is for thought and communication' (Wiltschko, 2022). If any one of 'thought' or 'language' is affected, it results in impaired communication. The impairment in communication is similar in persons with aphasia (with language disorder) and persons with thought disorder (PWTD), proving the interlink between thought, language, and communication (Zlatev, 2012). This review and findings of the present study showed that PWA also experiences thought disorder-related deficits.

5. Conclusion

The current study explored the intricate interplay between thought, language, and communication in persons with aphasia (PWA). Designing an assessment protocol that integrates both thought and language enables a more comprehensive understanding of communication. Traditional assessments often focus solely on language skills, neglecting the underlying cognitive processes that contribute to effective communication. By incorporating thought processes into the evaluation, clinicians can gain insights into how persons with aphasia formulate ideas, organize their thoughts, and express themselves. This holistic approach not only enhances the understanding of communication challenges faced by PWA but also facilitates the tailoring of therapy to meet their unique needs. Ultimately, this study emphasizes the importance of considering the interrelation of thought and language in assessment and therapy. The clinical implication of the study is, understanding the interaction is crucial for developing effective therapeutic interventions. By identifying specific thought deficits alongside language impairments, Speech-Language Pathologists (SLPs) can create customized treatment plans targeting cognitive challenges and language recovery. This dual focus can lead to significant improvements in overall communication outcomes. By adopting this comprehensive framework, SLPs can foster improved communication skills and overall quality of life for persons with aphasia.

6. Limitations and future directions

The major limitation of the study is the sample size (n=5). As it is, the preliminary investigations' limited sample size was included, which reduces the generalizability of the findings. Consequently, the observed patterns may not accurately reflect broader trends across diverse populations or clinical presentations. Another limitation of the study is that it included all types of aphasia and severity; only severe aphasia was excluded from the study. The third limitation of the study is that the participants included were PWA, but comparison was made with Persons With Thought Disorder; they are not the actual participants of the study. A review of the existing literature revealed a lack

of empirical studies directly examining the combined assessment of thought, language, and communication, highlighting the novelty and significance of the present investigation.

Future research should aim to include a larger group of PWA, establishing the reliability, including inter-rater, intra-rater, test-retest reliability, and validity of TLCAS-PWA. This will provide the broader applicability of the finding to clinical practice by including different types of aphasia across age and gender, which are essential for developing targeted assessment and intervention strategies within clinical populations. Also, comparison should be made with PWA and PWTD by including them as participants in the study.

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Data availability

Data analysed in this study are not publicly available. However, these could be obtained from the corresponding author on a reasonable request.

Ethics Statement

This study was carried out and reported adhering to ethical standards. A written informed consent was obtained from the parents or caregivers of all the participants before initiating the study procedures.

Author Contribution Statement

Both the authors equally contributed, read and approved the final version of this work.

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