WORD CLASS EFFECT ON VISUAL ASYMMETRY

Register No. 8508

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May 1987

DEDICATED TO:

PAPA AND MAMMA

WITH ALL MY LOVE

CERTIFICATE

This is to certify that the dissertation entitled "Word Class Effect on Visual Asymmetry" is the bonafide work in part fulfilment for the degree of Master of science (Speech and Hearing) of the student with Register No.8508.

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CERTIFICATE

This is to certify that this Dissertation entitled "Word Class Effect on Visual Asymmetry" has been prepared under my supervision and guidance.

GUIDE

DECLARATION

This dissertation is the result of my own study under the guidance of Dr.(Mrs) P.Karanth, Reader and Head of the Department of Speech Pathology, All India Institute of Speech and Hearing, Mysore, and has not been submitted earlier at any University for any other Diploma or Degree.

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INTRODUCTION

Cerebral asymmetry with respect to language functions has been an area of interest for several decades. The early localizationist view that language is represented solely in the left hemisphere is no longer accepted. The localizationist had attributed verbal tasks to the left and nonverbal tasks to the right hemisphere in right handers But such a clear dichotomy is not seen and the antilocalizationists have proposed the fact that language is not mediated by a particular area of the brain.

It has been suggested that both the hemispheres are equally competant in language. With the interhemispheric connections intact the left may suppress the functioning of the right hemisphere for language. For tasks such as music the right may dominate the functioning of the left hemisphere (sperry et al, 1968). Hence, for different kinds of tasks the dominance varies. Sperry et al made these observations based on experiments on commisurectomy patients and cannot be generalized to normals without reservations.

Eisenson (1962) claim, for language processing in the right hemisphere was supported by findings of deficit language in right brain damaged patients. His patients were deficit in vocabulary processing and sentence construction. Weinstein (1964) also studied the clinical population and attributed

functions to the two hemispheres. He stated that the left hemisphere appears to be dominant for phonological, sequential, syntactic and referential functions of language, whereas the right hemisphere is more specialised for the experiential aspects of language. It is also responsible for netaphoric speech. Lesser (1974) found that right brain damaged patients had difficulty mainly on semantic tests. These properties of right hemisphere cannot be generalized to a normal brain, since the functioning of the two hemispheres changes consequent to any cerebral damage.

Hence, the need for behavioural tests of laterality in normal subjects. Laterality tests have been done using the auditory modality and the visual modality. The dichotic listening tests uses the auditory mode, the tachistoscopic test use the visual mode.

A tachistoscope is an instrument which has the facility to present stimuli to any visual field for any duration of time generally for a very small duration of time. The rationale of Tachistoscopic studies is that materials presented to one visual field will be sent to the contralateral hemisphere. If it cannot be processed in that hemisphere it is transferred to the opposite hemisphere via the corpus callosum. The assumption is that reaction time or error rate will be least when processing occurs in the hemisphere which directly receives the information. In other words, the contralateral

pathways are stronger than the ipsilateral fibers, and interhemispheric transfer increases reaction time or error rate (Bryden, 1982).

In the visual system, it is not that the left eye represent the left visual field and the right eye represents the right visual field. The right half of each retina (eye) sends its fibers to the right visual cortex, and the left half to the left visual cortex. This means, that the image of objects lying to the right of the line of sight for either eye are transmitted to the left visual cortex, while those lying to the left of the line of sight pass to the right visual cortex. This reversal is due to the optic reversal of the lens of the eyes.

So material in a tachistoscope should be presented to only the right and left visual field. But when the eyes are in constant movement it is difficult for the visual fields to be constant. Hence a fixation point is used. Having the patient fix his gaze on a fixation point controls his gaze. The stimulus card is presented for a very small duration of time, so that the eyes do not have the time to move from one location to another during the exposure. Hulme(1976) stated that time up to 300 m.sec is required to initiate an eye movement. Experiments use a stimulus duration of less than 100 m.sec (Bryden, 1982).

Visual asymmetry has been found for different types of stimuli. A right visual field (RVF) i.e. left hemisphere dominance has been reported for tachistoscopically presented words and letters (Kimura, 1966 and Bryden, 1966). A left visual field dominance has been reported for non-verbal materials such as dots lines and face recognition (White, 1969) (Bradshaw et al, 1979). Single letters or numbers are reported faster when presented to the RVF (Bradshaw, Bradley and Patterson, 1976; Umilta, Frost and Hyman, 1972). A LVF/RH superiority may be introduced when largely physical attributes of the verbal stimuli are important (Bryden and Allard, 1976; Cohen, 1972; Davis and schmit, 1973; Umilta et al, 1972). A LVF/RH advantage for the line orientation (Gelfen et al, 1971) and for handwritten words has been reported (Bryden and Allard, 1976).

It has been found that word class has an effect on cerebral asymmetry/visual asymmetry. Caplan, Holmes and Marshall(1974) found no difference in magnitude of field differences between different classes of nouns and verbs. However, Ellis and Shepherd (1974) conducted tachistoscopic experiment using abstract and concrete nouns. They found a greater RVF/LH advantage for abstract words. Hines(1976, 1977) also reported a interaction between hemispheres and concreteness, the RVF/LH was superior for abstract words than for concrete words. Day (1977) using the reaction time paradigm rather than the report accuracy found that both the hemispheres were equally competent

for concrete nouns. The right hemisphere was found to be inferior to the left for abstract nouns.

The general findings for studies done in the English language are as above, studies done on the Kanji script (which is pictorial) of the Japanese language show that there was a LVF/RH superiority for concrete words (Hatta, 1977). When Chinese characters were presented tachistoscopically, RVF/LH advantage was found for low imagery (abstract) words (Tzeng et al 1976, Coltheart, 1986).

Literature on the acquisition of reading in English postulates that reading can be done through different routes. In the early stages a child proceeds from wholistic reading to a specific grapheme - phoneme route. Studies have reveqled that right hemisphere is either incapable of deriving phonology from print or is slower than the left hemisphere (Gelfen et al 1972). The OLH seems to be dominant in this function. It is therefore, hypothesized that reading of imageable concrete words is processed faster when presented to the LUF/RH and reading of abstract words faster when presented to the RVP/LH for English. Much of this research has been carried out on alphabetic scripts like English and an ideographic script like the Kanji. The results of these studies need to be verified in terms of scripts such as syllabaries which is midway between

the range of scripts from alphabetic to ideographic. This study aims to verify if the cerebral asymmetries reported in the processing of abstract vs concrete words in the English speaker is true of the Kannada speaker.

REVIEW OF LITERATURE

Tests of laterality have attributed major language functions to the left hemisphere. However, right hemisphere has been found to possess certain language functions. Thw tachistoscopic studies done to evaluate the visual asymmetries have been reviewed here. The different behavioural and physiological methods of laterality are:

l.Dichotic listeing (Kimura, 1961).

2.Tachistoscopic hemiratinal stimulation.(Kimura, 1969).

3.Various electrophysiological techniques such as analysis of motor potentials (McAdams and Whittaker, 1971).

4.Evoked potentials (Eachsbaum, and Fedio, 1970; Wood and Gulf, 1971).

5.CNV waves (Low, Wada and Fox, 1975).

6.Use of pharmacological agents eg. Sodium amytal test(Wada and Rasmussen,1960).

7.Electrical stimulation of the exposed cortex (Penfield aad Roberts, 1958)

8. Clinical population.

9. The concurrent activity or a time sharing paradigm (Kinsborne and Cook, 1971).

The general conclusion from these studies in that LH deals primarily with processing linguistically coded material while the RH, processes materials which are nonlinguistic (Bryden,1966; Kimura, 1966). This is the oversimplified view as it has been found that RH does have certain linguistic abilities which

surface after a LH lesion. Thus, at present the dichotomy of verbal/nonverbal has lost favour. The trend is towards the task processing i.e. left hemisphere is analytic and RH is wholistic.

Left hemisphere dominance is not equally strong for all aspects of language and speech perception and the RH does have certain language functions (Goldberg, 1978) Rt hemisphere may be dominant for:

1. appreciation of word connotations (Gardener and Denes, 1973; Brownell et al 1984).
2. metaphors (Winner and Gardner, 1977)
3. Antonymic contrasts (Gardner et al 1978)
4. Humor (Gardner et al 1975; Brownwell et al 1983) and
5. solution of one step verbal reasoning problems (Caramazza et al 1976; Kenneth et al, 1986).
6. Semantic functions.

The nonverbal abilities listed for RH are (l) spatial relationships; (2) pattern recognition (3) facial recognition (4) spatial construction (5) drawing ability (6) dressing apraxia (7) emotional expression (8) perception of emotions (9) humor (10) tonal discrimination (11) subtleties of dis-course and attentional arousal (Kerterz, 1983).

A Comparison of LH and RH language functions

	LH	RH
Gestural Language	+	+
prosodic Language		
Rhythm	++	+

	LH	RH
inflection	+	+
Timbre	+	+
Melody		++
Semantic language		
Verbal meaning	++	
Concepts	+	
Visual meaning		++
Syntactic meaning		
Sequencing	++	
Relationships	++	
Grammar	++	

Thus, it is clear that language function is not monopolized by the LH. Also, non-linguistic processing is not solely the function of the RH.

The factors influencing lateralization:

1) Subject's state, i.e. the cognitive task he is involved in, or his ability to extract certain types of information from the stimuli (Davis, and Wada, 1977).
2) Characteristics of the stimuli presented.
3) Presence of sensory deficits like blindness or deafness.
4) Environmental factors - the amount of exposure to the language and the age and manner of acquisition.(Brown and Hecaen,1976)
5) Ontogenny, as age increases the laterality becomes more pronounced.
6) Bilingualism/Monolinguals.
7) Number of languages known.

Visual laterality effects:

Although the dichotic listening procedure was the first approach to laterality in the normal brain to be related to cerebral asymmetry, vision has recently become a popular modality for laterality research. Such experiments are done using a T-scope.

Not all stimuli yield a cerebral advantage and it is important to know that are the crucial determining stimulus characteristics. The general finding that verbal material yields a LH advantage and nonverbal materials and a RH advantage is not strictly dichotomous. If the nonverbal stimuli has a sequential aspect it will show a RH advantage. (Robinson and Solomon, 1974). Studies have also revealed that hemispheric advantage can be reversed according to physical size of the stimulus (Pring, 1981) type face (Bryden and Allard, 1976) angle of exposure (Finlay and Jenkins 1980) degree of luminance (Sergent 1982) serial position of the stimuli (Kirsner and Brown, 1981).

A review of the studies done on (monolinguals) rt handers using the Tachistoscope paradigm follows. Studies on letters, numbers and finally words classes will be discussed.

1) In a simple letter identification task, Bryden and Allard (1976) found that letters in certain nonstandard typeface yielded a reliable left visual field (LVF) effect, whereas

a more familiar typeface gave the usual right visual field (RVF) superiority.

Kimura found a LVF superiority for counting of the number of letters on a presentation.

Dimomd and Beaumont (1972) indicate a RH advantage for digit comprehension. In acquired dyslexic the preserved ability to read digits can be taken as evidence of a RH/LVF participation or superiority. Hirata and Osaka (1967) have demonstrated a RH/LVF advantage for the recall of briefly displayed Arabic digits. But this advantage can be explained on the basis that Arabic numerals require Holistic processing which is the characteristic of RH functioning - hence in this case digits may not be having a sole effect. There is insufficient data to conclude and say with finality that RH is superior in processing digits. As there are studies which support the fact that single letters or numbers are usually discriminated faster when presented to the RVF/LH i.e. there is a LH advantage. (Bradshaw et al 1976; Carmon et al 1972; Gelfen et al 1971; Umilta et al 1972 etc) Bradshaw and Gates, 1978.

Laterally displaced line drawings and the words which name these drawings were T-scopically presented to normal adult subjects in an experiment by Levine and Banich (1982). They found as expected for words - RVF effect i.e. a left hemisphere advantage. For line drawing earlier studies have reported a RVF/LH advantage (Young et al, 1980; McKeever and Jackson, 1979; Bryden and Rainey, 1963; Wyke and Ettlinger,1961).

but this study did not obtain any visual field advantage. This absence of a visual field asymmetry for line drawing is consistent with reports of a shift towards greater RH involvement in the recognition of pictographic as compared to phonetic writing system.

Salmaso and Umilta (1982) conducted 2 experiments using vowels pairs. They found that physical matches and name matches for printed vowels are performed by both hemispheres. A RH advantage for script like letters wese found and this was attributed to the higher order level of spatial processing required bythis material. Previous studies have demonstrated a RVF/LH advantage for name matches when only stop consonants (Umilta et al 1980) only consonants (Simion et al 1980) or both consonants and vowels (Davis and Schmidt 1973 etc) were used as stimuli.

Sergent (1984) found a LH advantage in the processing of visually presented vowels. He found that the viewing conditions played a role in cerebral asymmetry. This contradictory finding may be because of the difference in visual characteristics used by the experimenters. Another contradictory finding by Umilta et al 1980 was that they found a LH advantage for script like letters (unlike the RH advantage as reported earlier). They attributed it to the use of consonants. Hence, no clear cut statement can be made as the stimulus used by each experimenter has been different.

Studies in Japanese Language:

The Japanese language has two scripts. One is the Kana which is syllabic and reading a word would require phonological recoding. The other is Kanji which is ideographic. There is a separate "Character" for each word. So this would require visual reading. Japanese speakers have a knowledge of both these scripts. It is of interest to study the lateralization of these scripts as they involve two completely different processing strategies. Clinical data has demonstrated a dispro-portionate affect on the 2 scripts. A LH lesion affects Kana to a greater extent and RH lesion affects Kanji to a greater extent.

Hatta (1977) found that when a single Kanji word is presented T-scopically, a RH advantage is seen. Using the Kana script a LH advantage is seen, so in normal right handed Japanese speakers there is differential representation of the two scripts. This difference has been explained on the basis that LH specializes in serial tasks and that is what is required in reading Kana. Whereas RH has a wholistic approach and that is what is required in reading Kanji.(Coltheart, 1982).

Tzeng, Hung and Garro (1978) have obtained parallel results in native Chinese speakers. A single character showed a RH advantage while multiple characters showeda LH advantage.

A low imagery (abstract) word yielded a LH advantage in a lexical decision task in the Chinese language. Tzeng et al (1979) carried out a lexical decision task. Using pairs of Chinese characters (Coltheart,1982).

Hatta (1977) studied the ability of normal Japanese subjects to recognize Kanji items when presented to the left or right visual fields. He found that while there was the predicted superior recognition of all Kanji items when in the LVF/RH. Concrete Kanji nouns were better recognized than abstract nouns when ia the LVF/RH. Thus, he concluded that there is some RH specialization for the processing of concrete words when characterized in the non-phonetic symbols.

In brief these studies have demonstrated that the LH has an analytic approach and the RH a wholistic approach to any task. Also, in a language like Japanese (Kanji script) performance asymmetry varied as a function of word imageability, the RH displaying a superiority to process concrete words.

Studies in English Language:

The English language is diametrically opposite to the Kanji script. It is a phonetic language and requires a letter by letter analysis for reading. The concrete abstract processing has been the focus of many a studies.

Some words can easily be imagined eg. Disaster and some not eg. Economy. Some are concrete eg. animal and some are abstract eg. Fantasy, speed). These 2 words imageable and concrete are highly correlated.

Ellis and Shepherd (1974) employed normal (monolingual) adults on a recognition task of laterally presented abstract and concrete stimuli. They found that the concrete words were better recognized than the abstract when presented in the left visual field. The right hemisphere was found dominant in processing concrete/imageable words. (Hines 1977)

This hypothesis namely, the ability of the RH to process concrete/high imageable words is called the RH imageability hypothesis.

Hines (1976, 1977) supported this hypothesis. In his experiments he found a RVF/LH advantage for abstract words, and concluded that familiar concrete words may be independently recognized by the LVF/RH.

Orienstein and Meighan (1976) replicated Ellis and Shepherd's study and found an interaction between hemisphere and concreteness, though this was not statistically significant.

The difficulty with these experiments is that they did not control the order of report. Also, when one is dealing with percentage as data, whether one obtains an interaction between two variables depends on what data transformation is used and there is no way in which to make a non-arbitrary choice of transformation; even no transformation at all represents an arbitary choice (Colth eart, 1982).

To avoid this problem Marcel and Patterson (1979) uaed a different experimental design. They presented single words to the left or right of a fixation point, and followed the words with a pattern mask. The stimulus - onset asynchrony (SOA) of the mask was adjusted separately fox the two visual hemifield's until with high imageability words, the subject was equally accurate in the two hemifield's. At these sOAs, low imageability words(abstract) presented to the LH were reported just as well as high imageable/concrete words were reported much less accurately then high imageability words. Because concreteness and imageability were varied orthogonally, it was possible to determine that imageability was having an effect here, while concreteness was not, so they also found that abstract words were reported better when presented to the RVF/LH (Coltheart, 1982).

Support for the right imageability hypothesis comes from Skallice and Warrington (1975). They observed deep dyslexics ability to read abstract words was greatly impaired. They suggested that access to the abstract system may be largely phonological via the LH, while high frequency concrete items may be immediately named from a directly genevated RH image.

This set of experiments provides evidence of a selective disability of the RH it has difficulty in dealing with words which are low in imageability. However, this result is not unanimously obtained.

Lambert and Beaumont (1983) questioned the RH imageable hypothesis. They regard the results supporting this hypothesis as artifacts. They conducted 4 experiments and found that when subjects were asked to orally report words in the visual field the observed asymmetry in performance does not vary as a function of word imageability. But they varied the stimulus word orientation and hence the difference in results.

Hatta (1971) using Tachistoscopic presentation of single high frequency Kanji characters, found that performance was more accurate with LVF/RH presentation and also with concrete rather than abstract Kanji, but there was no interaction between hemisphere and concreteness.

Saffran et al presented single words or pronounceable non-works oriented vertically to the left or right of a fixation point, with a following pattern mask. Abstract words were reported better than concrete words when presented to LH. But there was no interaction between hemisphere and concreteness. In a second experiment using the Marcel and Patterson method of equating performance across the hemisphere on concrete nouns by allowing SOA to vary, again no hemisphere - by concreteness interaction was observed.

Schmuller and Goodman (1979) criticized the lack of control of order of report. In their experiment they used an arrow mark on each bilateral presentation of the pair of words. Results

showed a RVF/LH advantage for high imagery words and no advantage for low imagery words. This finding contradicts the earlier studies.

Day (1977) employed a lexical decision (i.e.word-nonword) reaction time task. Reaction time was used instead of report, accuracy. He also used vertically when written words for the T-scope presentation. Abstract and concrete words were compared. Presentation in the right field/LH were responded to faster than those in the left field for abstract words, but not when concrete. In other experiments involving decisions as to superordinate category membership. Day again found that there was no field difference for concrete nouns, while there was a right visual field superiority for abstract words. He concluded that while concrete words can be processed equivalently by either hemisphere, information about abstract words must be transferred to the left for analysis. Whitaker, however, criticizing Day's conclusion has noted that six of his subjects apparently had language located in their right hemisphere anyway. And the results with concrete words (which are the controversial ones) are biased by right hand response data, which was always faster that the left hand. Also, the use of vertical presentation of the words may have influenced the results (Coltheart, 1982).

Thus, Day's data suggests that with concrete words the two hemispheres are equally competent at lexical decisions,

whereas with abstract words the RH is so much inferior to the left that decisions are always made by the LH even when the stimuli are presented initially to the RH. This does not mean that the RH is incapable it may be simply slower than the left hemisphere.

Gross (1972) presented pairs of concrete nouns unilaterally, to the left or right visual field. The subjects had to decide whether or not the items belonged to the same category. Making a manual reaction time response a strong (35m.sec) RVF/LH superiority was found. So, he found on asymmetry for concrete word processing whereas Day did not.

Bradshaw and Gates (1978) found the magnitude of the RVF superiority/LH waa nonsignificantly greater for low frequency words and was significantly greater for abstract than for concrete words. This effect was greatest for abstract low frequency words.

A semantic categorization experiment was also carried out by Day (1977) to investigate the interaction of concreteness with hemisphere on each trial of this experiment, the subject saw a centrally - presented category word, followed by a noun presented to the left or right of centre the subject pressed a button if this noun was apexempler of the category, otherwise did nothing. Results were as per expectation when the category

and its exemplar were concrete, reaction times were equivalent for the hemispheres. The hand by field interaction was as predicted, that the hemisphere to Which the concrete noun is presented is the one Which performs the categorization task. The interaction was large but not significant. The error rate interaction by hand-by field was also in the direction predicted but not significant. When abstract words were fused reaction time was faster with LH presentation. Reaction time or error rate did not imply any RH involvement in decision making (Coltheart, 1980).

The varied results of these experiments reveals that a change in the experimental procedure or set up can change the results. There is a great need for series of controlled experiments to be able to conclude about the concrete/abstract processing in the two hemispheres.

To summarize, the experiment done on the interaction of hemisphere and visual field, have shown a left heaispher's advantage to process abstract words whepcompared to the right hemisphere, and a right hemisphere advantage for concrete words.

In Kannada language this effect of word class has not yet been studied. It is of interest to compare the results of the described English and Japanese studies with that of Kannada language.

METHODOLOGY

Aim of the study:

To test the visual asymmetry in the processing of abstract and concrete nouns in Kannada language.

Hypothesis:

1. There is no significant advantage for abstract words over the concrete words when presented to the RVF/LH.
2. There is no significant advantage for concrete words when presented to the LVF/RH

From the above, it follows that:

la) There is no significant difference for the abstract words in the two visual fields.

2a) There is no significant difference for the concrete words in the two visual fields.

Subjects:

20 adults,(10 males and l0females) in the age range of 18-40 years were selected for the study.

The criteria for selection were as follows:

1) They be self rated right banders for all types of tasks.
2) They have no family history of left handedness.
3) They have studied Kannada for atleast 10 years in school and their mother tongue and first language be Kannada.
4) They have normal vision or corrected vision and have no visual defects like nystagmus or strabismus.

5) Subjects who did not report atleast one word from either the left visual field or right visual field were excluded from the study (as it was not possible for them to show any asymmetry)

Stimuli:

Abstract and concrete norms were the word stimuli. They were selected from the Kannada word list prepared by M.R.Ranganath. C.I.I.L, Mysore, which has the relative frequency of Morphemes in Kannada. 20 high frequency abstract and concrete words (norms) were selected. These fourty words were then given to 15 proficient Kannada speakers to classify as abstract, and concrete. A concrete noun was defined as a word which immediately elicited an image. An abstract word was defined as a word which did not elicit definite image.

For the final word list only those words which were judged by 80% of the judges to be abstract or concrete were selected. The final list consisted of 15 abstract and 15 concrete words of high frequency.

The stimulus card was designed so as to have bilateral presentation of words in which an abstract word occurred in one visual field and the concrete word in the other. Hence, all the abstract words were randomly paired with concrete words, in such a way so that each word (abstract and concrete) occurred once in each visual field. Thus, in the first 15

pairs the abstract word occured in the left visual field(LVF) and in the 2nd 15 pairs the same abstract words occurred in the RVF. Visa versa for the concrete words.

The vord stimuli were hand written (by an artist) on a 4 x 6 file card. A central fixation cross was drawn on one card. On the other card the center digits used with every bilaterally presented word were randomly taken from 1-9. The digit was presented at the fixation point, and the inner edge of each word was 1.3 cm (.023 rad) from the center of fixation. The height of the letters was 2.2 cm. The letters were spaced .4 cm apart. (Hines, 1977). This ensured that each word was in right/left visual field.

The stimulus cards were numbered 1-15 (with abstract words in the LVF and concrete words in the RVF) and 16-30 (abstract words in RVF and concrete words in the LVF). The order of presentation of the cards was randomized across the subjects. The word list is given in the appendix.

Apparatus:

1. The Gerbrands G1132 T-3B-2 Tachistoscope with a 3-field cabinet.
2. A Phillips tape recorder Model AM 125 and a Coney Cassette.

Description of the Tachistoscope:

This Tachistoscope has 3 accessories each having its own function. When working together if permits the presentation

of predetermined sequences of timed exposure. The accessories are:

1) 6 channel - 300 - C series Timer

2) 400 series camp driver

3) G1159 Logic interface.

300-c-Series Timer:

Controls and function:

1) Power /off - This switch controls the A.C. power

Manual - A manual button permits manual operation of each channel.

Indicator Lamps - The LED lights either when the channel is timing or when the manual button is pressed.

Thumbwheel Switch and Multiplier switch - The time interval can be set by rotating the thumbwheel switch and manipulating the multiplier switch.

Start/End - This switch (below the thumb wheel) enables the sequencies of operation of the Timer.

Cycle/Normal - Controls the cyclic operation of the timer.

Normal position - Timer will loop through only one sequence and stop.

Cycle position - The timer will loop through the timing sequence continuously until terminated by stop lever.

Start/stop - This controls indicated or terminates a timing cycle.

2) 400-series Lamp Driver:

Supplies DC power necessary to operate all lamps simultaneously at full rate intensity.

Intensity control - Continuously variable intensity control permits independent control of field illumination - Graduation range from '0 to 100' (The correct position for knob and intensity shaft control is 100').

Mode switch - (on the rear panel).

Mode-1 - Separates the input of the fields and allows them to be fished independently.

Mode-2 - Enables the use of field as fixation or adaptation field.

3) G 1159 Logic Interface :

Allows structuring of stimulus - delay sequence in many patterns.

Push buttons - the matrix of push buttons (push to operate, push to release) provides. Maximum convenience in programing and modifying the conditions of stimulus presentation.

Horizontal rows - Represent the stimulus presentation fields.

Columns - represents Timer channels.

When a button or any combination of buttons is depressed, the corresponding stimulus field or fields will be illuminated during the time intervals set in the corresponding Timer channels.

Inverse Mode - (Red Button 1NV) - A button or combination of buttons when depressed, the corresponding stimulus field or fields will be extinguished.

Warm up time was 10 minutes.

procedure:

Operation of the Tachistoscope:

1) The power/off is kept at off

2) Connect AC input.

3) Set power/ff switch to power.

4) Press the MANUAL button on each channel for field one.

5) The thumbwheel for field one is Rotated to 90, the multiplier switch to x10. For field 2, the thumbwheel is set to 40, the multiplier to xl, for field 3, the thumbwheel is set to 10, the multiplier to x10. All the short/end switches pressed to End and Cycle/normal switch to normal.

Programming the Logic Interface:

The push buttons of Field 1, 2, 3 are pushed in such a way so that the sequence is-Field 2, Field-1 and then Field-3. The intensity control is kept at 100% for all the fields.

With this arrangement each trial consisted of the fixation cross in Field-2 exposed for 900 m.sec, next the Field-1 which has the stimulus card exposed for 40 m.sec 4 lastly Field-3 which has a blank card is exposed for 100 m.sec.

Instructions to the subjects:

The subjects were instructed in the following manner "0nce you place your eyes in the hood you will see a White card with a cross in the center. Please fix your eyes on it. Following this card you will see the stimulus card which has a digit

in the center and two words on either side. You have to report the digit first followed by the words in any order. It is important that you report the digit or else the trial will be cancelled. The exposure is for a very small duration and before every trial you will be alerted by the word 'ready'?

Each subject was given 3 trials. The entire session was tape recorded.

Once the subject was seated with eyes in the hood, the 'ready' one was given. Next the stimulus card was dropped into the stimulus slot. The start/stop switch was depressed. Thus, the timer looped through one cycle of predetermined sequence and exposure duration. The stimulus card was then released and the next card dropped again into the slot and the start/stop switch again depressed. In this manner all the 30 stimulus cards were exposed.

Responses:

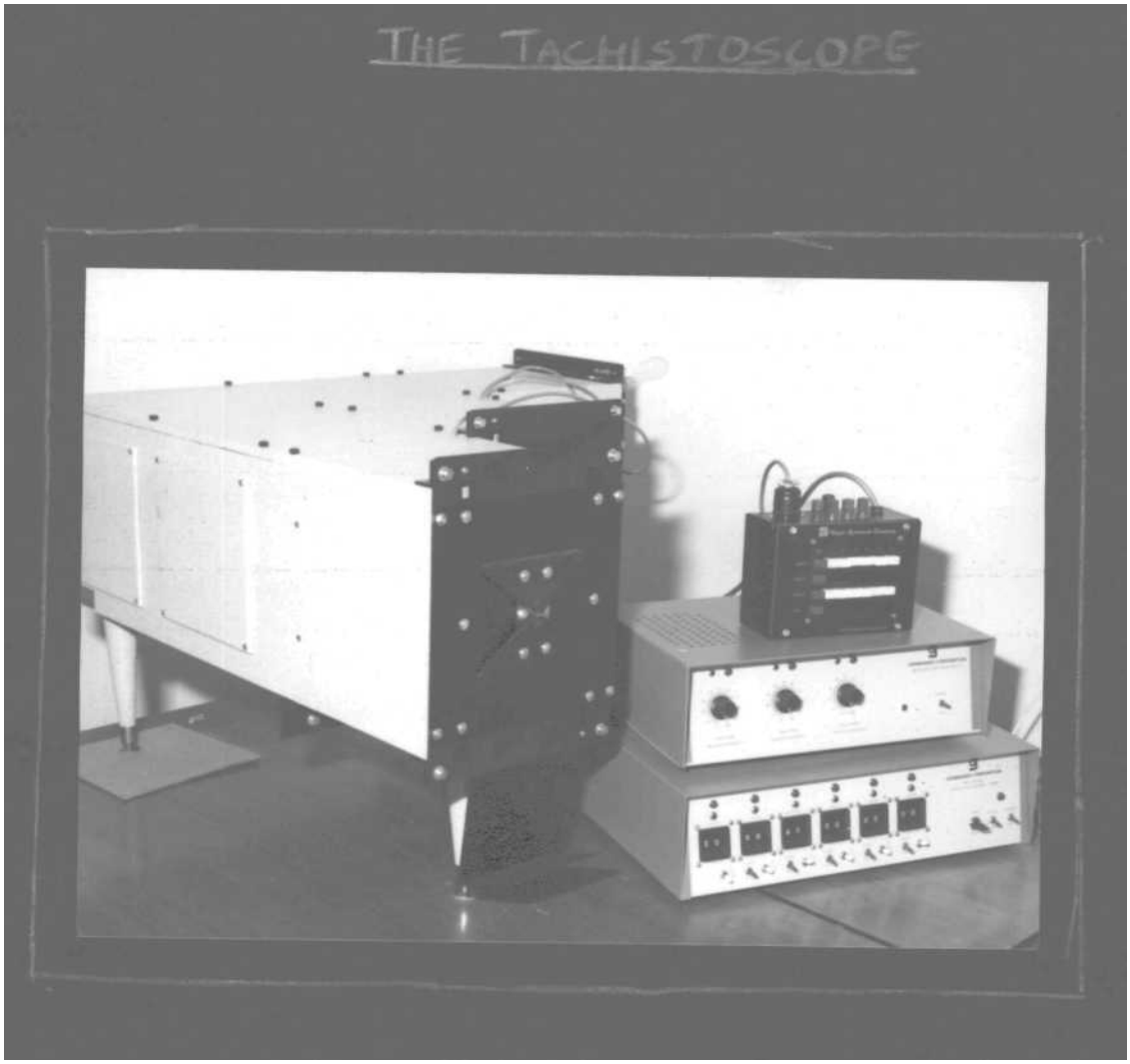
The response sheet shown in Table-1 was used and th* subjects responses were 'trascribed' from the tape. The response to each stimulus card was taken down in terms of the word/s reported. If for example the subject reported only the abstract word of stimulus card No.3, a 'tick' mark was made in the respective vox. If both the abstract and concrete word (i.e. words in both the visual fields) were reported a tick mark in

both the column was made. In this way all the responses were tabulated. Than, the total number of responses for the RVF and LVF for abstract and concrete words were tabulated.

Table-1:

RESPONSE SHEET

Visual field	Stimulus cards														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Right (con-crete)															
Left (abstract)															
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Right (Abstract															
Left (con-crete)															


THE TACHISTOSCOPE

RESULTS AND DISCUSSIONS

RESULTS

The scores of each subject on both the visual fields for both abstract and concrete words are given in Table-2.

The 't' test of significance was computed first between males and females so as to decide whether to treat the two groups as one or not. The 't' score was below significance at both 0.01 and 0.05 levels. Hence it was concluded that there was no significant difference between males and females with respect to abstract and concrete words for LVF and RVF.

Hence, the 2 groups were considered as one to test the other hypotheses.

There is no significant advantage for the abstract words over the concrete when presented to the RVF.

The t-test revealed a t score of 0.42 which is not significant at both the 0.05 and 0.01 levels. Hence it was concluded that there is no right visual field advantage for abstract words.

There is no significant advantage for concrete words when presented to the LVF.

The scores of the abstract and concrete word were compared in LVF and the t-test yielded score of 0.8916 which is not

significant at both the levels. Hence, there was no LVF advantage for concrete voids whan presented in the LVF-1.

There is no significant difference in the LVF and RVF for obstract words.

The t-test it was done to test if there is any significant difference in the LVF and RVF scores for abstract words in the 20 subjects tested. The t-score was not computed as the means of both the scores were the same. Hence, the difference was not significant.

There is no significant difference between the LVF and RVF for concrete words.

The t-test was done to test if there was any asymmetry or difference in the LVF and RVF for the reporting of concrete words. The t-score was 1.62 which was not significant at both the 0.01 and 0.05 level. Hence, there is no visual asymmetry for concrete words.

Thus, all the 4 hypothesis were accepted.

Table-

	t-Score	Significance at 0.05	Significance at 0.01
Abstract LVF vs RVF	0	NS	NS
Concrete LVF vs RVS	1.62	NS	NS
JVF Abstract vs concrete.	0.8916	NS	NS
RVF Abstract vs concrete.	0.42	NS	NS

NS - Not Significant.

Table-2

Males

Subjects	Abstract words		Concrete words	
	LVF(x_1)	RVF(x_2)	LVF(x_1)	RVF(x_2)
B	14	14	14	13
R	8	7	9	7
C	2	7	4	6
S	8	3	11	5
RS	12	9	14	10
V	13	13	12	12
S	10	2	12	12
M	2	11	1	11
C	11	12	13	9
P	14	15	15	14
	93	92	105	95
Mean	9.3	9.2	10.5	9.5

Females

subjects	Abstract words		Concrete words	
	LVF	RVF	LVF	RVF
C	7	12	6	5
S	14	13	14	8
M	5	12	11	12
I	13	10	13	12
S	14	13	15	12
R	12	13	13	12
N	8	11	12	13
H	9	8	14	11
V	14	14	14	9
S	14	5	13	4
	110	111	125	98
Mean	11.0	11.1	12.5	9.8

significant at both the levels. Hence, there was no LVF advantage for concrete words when presented in the LVF-1.

There is no significant difference in the LVF and RVF for abstract words.

The t-test it was done to teat if there is any significant difference in the LVP and RVF scores for abstract words in the 20 subjects tested. The t-score was not computed as the means of both the scores were the same. Hence, the difference was not significant.

There is no significant difference between the LVF and RVF for concrete words.

The t-test was done to test if there was any asymmetry or difference in the LVF and RVF for the reporting of concrete words. The t-score was 1.62 which was not significant at both the 0.01 and 0.05 level. Hence, there is no visual asymmetry for concrete words.

Thus, all the 4 hypothesis were accepted.

Table-3

	t-scores	significance at 0.05	Significance at 0.01
Abstract LVF vs RVF	0	NS	NS
Concrete LVF vs RVS	1.62	NS	NS
LVF Abstract vs concrete.	0.8916	NS	NS
RVF Abstract vs concrete.	0.42	NS	NS

NS - Not significant

DISCUSSIONS:

The results show that there is no visual field advantage either for abstract words in the RVF, nor for the concrete worse in the LVF. The visual asymmetry seen in studies done in English and Japanese language is not observed in Kannada.

This lack of asymmetry for processing abstract and concrete nouns may be due to the difference in the type of script/language. Earlier studies have been done on languages with alphabetic and ideographic script. This study has been done on a syllabic script. Thus, the difference in reading an alphabetic script, an ideographic script and a syllabic script.

Postulations in current literature on acquisition of reading and acquired reading disorders -

1) Reading uses both a wholistic (logographic) and grapheme - phoneme correspondance method.
2) In the early stages of reading the wholistic or logographic route is used. The grapheme -phoneme correspondance route is acquired later. Once the reader becomes a skilled reader becomes both techniques with wholistic (semantic) reading used in rapid reading. There is a fall back to grapheme - phoneme reading whenever new, unfamiliar words are presented.

Support for existence of those two routes are found in the acquired dyslexias where in one or the other route is selectively disturbed. In deep dyslexia the wholistic (semantic)

reading is preserved with the grapheme -phoneme reading disturbed and in surface dyslexia where the reverse is observed.

Geffen et al (1972) have found evidence that the right hemisphere is either incapable in phonological task or is slower than the left hemisphere. T-score studies are seen to support the notion of differential representation of these two routes with the right hemisphere processing wholistic (logographic) reading hence, showing a LVF/advantage for imageable concrete words. The left hemisphere is capable of deriving phonology from print and hence processes the grapheme-phoneme reading. Hence a RVF advantage is seen for non imageable abstract words (Coltheart, 1982).

Considering the results obtained in this study,it should be emphasized that the models of reading have primarily been based on reading scripts which represent the 2 extremes of the varieties of scripts, that is alphabetic vs ideographic and may not be true of scripts such as syllaberies which fall midway between the two and where the difference between the two methods of processing may not be so clear cut.

The lack of asymmetry in processing concrete and abstract words in Kannada could be attributed to any one of the following possibilities.

1) The difference between wholistic vs grapheme phoneme correspondance processing is not as great in Kannada as in alphabetic and ideographic scripts.

It follows that the exposure duration of 40 ms. may be too large to elicit this relatively slight difference in the two methods of processing.

2. In view of the above it would be essential to conduct experiments similar to Day's(1977) experiments, which involve reaction time paradigms for eliciting visual asymmetry with respect to word class, in Kannada.

SUMMARY

Research on the visual asymmetries for word class (abstractors concrete norms) have been done in alphabetic and ideographic script i.e. English and Kanji respectively. The general finding has been that the RVF/LH shows an advantage over the LVF in processing the abstract norms. The LVF/RH processes the concrete norms. This study aimed to (l) Test if there is a RVF/LH advantage for abstract words (2) Test if there is a LVP/RH advantage for concrete words, for Kannada.

20 (10 males and 30 females) Kannada speaking subjects were randomly selected after they passed the criteria of selection. A 3 channel Tachistoscope (Gerbrand G1132 7-3B-2) was used. A word list of 15 abstract and concrete words was constructed. 15 pairs of abstract and concrete words were randomly made. Bach word appeared once in each visual field. The stimulus card consisted of a digit in the center and an abstract and concrete word in the two visual fields. The card size, the distance of the words from the center and the size of the letters were based on the measurements given by Hines, 1967.

The sequence in each trial consisted to a 900 m.sec exposure of a cross followed by a 40 m.sec. exposure of the stimulus card

and finally a 100 m.sec. exposure of a blank card. The subjects were asked to report the digit and then the words in any order.

The scores of each subject in the LVF and RVF for abstract and concrete words was tabulated. The t-test was applied on the data to test the visual field difference/ advantage. The results shows no visual field differences for the words used. The implication and suggestions for further research in this area have been discussed.

BIBLIOGRAPHY

Benson, F.D.(1986) "Aphasia and lateralization of language" Cortex, 22: 71-86.

Bradshaw Gates (1980) "Right Hemisphere language - Familial and nonfamilial simistrals cognitive deficits and writing hand position in sinistrals, and concrete - Abstract Imageable - non—imageable dimensions in word recognition- A review of interrelated issues", Braid and Language, Vol.10, 122-188.

Bradshaw and Gates (1978) "Visual Field differences in verbal tasks". Effects of task familiarity and sex of subject", Brain and Language, Vol.5, 166-187.

Brand, N, Bekkum, J.V, Stumpel, M, and Kroeze (1983) "Word Matching and lexical decisions: A visual half field study", Brain and Language, Vol.18(1), 199-211.

Bryden and Allard (1976) "Visual Manifield differences depends on Typeface", Brain and Language, Vol.3, 191-193.

Bryden, M.P (1982) "Laterality -- Functional Asymmetry in the intact brain", Academic Press INC, London.

Coltheart, M (1988) Deep Dyslexia, Routledge and Kegan Paul, London.

Elman, J.L, Takahashi, K and Tohsaku, Y (1981) "Asymmetries for the categorization of Kanji norms, adjectives and verbs presented to the left and right visual field", Brain and Language, Vol.13, 290-300.

Geffea, G and Bradshaw, J.L and Netlleton, (1972) "Hemispheric asymmetry: verbal and spatial encoding of visual stimuli", J.of Experimental Psychology, 93:25-31.

Garrett, H.E (1979) "Statistics in psychology and education", Vakils, Felfer and Simons Ltd., Bombay.

Hines, D(1977) "Differences in Tachistoscopic recognition between abstract and concrete words as a function of visual half field and frequency", Cortex, 13:66-73.

Keever, W.P. and Dixon, M.S(1981)"Right hemisphere superiority for Discriminating memorized from non-memorized faces: Affective imagery, sex and Perceived emotionality effects", Brain and Language, Vol.12, 246-260.

Levine, S.C. and Banich, M.T (1982) "Lateral asymmetries in the naming of words"and corresponding line drawing" Brain and Language, Vol.17, 34-45.

McKeever, W.F. and Hoff, A.C (1982) "Familial sinistrality sex and laterality differences in naming and lexical Decision latencies of right banders", Vol.17, 225-239.

Moscovitch Morris (1976) "On the representation of language is the right hemisphere of right handed people", Brain and Language, Voll3, 47-71.

Ranganatha, M.R(1982) "Morphophonemic analysis of the Kannada Language", CIIL Publications, Mysore.

Salmeso and Umilta (1982) "Vowel processing in the left and right visual fields", Brain and Language, 16:147-157.

Schmuller, J and Goodman, R(1980) "Bilateral Tachistoscopic perception, Handedness, Laterality for nonverbal stimuli", Brain and Language, Vol.11, 12-18.

Sergent, J (1984)"Processing of visually presented vowels in the cerebral hemispheres , Brain and Language, Vol.21(l), 136-146.

Sewell, D.F and Panough (1983) "Visual field asymmetries for verbal and dot localization tasks in monolingual and bilingual subjects", Brain and Language, Vol.18(1) 28-34.

Tsao, Y, WuHing-Fung and Fenstel,T(1981) "Stroop interference: Hemispheric difference in Chinese speakers", Brain and Language, Vol.13, 372-378.

Umilta, C and Sava, D, and Salmaso, D(1980) "Hemispheric asymmetries in a letter classification task with different typefaces", Brain and Language, Vol.9, 171-181.

Wapner, W, Hamby, S, Gardner (1982) "The role of the right hemispere in the comprehension of complex linguistic material", Brain and Language, Vol.15, 15-33.

Appendix

Stimulus words and the position digits.

ಕ್ರಮ ಸಂಖ್ಯೆ			
1.	ನಾಲ	5	ಕೈ
2.	ಕಾಲ	6	ತಾಂತು
3.	ಚಂದ	1	ಸಂದೆ
4.	ವರ್ಷ	2	ನಾಲಕೈ
5.	ವಿಷಂತು	3	ಒಬ್ಬ
6.	ವಿಚಾರ	4	ಜನ
7.	ಮನುಷ್ಯ	5	ಆದ
8.	ನಂತರ	6	ಹಣ
9.	ಕಳಿದ	7	ಮನೆ
10.	ಕೇವಲ	8	ಆಹಾರ
11.	ಕಾರಣ	9	ಮುಖ
12.	ಸತ್ಯ	1	ನಾವಿರ
13.	ಗುಣ	2	ಮೂರು
14.	ಕಷ್ಟ	3	ಕಣ್ಣು
15.	ಹೊತ್ತು	4	ಕಪ್ಪ
16.	ಮನೆ	5	ಕೇವಲ
17.	ಒಬ್ಬ	4	ಕಾರಣ
18.	ನಾವಿರ	3	ವರ್ಷ
19.	ಕೈ	2	ಕಳಿದ
20.	ಆಹಾರ	9	ಹೊತ್ತು
21.	ಹಣ	8	ನಾಲ
22.	ಮೂರು	7	ವಿಷಂತು
23.	ಮುಖ	5	ಸತ್ಯ
24.	ಜನ	6	ಕಾಲ
25.	ನಾಲುಕ್ಕ	5	ಸತ್ಯ
26.	ಕಣ್ಣು	4	ನಂತರ
27.	ತಾಂತು	3	ವಿಚಾರ
28.	ಕಪ್ಪು	2	ಗುಣ
29.	ಅತ್ತ	1	ಕೇಂದ್ರ
30.	ತಂದೆ	6	ಮುಖ