CHAPTER 5

Discussion

In the present study, an attempt was made to develop and standardize a comprehension test in Hindi language for persons with aphasia. The developed test investigated comprehension at the level of phonology, semantics, syntax, discourse and gestures in different modalities for neuro-typical participants and persons with aphasia. The tasks were administered on both male and female neuro-typical participants and persons with aphasia. There were no significant differences between male and female neuro-typical participants on the entire task and across modalities i.e. auditory, picture and orthographic. The results indicate that male and female neuro-typical participants have intact comprehension skills across modalities. Thus, the scores obtained by neuro-typical participants can be used as normative values for assessing the comprehension skills in persons with aphasia. Any score in any modality which deviates from these normative values may indicate poor comprehension skills. Thus, these normative values can be used as a reference against any form of neurological dysfunction which may lead to language comprehension deficits. In addition, the performance of neuro-typical participants showed subtle variation across tasks. For instance, maximum scores were obtained in sections such as phonology and discourse whereas near maximum scores were obtained in semantics, syntax and gesture sections. These minor variations may be attributed to factors such as stimulus complexity, familiarity and variability in the responses, which are not significant.

With reference to persons with aphasia, both male and female participants scored significantly lower than neuro-typical participants on the developed comprehension test.
Also, on mere observation of the mean scores, the performance of males appeared to be better than female persons with aphasia. However, there was no significant difference between the performance of male and female persons with aphasia. Earlier studies have also reported similar results. Goswami (2004) reported that the performance of males and females were not significantly different on LPT and WAB in Kannada. Similarly, Bhatnagar et al. (2002); Shyamala and Vijayashree (2008); and Shyamala and Ravi (2008) have also reported no gender differences. Further, Pena-Casanova et al. (2009) used the Token Test (TT) and reported that gender was unrelated to the scores of a neurotypical group of 340 participants of which 138 were males and 202 were females. Several studies support the findings (Swisher & Sarno, 1969; De Renzi & Faglioni, 1978; Emery, 1986; Ivnik, Malec, Smith, Tangalos, & Petersen, 1996).

Thus, the present study does provide corroborative support to the existing research that gender variation in neuro-typical persons and persons with aphasia may not be a major variable in comprehension of phonology, semantics, syntax, discourse, and gesture. However, the difference apparent on mere observation of the scores may indicate towards subtle difference. The major results of this study are discussed under the following sections:

5.1 Phonology

Syllable identification and syllable discrimination tasks were used to find the comprehension of phonology in auditory and orthographic modes. All the neuro-typical participants scored high on the entire task of comprehension test in both auditory and orthographic modalities. This result indicates that neuro-typical persons have good comprehension of phonology and intact information processing approach. It also shows
that neuro-typical participants have intact auditory and orthographic processing modalities. Comprehension of syllable identification and syllable discrimination was poor for persons with aphasia than the neuro-typical participants in both auditory and orthographic modes. This may be due to cognitive deficits and/or difficulty in accessing information through auditory and orthographic modes. Studies have shown that persons with aphasia have difficulty in both identification tasks and discrimination tasks (Blumstein, Baker, & Goodglass, 1977; Baker, Blumstein, & Goodglass, 1981; Goswami, 2004). This impairment has also been observed in visual discrimination (Filby, Edwards, & Seacat, 1963; Solovitz, 1966) and in auditory discrimination (Lane & Moore, 1962; Filby, Edwards, & Seacat, 1963). Persons with aphasia performed better on syllable identification task than syllable discrimination task.

In contrary to the findings of present study, Gow and Caplan (1996) reported that persons with aphasia have more difficulty in identification task as compared to discrimination task for both real words and nonsense syllables. Persons with aphasia showed problems in discriminating phonological contrasts (Blumstein, Baker, & Goodglass, 1977) or in identifying consonants presented in a consonant-vowel context (Basso, Casati, & Vignolo, 1977). Persons with aphasia made speech perception errors for consonant contrasts than for vowel-consonants. Overall the results of this study have shown that persons with aphasia have comprehension deficits, which are in a par with the reports stated in the literature.

Comprehension of phonology for persons with aphasia was lesser than neuro-typical participants in both auditory and orthographic modes. Findings, similar to that obtained in the present study in persons with aphasia have been earlier reported by
Alajouanine & Lhermitte, 1964; Blumstein, Baker, & Goodglass, 1977; Caramazza, Berndt, & Basili, 1983. On the phonological level the different aphasic types exhibited comprehension deficits to variable degrees. This shows that the site and the extent of the lesion affecting the language region do have a major influence on comprehension. Hence, the overall results reveal that brain damage may cause deficits in phonology comprehension both in auditory and orthographic modes for persons with aphasia. Further, poor performance on comprehension of phonology for persons with aphasia may be due to the use of using a single mode task. This finding was supported by Schuell and Jenkins (1959) who reported that the performance of persons with aphasia does improves when the linguistic stimuli is presented in both graphic and verbal modalities, rather than verbal modality alone.

Persons with fluent aphasia performed better than non-fluent aphasia on the entire task in both auditory and orthographic modes. Persons with non-fluent aphasia performed poorer probably due to the consideration of persons with global aphasia in this group. When compared the comprehension of phonology between persons with Broca’s aphasia and Wernicke’s aphasia, persons with Broca’s aphasia performed better in auditory mode when compared to persons with Wernicke’s aphasia in auditory mode. This shows that persons with Broca’s aphasia have better auditory comprehension then Wernicke’s aphasia. The finding was supported by Blumstein, Baker, and Goodglass (1977) who reported that persons with Wernicke’s aphasia have severe auditory language comprehension deficits. Also, Luria in 1966 reported that reception skills mainly lie in posterior brain structures and phonological impairments are noticed in persons with Wernicke’s aphasia.
During the test administration several interesting observations were noted. The person with Broca's aphasia showed self monitoring behaviors, where as these were not observed in persons with Wernicke's aphasia. It was also noticed that persons with Broca’s aphasia required repetition of questions and their responses were characterized by delays. Like the persons with Broca's aphasia, Wernicke’s aphasia also exhibited delayed responses and required repetition of the questions. Performances would have been better, if the stimuli were presented in a slower rate. Improvement observed in persons with aphasia with slower than normal rates have also been reported by Schuell, Jenkins, and Jiminez-Pabon, (1964); Albert and Bear (1974); Weidner and Lasky (1976); Cermak and Moreines (1976). These responses could probably be due to auditory comprehension deficits.

The performances of the persons with global aphasia were poorest among all the aphasia but they made attempts to carry out the commands indicating that they have the intent to carry out the command. But their apparent responses were mostly attributed to chance. No self-monitoring behaviors were noticed. Similar results were reported by Goswami (2004).

Performance on syllable identification task was lesser than syllable discrimination task in auditory mode for persons with anomic aphasia. Comprehension of phonology was identical in orthographic mode for both persons with anomic aphasia and neuro-typical adults. Persons with anomic aphasia scored lower than neuro-typical adults in auditory mode. Thus, suggesting that persons with anomic aphasia do not have a problem in comprehension of phonology in orthographic mode. However, they do have deficits in the auditory mode.
Overall, the results show that persons with aphasia have difficulty in processing information in both modalities i.e. auditory and orthographic modes. It also shows that comprehension of phonology is better in auditory mode when compared to orthographic mode for persons with aphasia. However, it also depends on the type of aphasia. These findings will help clinicians in appropriate planning of rehabilitation.

Thus, based on the performances of persons with aphasia and neuro-typical participants, the present test makes a distinction between the two groups. Hence, the test is sensitive to assess the comprehension skill under phonology in persons with aphasia.

5.2 Semantics

Comprehension of semantics was found using nouns (i.e. body-parts, common objects, colors, geometric forms, and number task), polar questions, semantic anomaly, syntagmatic relation, paradigmatic relation, semantic contiguity, and semantic similarity task. Neuro-typical participants performed good on the entire task in all the three modalities i.e auditory, picture, and orthographic modes. Thus, the results show that neuro-typical participants have good ability for comprehension of nouns and intact information processing in all the three modalities.

Comprehension of noun was better in picture mode when compared to auditory mode followed by orthographic mode for persons with aphasia. These results show that persons with aphasia have better comprehension skills through picture than auditory and orthographic modes. The poorer comprehension of noun for persons with aphasia could be attributed due to the usage and is indicative of category specific deficits in persons with aphasia. This aspect also receives support from Dennis (1976), McKenna and Warrington (1978), and Warrington and McCarthy (1983). Comprehension of noun was
better in persons with fluent aphasia than in non-fluent aphasias in all the three modalities. Persons with fluent aphasia performed identical to neuro-typical participants in picture mode. This could be due to intact information processing in the picture mode.

These results are further suggestive of category specific impairments in semantic comprehension. Category specific impairments have also been reported by Goodglass, Klein, Carey, and Jones (1966). They reported of persons who have inappropriate difficulty with particular semantic categories, objects and actions were easiest to comprehend and letter the most difficult. Dennis (1976), McKenna and Warrington (1978), and Warrington and McCarthy (1983) indicate selective impairments in the comprehension of body parts names and inanimate object names. Hillis and Caramazza (1991) also reported of greater impairment in comprehension of the mass noun or count noun distinction as opposed to the proper noun or common noun distinction in persons with Broca’s aphasia but not in Wernicke’s aphasia. The breakdown in the ability to comprehend nouns in persons with aphasia when compared with the neuro-typical adults is in consensus with a few other studies (Benedet & Goodglass, 1989; Goodglass & Wingfield, 1993; Jodzio, Biechowska, & Leszniewska-Jodzio, 2008).

Schuell and Jenkins (1961) also reported that persons with aphasia do better on single word comprehension tasks, when written and auditory stimuli are used instead of auditory stimuli alone. Moreover, the repetition of linguistic command also improved the performances of these persons. Further, sub-vocal rehearsals were also noticed in these participants, which is an indication that these participants rely on their auditory feedback and sub-vocal rehearsals help in retaining the linguistic stimuli for a longer duration. According to Schuell, Jenkins, and Jimenz-Pabon, (1964) and Goswami (2004), nearly all
persons with aphasia exhibit retention deficits. Therefore, these sub vocal rehearsals may be used as a compensation mechanism for these deficits. But on the other hand, the responses of persons with Wernicke’s and global aphasia were neither clear, nor prompt and did not improve even when the stimuli were presented both in the verbal and graphic modalities. Moreover, no self corrections or sub-vocal rehearsals were noticed.

According to Marshall, Grinnell, Heisel, Newall, and Hunt, (1997), attention deficits in persons with aphasia may result in the individual missing out initial portions of messages or, missing out short messages completely. Thus, the persons with aphasia may be benefited with repetition of command on a single word comprehension task.

A study by Blumenfeld, Schroeder, Ali, and Marian (2009) reported that accuracy rates and response latencies in word comprehension decline with age on inhibition and facilitation in auditory comprehension across the lifespan. Older adults show more interference than younger adults. There is even an evident decline of inhibitory control with age (Comalli, Wapner, & Werner, 1962). In addition, older adults show a greater reliance on target word activation for word selection. In younger adults, activation and inhibition mechanisms are tightly linked during auditory word comprehension in a dual mechanism context. With aging, it appears that inhibitory mechanisms become less involved in auditory comprehension, with greater reliance on an activation mechanism.

Comprehensions of polar question, semantic anomaly, syntagmatic relation, paradigmatic relation were better in auditory mode than orthographic mode for persons with aphasia. The performances of persons with aphasia however, were not similar across the various sections on semantics. They exhibited better comprehension on polar questions as compared to the semantic anomaly, paradigmatic relations, syntagmatic
relations, semantic contiguity, and semantic similarity. Better comprehension on polar questions could be attributed to the simplicity of the stimuli and/or the task used in this section as compared to semantic anomaly, syntagmatic relations, paradigmatic relations, semantic contiguity, and semantic similarity. Moreover, these sections also require intact reasoning skills which may get compromised due to brain damage as seen in other cognitive processes such as attention and memory which were reported to be impaired in these persons (Martin and Romani 1994; Martin, Shelton, and Yaffee 1994; Freedman and Martin 2001).

However, the performance of persons with aphasia differs with different modality stimuli presentation for all the sections and/or sub-sections. This highlights an important observation that the benefits of different modality stimuli presentation are also commensurate on the degree of a person’s comprehension difficulty on a particular task. Semantic comprehension would have influenced persons with aphasia over aspects such as familiarity, semanticity, speech rate, and stimulus modality.

Performances of persons with fluent aphasia were better than non-fluent aphasia on all tasks under semantics. This may be due to the consideration of persons with global aphasia in non fluent aphasia group. Persons with global aphasia performed poorly on all semantics tasks. Comprehension of semantics was better in persons with Broca’s aphasia than Wernicke’s aphasia in all the three modalities: auditory, picture, and orthographic. Peuser and Schriefers (1980) also found that in persons with global and Wernicke’s aphasia, comprehension is affected to a large extent when compared to persons with anomia and Broca’s aphasia. Various other investigators have also reported similar findings (Milberg & Blumstein, 1981; Semenza & Goodglass, 1985).
Persons with Broca’s aphasia and global aphasia performed better in picture mode than auditory mode followed by orthographic mode. This result shows that comprehension of semantics is better in picture mode than auditory and orthographic modes in any types of persons with aphasia. The persons with aphasia when assessed for the comprehension deficits at semantic level in different modes showed obvious deficits with varying degrees. Several researchers have also demonstrated the existence of semantic deficits in comprehension, additionally; this study also delineated quantitative as well as qualitative differences in semantic comprehension between the various aphasic types (Goodglass & Baker, 1976; Coughlan & Warrington, 1978; Pierce, Jarecki, & Cannito, 1990).

Overall, semantic comprehension was better in picture mode than auditory mode, followed by orthographic mode for persons with aphasia. Compared to persons with aphasia, neuro-typical adults seem to comprehend well on all tasks in all modalities. Deficits in comprehension of linguistic stimuli in persons with aphasia can be attributed to the extent and nature of brain damage sustained by the person (Caramazza & Zurif, 1976; Peach, Canter, & Gallaher, 1988). Similar findings of impaired semantic comprehension were also reported in persons with aphasia as compared to the neuro-typical adults (Burchert, Friedmann, & De Blesser, 2003; Goswami, 2004; Wright & Newhoff, 2004).

5.3 Syntax
Comprehension of syntax was investigated in auditory and orthographic modes for neuro-typical participants and persons with aphasia. Action verb, preposition, PNG marker, tense, Wh-question, conjunction and comparatives, and conditional clause tasks in
auditory and orthographic modes were used to investigate the comprehension of syntax. Neuro-typical adults performed well on the entire task in both modalities. This result shows that neuro-typical adults have intact comprehension of syntax and information processing in both modalities.

Results revealed that deficits in comprehension of action verb, preposition, PNG marker, tense, Wh-question, conjunction and comparatives, and conditional clauses in both auditory and orthographic modes for persons with aphasia. Comprehension of action verb, preposition, PNG marker, Wh-question, conjunction and comparatives, and conditional clauses were better in auditory mode than orthographic mode for persons with aphasia. In auditory mode, comprehension of action verb was better than Wh-question followed by preposition, tense, PNG marker, conditional clauses, and conjunction and comparatives. In orthographic mode, comprehension of action verb was better than tense followed by preposition, Wh-question, PNG marker, conditional clauses, and conjunction and comparatives. Persons with aphasia performed identically in both modes (auditory and orthographic) on the tense task. The comprehension of conditional clause, and conjunction and comparatives were poor for persons with aphasia and this may be attributed to less familiarity, less frequent usage in everyday communication, and increase in sentence length as compared to other tasks whereas the neuro-typical adults comprehended syntax well and performed identically in both modes.

Comprehension deficits in persons with aphasia at a syntactic level have been well documented in literature (Law & Leung, 1998; Law, 2000). However, this study attempted to elaborate on the syntactic comprehension deficits in persons with aphasia in auditory and orthographic mode which was graded in difficulty and grammatical
complexity. The average scores in each task for the persons with aphasia declined with increase in complexity of tasks. Persons with aphasia achieved maximum mean scores in action verb task and lowest in conjunction and comparatives. The mean scores of other tasks fell within this range.

The performances of the persons with aphasia however, were not similar across the various sections on syntax. They exhibited better comprehension on action verb compared to preposition, PNG marker, tense, Wh-question, conjunction and comparatives, and conditional clauses. Better comprehension on action verb task could be attributed to the relative simplicity and familiarity of the stimuli and the task demands in these sections as compared to the preposition, PNG marker, tense, Wh-question, conjunction and comparatives, and conditional clauses. Moreover, the latter mentioned sections also requires intact reasoning skills which may get compromised due to brain damage as reported by Martin and Romani (1994); Martin, Shelton, and Yaffee (1994); Freedman and Martin (2001).

Deficits in comprehension of linguistic stimuli in persons with aphasia can further be attributed to the extent and nature of brain damage sustained by the person (Caramazza & Zurif, 1976; Peach, Canter, & Gallaher, 1988). Similar findings of impaired syntax comprehension in persons with aphasia as compared to the neuro-typical adults have also been reported by Burchert, Friedmann, and De Bleser (2003); Goswami (2004); Wright and Newhoff (2004).

The effect of stimulus length on comprehension of syntax has also been described by Weidner and Lasky, 1976; Curtiss, Jackson, Kempler, Hanson, and Metter, 1986; Goswami, 2004. They reported that the sentence comprehension tends to reduce as length
increases. The decline in comprehension with enhance in sentence length is pin points to
the retention deficits in persons with aphasia. Deficits in verbal memory span in persons
with aphasia have also been reported by Martin and Feher, 1990; Martin and Romani,
1994; Martin, Shelton and Yaffee, 1994; Freedmann and Martin, 2001; Martin and He,
demonstrated improvements in sentence comprehension of aphasics following training to
improve verbal memory span. Thus, literature supports the findings of the present study.

Comprehension of syntax was better in persons with fluent aphasia than non-
fluent aphasia in both auditory and orthographic modes. This result may be due to the
consideration of persons with global aphasia in non-fluent group. However, persons with
Broca’s aphasia comprehended syntax better than persons with Wernicke’s aphasia in
both modalities. This result shows that persons with Broca’s aphasia can comprehend
syntax well. However, the performance of persons with aphasia differs with modality of
stimulus presentation in all the sections. This highlights an important observation that the
benefits of different modality of stimulus presentation are also commensurate on the
degree of a person’s comprehension difficulty on a particular task. Comprehension of
syntax may also be influenced by factors such as sentence length, familiarity,
semanticity, speech rate, and stimulus modality.

Effect of sentence length (Caplan & Evans, 1990; Cannito, Hough, Vogel &
Pierce, 1996; Caplan, Waters & Hilderbrandt, 1997) and grammatical complexity (Lasky,
Weidner & Johnson, 1976; Law & Leung, 1998; Law, 2000) has also been addressed by
several other studies. Generally, they state that the more complex a sentence is
grammatically, the more difficult is its comprehension for persons with aphasia (Goswami, 2004).

Comprehension of grammatical elements such as action verb, preposition, PNG marker, tense, Wh-question, conjunction and comparatives, and conditional clauses needs intact reasoning skills, good attention and memory span. And these cognitive processes are affected in persons with aphasia (Schuell, Jenkins, & Jimenz-Pabon, 1964; Brookshire, 1974; Papagno & Genoni, 2003; Wright & Newhoff, 2004).

5.4 Discourse

Neuro-typical participants performed well on conversation and picture description tasks. They spoke at sentence level without any deficits. This result shows that neuro-typical persons have intact comprehension and production abilities. However, persons with aphasia performed poor on conversation and picture description tasks. Difficulties which were observed in persons with aphasia were improper pauses, reduced phrase length, effort in initiating to speak, speech tempo, number of pauses, and prosody. Different types of aphasia have performed differently on both conversation and picture description tasks. Persons with fluent aphasia performed better than non-fluent aphasia. Persons with global aphasia performed poorer than any other types of aphasia on both tasks. This result shows that persons with global aphasia have more difficulty in comprehension as well as in production. Easterbrook, Brown, and Perera (1982) compared the verbal expression in unstructured (spontaneous speech) and structured interactions (a picture description task). A measurable dissimilarity was noticed between the persons’ presentation in the two interactions. Persons with aphasia produced the biggest proportion of distinct grammatically analyzable utterances in the picture description task. This suggested that
persons with aphasia tended to produce a similar range and variety of grammatical structures in any tasks.

Further, Feyereisen, Verbeke-Dewitte, and Seron (1986) reported that conversation and picture story description vary significantly in temporal characteristics and grammatical structure. They also reported that fluency measures and proportions of content words are not associated. Thus, persons with non-fluent aphasia are not inevitably characterized by a decreased use of grammatical words. They also reported that dissociations produced by persons with aphasia do not evidence a content word/ function word distinction (Feyereisen, 1984). However, Deloche, Jean-Louis, and Seron (1979) studied verbal output in two conditions i.e. interview and description and did not find any indication of a single pattern for the persons with aphasia.

Various other studies were conducted to examine nine subjective evaluations of word choice, phrase length, articulation, effort in initiating to speak, number of pauses, speech tempo, the number of verbal and phonemic paraphasias, prosody, and perseverations. The mean length of utterances variable add to the problem of recognizing the limits of larger units i.e. sentence and phonemic clause for which prosodic, syntactical, or pause criteria may be used (Benson, 1967; Kerschensteiner, Poeck, & Brunner, 1972; Howes, 1967). Wagenaar, Snow, and Prins (1975) further, argued against utilizing pauses as the principal condition, since a little hesitation pauses may also be owing to word finding difficulties. Thus, the findings support the evidences of the present study.

Neuro-typical adults performed superior on paragraph comprehension when compared to persons with aphasia in both auditory and orthographic modes. Overall,
persons with aphasia performed similarly in both auditory and orthographic modes. However, assessment of reading comprehension response accuracy showed inconsistency within the aphasic group. Persons with global aphasia had scored poorly as compared to the other types of aphasia. Persons with Broca’s aphasia had scored better as compared to persons with Wernicke’s aphasia and global aphasia in both the auditory and orthographic modes.

The results of the present study further suggest that persons with aphasia can answer questions in relation to spoken paragraphs more precisely when they include content that is familiar to the person. This is support of the earlier findings that persons with aphasia take advantage from contextual information in the form of predictive information, familiar topics, and redundant information (Germani & Pierce, 1992; Jones, Pierce, Mahoney, & Smeach, 2007). This can also be interpreted with reference to aspects such as attention and domain knowledge. The participants could have found these paragraphs to be more interesting as they contained references to people and places that they knew (Miller, 2001; Van Overschelde & Healy, 2001; Hambrick & Engle, 2002).

Further, persons with aphasia performed better in auditory comprehension as compared to orthographic comprehension and this could be attributed to the less taxing effect in auditory mode as compared to the orthographic mode. This is affirmed by the study where enhanced attention is said to have enhanced auditory comprehension response for persons with aphasia (Helm- Estabrooks & Albert, 2004; Murray, 2002). Persons with global aphasia scored low in both auditory and orthographic modes owing to poor attention span. Further, the finding where the persons with Wernicke’s aphasia have who had comparatively poorer comprehension than persons with Broca’s aphasia
(Kertesz & Hooper, 1982), could also be attributed to the fact that persons with Wernicke’s aphasia performed poorly on paragraph comprehension when compared to persons with Broca’s aphasia.

Persons with aphasia have shown that the orthographic context is useful when paired with auditory input for the reading passage. However, they did not reveal significant improvement in reading comprehension in the pictures mode (Brennan, Worrall, & McKenna, 2005). Furthermore, persons with aphasia would have comprehended best had the paragraph been presented in all three modes: auditory, picture, and orthographic together. Rose, Worrall, and McKenna (2003) reported, “significantly higher confidence ratings by persons with chronic aphasia after reading health brochures that employed aphasia friendly principles (i.e., simple words and sentences, large print, large amounts of white space, and relevant pictures) than after reading traditionally formatted health brochures”. Thus, these findings imply that modification of the visuographic components of reading materials facilitates an improvement in the reading tasks in terms of confidence and ease of the persons with aphasia.

In addition, these findings also mirrors the findings of other investigators who deduced that persons with aphasia with limited comprehension skills on standardized aphasia battery subtests improved in their auditory comprehension when supported in the linguistic and/or visuographic context (Pierce & Beekman, 1985; Garrett, 1993; Lasker, Hux, Garrett, Moncrief, & Eischeid, 1997; Garrett & Huth, 2002). Thus, these outcomes support the findings of other researchers suggesting that pictures definitely influenced the
comprehension of persons with aphasia (Waller & Darley, 1978; Brennan, Worrall, & McKenna, 2005).

5.5 Gesture

Performance of neuro-typical participants was good on the gesture task. The results showed that neuro-typical participants have good ability to comprehend gesture. Persons with aphasia performed poorer than their neuro-typical counterparts. Persons with fluent aphasia recognized gesture better than non-fluent aphasics. Persons with anomic aphasia and conduction aphasia performed identical on gesture task whereas persons with Wernicke’s aphasia and Broca’s aphasia performed similarly. Further, persons with global aphasia performed poorly on gesture task. This result shows that persons with aphasia have difficulty in recognizing gesture. This also depends on the severity and type of aphasia. Goodglass and Kaplan (1963) and Pickett (1972) reported that persons with aphasia demonstrate significantly greater impairment in gesture and pantomime than either neuro-typical or persons with non-aphasia brain injured. Duffy and Duffy (1975) also reported that persons with aphasia were impaired relative to persons with non-aphasia and that such impairment of gestural ability is highly correlated with impairment of verbal ability.

In addition, Gainotti and Lemmo (1976) reported that persons with aphasia performed significantly poorer as compared to any other group of brain damaged persons on the test of symbolic gesture interpretation. Within the persons with aphasia, the inability to comprehend the meaning of symbolic gestures was extremely associated to the number of semantic mistakes obtained at a verbal comprehension test. Gainotti and Ibba (1972) also reported that gesture comprehension disturbances were frequently
noticed in persons with aphasia, and that they seem to be closely associated to the severity of the verbal communication disorder. Peterson and Kirshner (1981) also noticed impairment of gestural comprehension and expression in persons with aphasia. They reported that there is a close correlation among severity of aphasia and degree of gestural impairment.

In 1983, Ferro, Martins, Mariano, and Caldas suggested that gesture recognition is a multi-component task which includes linguistic, perceptual/conceptual symbolic and spatio-temporal demands. Persons with aphasia reflect a central symbolic impairment that can affect both verbal and non-verbal processes, including pantomime recognition (Duffy & Watkins, 1984). This was further supported by Netsu and Marquardt (1984) who reported that there were more number of correct pantomime responses noticed for objects and action pictures as compared to line drawings.

Another study by Cocks, Sautin, Kita, Morgan, and Zlotowitz (2009) further supported the findings by reporting that the persons with aphasia obtained a lower score than the neuro-typical participants on gesture task. They also reported that the persons with aphasia relied on gesture in order to interpret the message while the neuro-typical participants relied on speech in order to interpret the message in speech and gesture integration tasks. The results support findings by Records (1994) that impaired verbal comprehension leads to a greater reliance on gesture to decode messages. Moreover, multi-modal integration of information from speech and iconic gesture can be impaired in aphasia.

Overall, the scores on the developed comprehension test, clearly showed that persons with aphasia face difficulty in comprehension at the level of phonology,
semantics, syntax, discourse and gesture across modalities of stimulus presentation. This again depends on the severity and type of aphasia.

Kertesz in 1979 had listed a set of criteria to evaluate an aphasia test to consider it as useful. Table 5.1 compares the attributes of the comprehension test in Hindi language against each criterion that were put forth.

Table 5.1
Comparison between the different attributes of an Aphasia test stated by Kertesz and the comprehension test in Hindi Language.

<table>
<thead>
<tr>
<th>Criteria(s) (An Aphasia test)</th>
<th>Comprehension test in Hindi language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Should explore all potentially disturbed modalities</td>
<td>The comprehension test is focused at assessing all the three modalities i.e. auditory, picture, and orthographic modes</td>
</tr>
<tr>
<td>Should employ subtests that discriminate among various clinically meaningful types of aphasia</td>
<td>It contains five sections which involves assessment of comprehension at the level of phonology, semantics, syntax, discourse, and gesture and is therefore, capable of stating which type of aphasia has how much of a comprehension deficits in different modalities and at what level</td>
</tr>
<tr>
<td>Should include graded test items so that a representative range of severity can be examined</td>
<td>The present test contains five sections with increasing order of difficulty with ten items in each sub-section</td>
</tr>
<tr>
<td>Should contain enough items to eliminate variability in participants performance</td>
<td>In the construction of this test, care was taken, to eliminate the variability by having more than 400 commands in the test</td>
</tr>
<tr>
<td>Should be practical enough in terms of duration required to administer the full test</td>
<td>The time taken for the neuro-typical adults to perform on this test was 30 minutes and about one and a half hour for persons with aphasia</td>
</tr>
<tr>
<td>Should minimize the effects of intelligence and education and permit to measure language performance as purely as possible</td>
<td>The results of the present test have shown that it is not affected by intelligence and required a minimum of ten years of schooling for all the participants</td>
</tr>
<tr>
<td>Should be standardized as to scoring and administration so that the test is reliable</td>
<td>A three point and five point scoring pattern was used for scoring the abilities of the participants on the commands of the sub-sections</td>
</tr>
<tr>
<td>Should discriminate between aphasics from normals, brain damaged aphasics and other problems</td>
<td>The results of the present study evidenced a significant difference in scores of neuro-typical adults and persons with aphasia</td>
</tr>
<tr>
<td>Should have internal consistency and comparability of scores</td>
<td>Present in the study</td>
</tr>
<tr>
<td>Should have phase and content validity</td>
<td>The test was scored by twenty-five experienced Speech-Language Pathologists on factors such as simplicity, familiarity, color and appearance, arrangement, and presentation etc</td>
</tr>
</tbody>
</table>
Therefore, the present test meets the criteria of a good and useful test for persons with aphasia. This information testifies the present comprehension test as a highly structured clinical tool and helps in assessing a person’s comprehension ability at the level of phonology, semantics, syntax, discourse and gesture across modes, and thereby distinguishing the impairment in a person with aphasia. This study, thus, underlines the importance of development of the test and a scrupulous assessment of comprehension and its implication in depicting a profile of a person with aphasia and documenting even the subtle deficits on comprehension in auditory, pictorial and orthographic modes among the different aphasia types.

**Reliability and validity of the test**

**Interjudge reliability:** Cronbach’s alpha reliability was 0.95 for neuro-typical participants and 0.84 for persons with aphasia indicating high reliability between judges.

**Content validity of the test:** Content validity for the test was carried out from the ratings of the twenty-five Speech-Language Pathologists on the “Feedback questionnaire” supplied to them to rate on several parameters as simplicity, familiarity, size of the picture, colour and appearance, arrangement etc. A detailed inspection of the ratings on the questionnaire by the SLPs reveal that on the-

1. **Parameters concerned with the stimuli of the test** (like simplicity, familiarity, size of the picture, colour and appearance, relevancy), SLPs mostly rated these parameters in the ‘good’ to ‘excellent’ category indicating that the test stimuli used in the comprehension test in Hindi language has maintained the commonality and is deemed acceptable with regard to the cultural dimension of the population that it is intended at assessing.
2. **Parameters concerned with the test make up** (like arrangement, presentation, volume, complexity, iconicity, accessibility, flexibility, trainability, stimulability, and feasibility), most of the SLPs rated the test as ‘good’ to ‘excellent’ which indicated that the test although good at serving its purpose, was still viable to be considered for rephrasing and shuffling in terms of its complexity.

3. **Parameters concerned with the output of the test** (like Generalization, Scope of Practice, Scoring Pattern, Publications, Outcomes and Developers (Professional Background), Coverage of parameters (Reception & Expression), The most of the SLPs assessed the test to be ‘good’ to ‘excellent’ on these parameters. This suggests that the test has adequate implications for assessment and intervention purposes in persons with aphasia.

   It is apparent from Table 3.4 that the professionals rated the test on overall parameters as 55.79% excellent, 38.53% good, and 5.68% fair. Also for the publications, outcomes and developers domain, two professionals accounted that they were aware of the other existing materials which can be utilized to evaluate comprehension abilities, and 23 professionals affirmed that they were not aware of any other test existing either in the western or Indian context. Consequently, it can be stated that this test obtained a grading that ranged from excellent to good from most of the judges. Hence, this test can be utilized effectively on persons with aphasia.

   The Comprehension Test in Hindi language evaluates a wide range of language functions, which may be essential during the assessment process, in planning treatment and predicting outcomes. This test will help clinicians in assessing comprehension abilities of persons with aphasia and can provide a basis for intervention planning. It can
also be used to assess the effectiveness of therapy in persons with aphasia. The Comprehension Test in Hindi language will be clinically helpful, as a number of special features have been included to make the comprehension test as helpful and efficient as possible:

1. **It is comparatively brief.** The entire test is usually completed in 80 minutes.

2. **It is highly informative.** The entire test is constructed on the base of contemporary knowledge of features that influence aphasic performance in that task.

3. **It is modality specific.** The test gives the specific information about modalities (auditory, picture, and orthographic).

4. **It is easy to administer and simple to score.** The clinician can easily understand the administration rules and the scoring system of the test.

5. **It evaluates change over time.** The clinician can employ the information of the assessment of the person over the year to forecast the aphasia recovery or treatment accuracy.