TELEPRACTICE IN A PERSON WITH APHASIA

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Abstract

"TELEPRACTICE" (Source, Professional Issues in Telepractice for SLP) is defined as "The application of telecommunications technology to deliver professional services at a distance by linking clinician to client, or clinician to clinician for assessment, intervention, and/or consultation" (ASHA, 2004). There is a discrepancy between the available manpower, and ratio of individuals with communication disorders. It has been well documented that the traditional service delivery system of Speech language pathology does not suffice to the needs of individuals with disability in the rural and in urban area. The present study aimed at assessing the efficacy of "telepractice" for rehabilitation of a person with Aphasia with respect to Indian context. This was a single case study on a person with Broca's Aphasia who was assessed using the Face to Face (FTF) assessment and intervened using Skype via web camera system. The intervention was focussed on Expression, Repetition, Naming and Memory based on Manual for Adults Aphasia Therapy in Kannada (MAAT-K). Each session was audio recorded and was subjected to linguistic analysis. The results were analyzed as the baseline scores, mid therapy and post therapy scores. The results revealed there was significant improvement in the domains of Expression, Repetition, Naming and Memory. Also the impact of communication, activity limitation and emotional wellbeing was assessed using the sub-scales of The Burden of Stroke Scale (BOSS) i.e., The Communication Difficulty (CD), The Communication Associated Psychological Distress (CAPD), the Negative Mood Scale and the Positive Mood Scale and results revealed significant improvement in the domains of (CD) and(CAPD). Thus, telepractice is effective in the Indian context and is an upcoming area in the field of speech language pathology. It is vital to accelerate programs of research and clinical endeavours in this area to improvise the service delivery system.

Key words*: Face to Face (FTF) assessment, Manual for Adults Aphasia Therapy in Kannada (MAAT-K), The Burden of Stroke Scale (BOSS).*

Speech language pathology deals with providing effective services for persons with communication disorders, which is on a constant rise in the recent past. Traditionally the service delivery system of a Speech Language Pathologist involves providing direct therapy i.e., Face to Face (FTF) interaction with the persons with communication disorders. The other mode of therapy is indirect, which targets the parent or the caregiver to provide therapy which is constantly being guided and monitored by a qualified Speech Language Pathologist.

According to the National Sample Survey Organization's (2002) 58th round report on disability, the population in India suffering from communication disorders (Speech Disorder) is about 2.15 million persons (11.6% of total disabled population). The prevalence rate of speech disability (per million) in rural area was about 220 and 193 in urban areas (Tiwari, Krishnan, 2011).

There is a vast discrepancy between the manpower available to meet the needs of individuals with communication disorders who are deprived of quality services and benefits from speech language pathologists. The accesses issues for persons living in rural and remote areas where there are inevitably fewer numbers of SLPs are clear (Pickering et al., 1998). This remains a vexing issue for public health and education systems worldwide. Of equal concern are persons residing in urban areas where access to services may also be difficult due to disability, mobility, and financial issues, restrictive work schedules, and family support needs Theodoros (2011). Hence, there is a pressing need to provide effective services to people with communication disorders who cannot avail appropriate and timely services from speech language pathologist.

There has been global advancement of technology worldwide across various fields of health science. Where traditional mode of therapy falls short, it would be remarkable to exploit the upcoming technology to bridge the gap between the recipients' and the service providers. According to Internet usage Statistics

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and Telecommunication report, in 2010, 8.5% of population that covers 100,000,000 (www.internetworldstats.com) users have access to the internet, thus telecommunication can be a plausible mode to provide services. There have been various terinologies used interchangeably in the field of telecommunication for service delivery such as "telerehab", "telemedicine", "webnar" and so on. However, according to the position statement developed by ASHA in 2004-2005, ASHA has adopted the term "TELEPRACTICE" (Source: Professional Issues in Telepractice for SLP). They define it as "The application of telecommunications technology to deliver professional services at a distance by linking clinician to client, or clinician to clinician for assessment, intervention, and/or consultation (ASHA, 2004).

Various platforms have been developed to support service delivery in telepractice and this falls under two broad headings: synchronous (in real-time) and asynchronous (offline) service delivery. The types of technology used in telepractice research have included the Plain Old Telephone Service (POTS) (Carey et al., 2010; Wilson, Onslow, & Lincoln, 2004), videophones (Tindall, Huebner, Stemple, & Kleinert, 2008), conventional videoconferencing (Myers, 2005), Personal Digital Assistants (PDA) (Halpern, et al., 2005), computer-based programs (Thompson, Choy, Holland, & Cole, 2010) and customized multi-media videoconferencing systems (Constantinescu et al, 2010b; Georgeadis, Brennan, Barker, & Baron, 2004; Theodoros, Hill, Russell, Ward, and Wootton, 2008), web camera and video-conferencing via Skype (Howell, Tripoliti & Pring, 2009) .

A number of studies have successfully proved "Telepractice" as one of the service delivery methods for assessment and intervention for Adult Neurogenic Communication disorders. Hill & Theodoros (2002) reviewed the role of tele-rehabilitation in speech-language pathology and have provided evidences of its efficacy dating from 1976 where Vaughan (1976, 1977 & 1979) used "Tele-communicology" a method that used telephone adjuvant with teaching machine to provide visual aids, auditory practice material etc. There has been abundance of literature generated in the western population from then on to the present day.

The line of research in telepractice generally deals with comparison of assessment/ therapy between two settings (i.e.,) Face to Face (FTF) therapy versus telepractice. Brennan, Georgeadis, Baron, and Barker (2004) compared computer-based videoconferencing to traditional (FTF)

sessions in the assessment of adults with acquired brain injury on a story-retelling task. The results revealed that there were no significant differences between the two settings for the entire group. Similarly, Palsbo (2007) compared stand-alone video-conferencing equipment with face-to-face assessment in the assessment of functional communication and the results revealed a high percentage level of agreement within the 95% limits of agreement, with a range of 92% to 100%, indicating that assessment conducted in the two settings for this assessment protocol were equivalent.

An extensive research was done on 32 participants with mild to severe aphasia (Theodoros, Hill, Russell, Ward, & Wootton, 2008; Hill, Theodoros, Russell, Ward, & Wootton 2009), and 11 participants with mild to severe apraxia of speech (Hill, Theodoros, Russell, & Ward, 2009b). They were assessed in a laboratory setting using a custom-made PC-based multi-media video-conferencing system. These assessments were conducted simultaneously online and face-to-face (FTF). The findings from these studies included good strength of agreement between the online and FTF assessors for oro-motor performance and perceptual ratings of speech for the dysarthics speakers, with high inter- and intra-rater reliability across all parameters. Hill, Theodoros, Russell and Ward (2009a). No significant differences between test scores on the Apraxia Battery for Adults-2 (Dabul, 2000) were found for the online and FTF assessments. In addition, moderate to very good agreement was obtained for the online and FTF ratings of apraxia of speech (Hill, Theodoros, Russell & Ward, 2009b).

Similarly, no significant differences were determined between the online and FTF test scores on the Boston Aphasia Examination 3rd Edition (Goodglass, Kaplan & Barresi, 2001) with moderate to good agreement for assessor ratings, and good to very good intra- and inter-rater reliability for the majority of the online ratings (Theodoros et al., 2008). This study also stated few issues encountered during online assessment for persons with aphasia which made evaluation of naming and paraphasia, as well as apraxia of speech challenging. Thus, all the above stated literature provide sufficient evidence that telepractice may be an effective alternative to the traditional means of assessment and holds promising mode to outreach people on mass.

The studies have also evaluated efficacy of online and offline therapy using telepractice.

Cherney, Holland, and Cole, (2008) documented the use of Aphasia Scripts, a software program (offline) which uses a virtual therapist to provide conversational script training on persons with aphasia. The results showed that the verbal output of three participants improved in content, grammatical productivity, and rate following therapy. A web camera and video-conferencing via Skype was used by Howell, Tripoliti, & Pring (2009) to deliver Lee Silverman Voice Therapy to three people with Parkinson's disease (PD) in combination with FTF treatment. The participants received one treatment session per week FTF and the remaining three sessions via Skype. As accurate recordings of Sound pressure level (SPL) via Skype could not be obtained, the weekly FTF session was used to record vocal SPL using a sound level meter. This study found that remote treatment resulted in gains in SPL for sustained phonation, reading, and conversational speech consistent with previous FTF treatment.

Similarly, a single case study by Constantinescu, Theodoros, Russell, Ward, Wilson, and Wootton (2010a) used a public telecommunication system on a person with PD. The results revealed substantial improvements in SPL in sustained phonation, reading and conversation and in overall speech intelligibility following the treatment. Hence, the studies mentioned above provide an insight of the feasibility of using telepractice as a possible alternate mode for service delivery.

Where there is plethora of literature regarding telepractice in western population there is dearth of the same in India. Hence, there is a dire need to adopt this model of service delivery to the Indian Context and establish its efficacy across disorders. This may enable to enhance the quantity and quality of services for people in the rural and urban areas.

Need for the study

The scope of telepractice in the Indian context is an avenue which remains to be explored. With advancement in technology it is vital to determine how this development can aid to serve the people with communication disorders. Hence, there is a pressing need to conduct research along this line.

Aim of the study

This study attempted at assessing the efficacy of telepractice for rehabilitation of a person with Aphasia. This study may serve as a stepping stone to generate Evidence Based Practice (EBP)

in the field of telepractice for persons with aphasia.

Method

A 62 year old right handed male served as the participant for the study. He was a native speaker of Hindi (L1) and was equally proficient in English (L2). He suffered from an episode of stroke on 5th of April 2011. Results of the CT scan revealed the presence of severe diffuse stenosis of left Internal Carotid Artery (ICA). He exhibited symptoms of motor and language impairment post onset of stroke. Eventually, there was restoration of the motor functions, but not the verbal language. He showed obvious difficulty in recall of words, repetition, naming and expression. Subsequently a FTF assessment was conducted by a speech language pathologist and he was diagnosed as having Broca's Aphasia based on the Western Aphasic Battery (WAB) given by Kertez and Poole (1982). He was recommended for telepractice using Skype (Version 5.5) via web camera as direct therapy was not possible due to some practical reasons. He attended 25 speech language therapy sessions through Skype from All India Institute of Speech and Hearing, Mysore from 10th of August 2011 onwards. He was provided five sessions per week with each session lasting approximately 45 minutes.

Tasks and stimuli material

It has been well documented and observed by professionals that the traditional therapy does not fit into a person's need based protocol. During the online treatment on day to day basis, a profile was developed and evaluated for the participant's various activities which were taken from his need based protocol. A total of 25 sessions were considered for this study. The participant was provided speech and language therapy in both L1 and L2 by adapting the Manual for Adult Aphasia Therapy in Kannada (MAAT-K) to Hindi (L1) and English (L2).

MAAT-K was the cumulative outcome of Manual for Adult Non-Fluent Aphasia Therapy-in Kannada (MANAT-K) and Manual for Adult Fluent Aphasia Therapy- in Kannada (MAFAT-K) which was field tested by Goswami, Shanbal, Samasthitha and Navitha (2010) and Goswami, Shanbal, Chaitra and Ranjini (2011) respectively. This manual consisted of six domains: Functional Communication (FC), Repetition (R), Comprehension and Expression (C & E), Naming (N), Reading and Writing (R &W) and an additional section on treatment for Apraxia of speech and oro-motor exercises. The domains

targeted for the participant were Repetition, Expression and Naming based on linguistic profiling. The sub sections of repetition, expression and naming were used. The repetition task consisted of environmental stimuli; expression task consisted of activities related to daily routines, free recall narrations, descriptive and procedural. These activities were basically the basis for discourse. Confrontation naming, Lexical generative naming (Phoneme fluency, word fluency, category specific) and Responsive naming were the tasks included under naming section.

In addition to the above mentioned tasks for naming, few other sections were added to improve the participant's fluency at a broader level. The tasks included were cluster fluency, category specific fluency (perceptual, semantic and lexical), semantic mapping, and sentence fluency. In addition, symptomatic therapy was also provided for memory using a resource manual for mild traumatic brain injury by Green, Stevens and Wolfe (1997).

The therapy techniques used were cueing hierarchy wherein phonemic, semantic and rhyming cues were provided online via the microphone attached with the laptop. Wherever need for orthographic cues arose, the target phoneme was typed using the short message service (SMS) option available on Skype which served to provide online orthographic cue. De-blocking and Language Oriented Therapy (LOT) were also used as language therapy techniques. All the sessions were audio recorded and were subjected to linguistic analysis to monitor the error pattern and improvement in performance. To measure the participant's communication difficulty, subscales of the Burden of Stroke Scale (BOSS) were used. BOSS is a comprehensive patient reported measure of functioning (activity limitation) and well being (Doyle, Mcneil, Hula, & Mikolic, (2004). The Communication Difficulty (CD) section that consisted of seven items, the Communication Associated Psychological Distress (CAPD) section that consists of three items, the Negative Mood Scale and the Positive Mood Scale were used to measure the patient related outcomes. Both pre and post therapy ratings were obtained from the participant for all the subscales.

Procedure

The participant was provided profile based telepractice therapy using Skype via web camera.
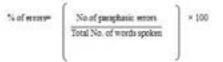
All the therapy sessions were conducted in a quiet room, free from any distraction. A pre-requisite protocol was developed to ensure effective communication during the therapy sessions. The protocol is shown in Table-1.

Scoring and analysis

The audio sample of every session was analyzed and the results were documented on a treatment recording sheet (adapted from MAFAT-K, Chaitra & Goswami, 2010). The analysis of sample was done based on the scoring provided in MAAT-K, 0 symbolized no response/incorrect response/unintelligible response, ½ for partially correct and intelligible response and 1 for fully correct and intelligible response. An average was obtained for every domain (except discourse) using the formula mentioned below.
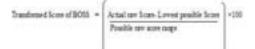
$$\text{Average Scores} = \left[\frac{\text{Scores obtained by the participant}}{\text{Number of trials used}} \right] \times 100$$

The analysis for discourse was done by calculating the number of paraphasic / circumlocution/perseveratory errors and it was expressed as a percentage of the total number of words spoken.

$$\% \text{ of errors} = \left[\frac{\text{No of paraphasic errors}}{\text{Total No. of words spoken}} \right] \times 100$$

The analyses for the samples were done across three conditions, i.e., the initial session (1 and 2), middle session (12 and 13) and final session (24 and 25).

The BOSS scale was mailed across to the participant at the end of 25th session to obtain a feedback on participant related communication difficulty. The scores of BOSS scale were linearly transformed using the metrics of (0-100), using the following formulae.

$$\text{Transformed Score of BOSS} = \left[\frac{\text{Actual raw Score - Lowest possible Score}}{\text{Possible raw score range}} \right] \times 100$$

A score of 100 represented least desirable health state that means greater activity limitation and greater emotional distress, whereas score of 0 represents most desirable health state and score between the ranges represents percentage of total score.

Table 1: *Pre requisite protocol*

Requirements		Pre requisite
		2 Microphones, video, desktop sharing, facility to record the sessions and facility to maintain the privacy of session recordings.
Initial face to face interview		Preferable
Knowledge of computer operation		Yes
Manual dexterity		Required
Sensory issues		Nil
Connection bandwidth		128- 384 kbps
Transmission lag		Minimal (0.5 sec)
Place of contact		Home
Point of contact		Telephone number (preferably mobile)
Sessions given		25
Assessment	No. sessions	1
	Tests used	WAB
Treatment	Sessions/ week	5
	Duration of session	45 min (+10 minutes to check the connectivity)
	Materials required	Comfortable seating of the client and clinician, video camera, desktop sharing program to share the reading material, scoring and to give online feedback.
Process study	Stakeholder satisfaction	Questionnaire (BOSS)

Results and Discussion

The present study was assessed the efficacy of telepractice on a person with aphasia. The participant was provided therapy based on MAAT-K and the results were tabulated (Table 2) across three conditions. The Scores of BOSS have also been tabulated in Table 3.

Table 2: *Performance of the participant across three conditions*

Domains	First session	Twelfth session	Twenty fifth session
REPETITION			
• Vocabulary	68.5%	85%	87.5%
EXPRESSION (% of errors)			
• Daily routines	11.66%	5.64%	0%
• Free recall narration	11.00%	6.36%	1.7%
• Descriptive	15.00%	7.7%	2%
• Procedural	17%	7%	1%
LEXICAL GENERATIVE NAMING			
• Phoneme fluency			
1. L1	72.08%	87.5%	91%
2. 2	70.03%	82%	90%
3. Alternating fluency	L1- 75%, L2-59.3%	L1-81%, L2-78%	L1-87%, L2-84%
• Cluster fluency			
1. L1	65%	70.7%	5%
2. L2	73.3%	78.5%	91%
• Category specific			
1. Perceptual semantic	75%	81%	86%
2. Lexical	90%	100%	100%
• Semantic mapping	50%	100%	100%
• Sentence fluency (% of error)	31%	26.78%	14.93%
1. L1			
2. L2	10%	7.69%	6%
MEMORY			
• Auditory sequencing			
1. Forward	60%	58.3%	44.4%
2. Backward	83.3%	55.5%	100%

The results revealed that there was a trend of consistent improvement across sessions in all the domains. There was differential performance between languages i.e., L1 and L2 across sessions. Improvement in performance was evident by the decrease in error percentage (sentence fluency, expression) and increase in overall percentage of success (repetition, lexical generative naming and memory). It can be stated from Table 2, that the repetition skills of the participant improved from first session to twenty fifth session. The percentage of correct repetition skills was 68.5% while in twelfth session it was 85% and in twenty fifth session it was 87.5%. It

is clear from these percentage score that the participant through telepractice showed an obvious improvement in his repetition skills. Thus, it can be stated that these linguistic skills can be facilitated using telepractice. The repetition skills which require cueing using multimodalities can be provided through this mode. However, the clinician needs to be clear, precise with appropriate rate of speech and pauses while presenting the stimuli. This mode of service delivery provides a better, easy and clear virtual graphics which were quite helpful in this person. This shows that for those persons with literate skills and a computer saviour, this is an apt mode.

His performance in the various domains of expression did show a clear trend of reduction in errors from first session to twenty fifth session. As illustrated in Table 2, his error percentage in first session was 11.66%,11%, 15% and 17% while for twelfth session was 5.64%, 6.36%, 7.7% and 7% and the twenty fifth session was 0%, 1.7%, 2% and 1% respectively for daily routine, free recall, descriptive and procedural tasks under expression. It is evident from these percentage values that under all the domains of expression the participant showed considerable improvement in his expressive skills. From the performance in these skills it can be explicitly stated that he showed an obvious improvement in the discourse level. During the session it was observed that cohesiveness was well maintained during spontaneous conversation as well as on structured tasks under expression skills. He showed a clear cut trend of using the PACE technique with ease .Thus from these results it is evident that a professional can use any available language technique to improve the expressive skills in persons with Aphasia.

These performances further strengthen the concept that telepractice does bring a difference in the overall expressive skills of persons with Aphasia who are literate and have an inclination towards the technology.

Performance of the participant under various subsections in naming task did improve from the first session to the twenty fifth session. His performance on the first session on L1 (Hindi) was 72.08% and 70.03% for L2 (English). He showed a clear improvement in L1 and L2 in twelfth session where he scored 87.5% and 82%. In the 25th session his percentage scores were 91% and 90% respectively for L1 and L2 for phoneme fluency task. Under Alternating fluency and cluster fluency tasks the scores for L1 and L2 showed a gradual trend of improvement wherein session one (L1 =75%, L1= 65%) and

(L2= 59.3%, L2= 78%). By twelfth session scores were (L1 = 81%, L1=70.7%) and (L2= 78%, L2= 78.5%), whereas in twenty fifth session the scores were (L1 = 87%, L1=85%) and (L2= 84%, L2= 91%).

With respect to category specific naming (perceptual and lexical) the results showed a gradual significant improvement from the first session to the twelfth session and the scores were maintained by the twenty fifth session, the scores were as follows (75%, 90%), (81%, 100%) and (86%, 100%). Thus, the results unequivocally support that the naming has improved considerably. I t can be clearly stated that Telepractice permits the clinician to use all the cueing hierarchies used in face to face therapy. This in turn facilitated the naming skills. Furthermore with the help of telepractice it becomes convenient to provide graphic, auditory or visual cues separately or in combinations.

The performance scores for sentence fluency showed a trend of significant decrease in the error percentage across sessions which was as follows, first session (L1= 31%, L2=10%), twelfth session (L1= 26.78%, L2=7.69%) and twenty fifth session (L1= 14.93%, L2=6%). Thus, the trend shows that there was significant improvement in naming under various subsection and tasks. This corroborates that there was generalization of skills and hence a significant decrease in communication difficulty on the BOSS subscales.

The participant's performance score on memory which included Auditory sequencing showed the following trend for Forward sequencing across the three sessions, 60%, 58.3% and 44.4%, whereas for Backward sequencing the scores were 83.3%, 55.5% and 100%. Hence it was seen that there was considerable improvement across the memory skills. Thus, it paves way that even the cognitive skills can be improved using telepractice in persons with Aphasia.

Table 3: *BOSS scores*

Tests/variables	Pre-Therapy (%)	Post-Therapy (%)
Communication Difficulty (CD)	64.2%	14%
Communication Associated Psychological Distress (CAPD)	66.6%	33.3%
Negative Mood Scale	0%	0%
Positive Mood Scale	75%	75%

BOSS scores (Table 3) reveal that there was decrease in activity limitation and emotional distress which correlated with improvement in

performance in speech and language therapy across sessions. Hence, it is inferred that there is a correlation between degrees of linguistic impairment to the participant reported communication difficulty.

Hence, the results indicate that telepractice is effective which is evident from improvement in performance as rated by the person and evaluated by the clinician. It is reiterated that speech language therapy must be customized based on need based profile of a person with Aphasia. This will maximize the generalization and hence reduce the activity limitation and emotional distress faced by the person with aphasia.

Thus the results of the study are quite encouraging which views telepractice as a promising approach to strengthen the service delivery for persons with aphasia. This has got more advantages over the face to face approach in terms of the mobility of the person, cost, accessibility, noise reduction as the stimuli is presented through the headphones as a result extraneous variables can be minimized. Moreover, the total cost involved in terms of travel, time and manpower can be used more effectively and accessibly which in turn facilitates the activity and participation of person in the society at large. Further, using telepractice neither the clinician nor the stake holder has to make any adjustment in the clinical setup especially with reference to disable friendly environment. This has received support from western literature where researchers have advocated the use of telepractice. Theodoros, (2011) has stated the efficacy of telepractice across age groups. This mode of therapy is more effective for the elderly who encounter issues like associated disability and mobility issues which make it challenging to maintain appointments.

Georgeadis et.al., (2004) stated that the other benefits of providing telepractice are that the patients do not need to travel and thus receives better access timely assistance at their own home. This mode of therapy is also cost-effective as the clinician does not have to travel, and the clinician can see multiple patients from one setting. Use of computer for providing speech-language therapy is interesting and increases the motivation of the stakeholder thus serves as a reinforcer.

Caution needs to be excised while prescribing telepractice as a mode of therapy for persons with aphasia. Detailed assessment must be carried out to evaluate the presence of pre requisite skills required to benefit from telepractice. An initial FTF assessment followed by telepractice will be a suitable model of service delivery for persons with aphasia. Also, persons with aphasia in the acute stage and those who require assistance with reading and writing skills may not be appropriate candidates for telepractice. Telepractice will also be beneficial option for persons who are recommended for regular follow ups.

There are few technical barriers which adversely affect the quality of telepractice. Connectivity availability and speed are critical issues as they interfere in online interaction by inducing a breakdown between the audio and video signal. Moreover in telepractice professional has to keep up the timing and should prepare well in advance for the session. Thus, a structural and professional approach using telepractice does bring a difference in the overall quality of life of a person with Aphasia. This telepractice works as a complement as well as supplement to FTF.

Conclusions

This study addressed the feasibility of using telepractice as a mode of therapy in the Indian context. Telepractice was provided to a person with aphasia using Skype via web camera for a total of 25 sessions. During the online treatment on day to day basis, a profile was developed and evaluated for the participant's various activities which were taken from his need based protocol. Speech and language therapy was provided in both L1 and L2 based on MAAT-K. All the sessions were audio recorded and detailed analysis was done based on the scoring system of MAAT-K. The results revealed that there was consistent improvement in the domains targeted for therapy. The client feedback obtained using the BOSS scale also correlated with the improvement in language performance. Thus, this study provides evidence that telepractice is a feasible and an effective mode of therapy for persons with aphasia. Efficacy of this mode of therapy across age groups and disorders are avenues yet to be explored in the Indian context.

Acknowledgments

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