CHAPTER 3

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Research in different languages suggests recognition of printed words depends on the match between a printed letter string and a lexical representation (Frost, Katz, & Bentin, 1987), mediated through abstract representations of orthographic and phonemic information (Frost et al., 1987) that are activated automatically during the process of word recognition (Humphreys & Evett, 1985).

Furthermore, studies in many languages report readers to obtain partial and/or low level information and high level information may be extracted from the parafovea during lexical access through phonology, orthography, morphology and semantics in languages like Chinese and Hebrew (Yang, 2010) while reading isolated words or words in context. Additionally, reading proceeds through a sequential identification of words in the foveal vision (McConkie, 1979; McConkie, Zola, Blanchard, & Wolverton, 1982; Morrison, 1984) and that the preview benefit is a function of the visual and phonological similarities between preview word and target word (Pollatsek et al., 1992). However, studies that employed naming task (Cheng & Shib, 1988) and semantic judgement task (Perfetti & Zhang, 1995) suggested that phonological and/or orthographic preview benefit could be additive. These findings have been
explained by the current reading models like the interactive-activation models (Plaut, McClelland, Seidenberg, & Patterson, 1996; Seidenberg & McClelland, 1989).

As regard to morphological preview benefit studies in English and Finnish found no preview benefit (Bertram & Hyona, 2007; Juhasz, 2008; Kambe, 2004; Lima, 1987) while a reliable preview benefit being observed for Chinese (Yen et al., 2008) and Hebrew (Deutsch et al., 2000, 2005). Hence, preview benefit depends on the specific linguistic feature of a language and attributed the divergent patterns in morphological processing in European and Semitic languages to the differences in morphological structure of the respective languages (Plaut & Gonnerman, 2000).

The above studies on lexical access have mainly focused on European languages with contrasting results reported in Semitic languages like Hebrew or Arabic. These studies summarize that morphological structure and productivity of a language plays a crucial role during the process of word recognition. We planned a series of experiments in a language which has similarities and differences in both the language systems. In other word, Urdu, an Indo-European language, seems to be sandwiched between these two language systems with its linguistic roots in Hindi and orthography in modified Arabic resulting in a complex morphological

We planned five experiments to examine the role of phonology, morphology, and word type using e-prime and eye tracking as tools of investigation. We designed our experiments under different paradigms. We planned our first experiment with the printed version of the visual world paradigm (Huettig & McQueen, 2007) to track the time course for relative proportion of fixation duration and in what point in time did competition to phonological and morphological cues resolved. We added children in the age group of 14-17 along with adults to see if there could be differences in the effect of phonology versus morphology as regard to age and skill in reading.

We observed that both children and adults rejected distractors at almost the same time. This indicates that distractors did not compete during lexical access because they were not phonologically, orthographically or morphologically related to the target word. Furthermore, though readers in Urdu are tuned to use specific letters for Arabic loanwords and words of Indic origin, readers seem to have not mastered the concept of homophone graphemes. Where children took more time to resolve phonological competition, we observed phonological competitor closely competed with the target word in case of adults. It seems to be evident
that readers in general take more time to disambiguate the correct letter as against its homophone equivalent. Surprisingly, both children and adults took almost equal time to resolve morphological competition hinting morphology to play a more dominant role in lexical access and seem to be more inhibiting than facilitating word recognition even in skilled reading.

Our next step was a simple experiment with a simple word recognition task using e-prime with morphologically related stimuli. The results showed that response time was fastest for the base word and slowest for derivatives. We also found no significant differences in processing of extension (inflections) and derivatives. This signals that complex words may be stripped off their affixes before lexical access. The results mimed Taft and Forster’s model of prefix stripping.

With the preliminary study reporting differential processing of words where word length though significant did not interfere in the processing we furthered our research with the same stimuli but a different paradigm. We planned to examine the effect of root letters being presented in the parafovea with three conditions having different word-class. The results were similar to the previous study where the response time was shortest for base word as compared to derivatives. Our hypothesis that there would be no significant difference between base word and extension and
significant differences to be seen between inflectional and derivative target words was true. The limitation of this experiment was that there was no baseline for comparison and even the stimuli had no control. The results were hence inconclusive.

Therefore we planned our next experiment by overcoming the limitations with a no preview condition along with a preview condition and changed the stimuli set with a base word, a morphologically related word and an orthographic control following a similar study by Deustch, et. al (2000). The main objective of this experiment was to see the role tri-consonantal root borrowed from Arabic for loanwords in Urdu carries the core meaning as in Arabic to facilitate word recognition in the parafovea. We found no significant differences in word recognition across conditions. This shows that the tri-consonantal root presented in the parafovea had no effect on word-class. In other words the tri-consonantal root in Urdu seem to limit to mere letters and the concept of tri-consonantal root carrying the core meaning as seen in Arabic seems to be alien to Urdu morphology. We believe that word formation in Urdu seem to be similar to Arabic because the tri-consonantal root forms the basis of word formations. But in reality, the tri-consonantal root, first seem to form the base or stem words and then all derivational and inflectional words seem to be formed. Hence the concept of morphological preview aiding word recognition
seen in Hebrew is not seen in Urdu and our results seem to be similar to that of English (European) studies. We furthered our analysis to see if semantics played a role in preview benefit and found that semantics were not a confounding factor. Interestingly, we found that in comparison to base word, morphologically related word and orthographic control, morphologically related target words took the longest time to be identified. It seemed that morphology played a detrimental role in case of Urdu as regard to parafoveal preview benefit.

Hence we concluded that the concept of root letters carrying the core meaning seen in Arabic/Hebrew has not been borrowed in Urdu. Urdu morphology seems to be more stem-based as in Indo-European languages and that the borrowing of tri-consonantal root, orthography, semantics and the like are only superficial. We suggest that even loanwords of Arabic undergo nativization at the root level to suit Indic-based morphology and hence parafoveal information of root letters not only inhibits but acts as a detrimental factor during word recognition.

Though Urdu morphology is rich and productive, morphological processing seem to be more inhibitory than facilitatory. Therefore, we planned to end the research with the last experiment on processing of word type. While the results of all the four experiments reveal processing strategies in Urdu are more similar to European studies than Semitic
studies we wanted to tap on the processing strategies of word type as
word formations in Urdu are the same as in Arabic. This experiment
would act as forerunner for further research in the field of Urdu language.

In this experiment we observed that words formed from the Arabic tri-
consonantal root or without a specific root were processed in a similar
way. In other words, the tri-consonantal root did not play a dominant role
in comparison to words without a specific root. Therefore, it would be
safe to postulate that the root-word pattern in Arabic which facilitates
word recognition in Arabic is not true in the case of Urdu. Though words
in Urdu are formed from the tri-consonantal root the processing strategies
are not different in Urdu. This may be because the words formed from the
tri-consonantal root enter Urdu via Persian where they undergo changes
and further changes are made when they enter Urdu. The second part of
the experiment was to check if processing strategies were different for
prefixed words and compound words. We indeed found differential
processing for all word types. The words with tri-consonantal root and
without specific root seemed to be processed as whole words, the
prefixed words may have been stripped off their affixes and compound
words may have been morphologically decomposed before lexical access.

To summarize, the results of all the five experiments clearly state that
morphological structure of Urdu plays a dominant role but sometimes
detrimental. The processing strategies in Urdu are similar to that of results obtained in European studies. The claim made by Rao, (2010) that readers in Urdu follow a direct root during reading may be attributed to its visually complex, phonologically opaque deep orthography.

**Conclusion**

The present research, though a first attempt is an important one in understanding the cognitive strategies involved during word recognition in a lesser studied language like Urdu. There may be minor issues that have been overlooked by the authors. However, the experiments suggest words are processed as a whole directly from the mental lexicon for whole words, decomposed morphologically for compound words and stripped of their affixes for prefixed words. Processes involved in prefixed words and compound words needs further research. We report that processing strategies in Urdu word recognition and lexical access in similar to European studies.

**Limitations:**

The series of experiments were the first of its kind with regard to Urdu as a language of investigation. There is no standardized word corpus in Urdu hence the rating of high frequency words may not be exact. There may be a few discrepancies in the experimental designs.
Implications

The experiments in the thesis can be treated as a baseline for further investigation. This attempt of investigation in lexical access in Urdu has just begun and is expected to open new windows for further research. There are many areas that have been untapped which can further be studied to understand the underlying processes. We can further study if there can be differential processing for nouns and verbs in Urdu. We need to further investigate using words of Indic origin to compare effects of morphology in lexical access. There can be more studies planned to see if phonology or orthography aids parafoveal preview benefit in Urdu.