

Edith Cowan University  
**Research Online**

---

Theses : Honours

Theses

---

1997

## The Effect of Masking the Prime in Orthographic and Semantically Related Pairs : An Interactive Activation Account

Rowan Johnston  
*Edith Cowan University*

Follow this and additional works at: [https://ro.ecu.edu.au/theses\\_hons](https://ro.ecu.edu.au/theses_hons)



Part of the [Cognitive Psychology Commons](#)

---

### Recommended Citation

Johnston, R. (1997). *The Effect of Masking the Prime in Orthographic and Semantically Related Pairs : An Interactive Activation Account*. [https://ro.ecu.edu.au/theses\\_hons/773](https://ro.ecu.edu.au/theses_hons/773)

This Thesis is posted at Research Online.  
[https://ro.ecu.edu.au/theses\\_hons/773](https://ro.ecu.edu.au/theses_hons/773)

# Edith Cowan University

## Copyright Warning

You may print or download ONE copy of this document for the purpose of your own research or study.

The University does not authorize you to copy, communicate or otherwise make available electronically to any other person any copyright material contained on this site.

You are reminded of the following:

- Copyright owners are entitled to take legal action against persons who infringe their copyright.
- A reproduction of material that is protected by copyright may be a copyright infringement.
- A court may impose penalties and award damages in relation to offences and infringements relating to copyright material. Higher penalties may apply, and higher damages may be awarded, for offences and infringements involving the conversion of material into digital or electronic form.

**THE EFFECT OF MASKING THE PRIME IN ORTHOGRAPHIC  
AND SEMANTICALLY RELATED PAIRS. AN INTERACTIVE  
ACTIVATION ACCOUNT**

By

Rowan Johnston

A Thesis Submitted in Partial Fulfilment of the  
Requirements for the Award of

BA Hons (Psychology)

at the Faculty of Health and Human Sciences, Edith Cowan University, Joondalup

Supervisor: Prof. Don Thomson

Date of Submission: 31st October, 1997

## ABSTRACT

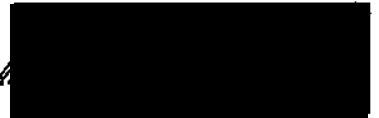
Visual word recognition studies rely on priming tasks to examine underlying processes within the lexical system. A commonly used method is the lexical decision task, where participants are presented with a letter string that is either a familiar word or a meaningless non word such as *fast*. Response times are measured for the time taken to decide if the letter string is a word or a non word. The word the participant responds to is the target, while the preceding word is referred to as the prime. There are three types of priming conditions reported here. First, semantic priming where a target in the pair *chair-table* is recognised faster than the target in the pair *horse-table*. Semantic priming studies are considered to reflect later processes in word recognition, which can occur after primes have been identified. A second paradigm is orthographic priming, where the target in a word pair sharing letters, such as *fable-table*, is recognised faster than the target item in the control pair *shoot-table*, in which no letters overlap. Orthographic priming appears to be more robust in a masked condition. That is, the prime stimulus is presented so briefly and in close proximity to other visual features that it cannot be readily recognised. The reason targets in orthographically related pairs are more likely to be facilitated when the prime is masked is unresolved. This work addresses this question by examining what effect the mask can have on the processing of the prime. There are two opposing views. Firstly, it is assumed word recognition occurs over time, and when a mask appears shortly after a word has been presented, further processing of the prime immediately ceases. However, because the prime has already been perceived by the system to some degree, it is said to be partially activated. This partial activation can persist for a brief

period of time, but later processes of recognition do not occur, and the word is never identified by the lexical system. This is referred to as an interruption theory of masking. The alternate account suggests the mask does not disrupt the processing of the prime, rather, it affects the ability a person has in consciously reporting the primes presence. That is, the word may have been identified by the lexical system, but it has not been identified by the conscious system. Determining the true effect of a mask has proved difficult. There are many parameters within the existing models of word recognition that are yet to be accurately identified and described. With a large volume of data from a vast array of different priming designs, theory testing is likely to remain a slow process. This paper aims to take a unique approach of examining both orthographic and semantic priming within the same design, which are considered here to be somewhat opposing forces. Unexpectedly, no orthographic priming was found in a design previously showing a robust effect. The results are examined in terms of an interactive activation model, where an interruption account of the prime did not appear to be supported. An expected result was obtained however in that a semantic priming effect was not found in the masked condition. Subsequent tests attempted to obtain a semantic effect while looking at the relationship between semantic priming and conscious awareness of the primes. The study highlights some of the difficulties in making an unbiased assessment of the “participants” ability to detect masked primes.

## DECLARATION

I certify that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any institution of higher education; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

Signature

A solid black rectangular box redacting the signature.

Date.....9/3/98.....

## ACKNOWLEDGEMENTS

It is with great thanks that I offer my appreciation to the following people for their help and support during my honours year.

Thanks firstly to my supervisor, Professor Don Thomson, who showed a belief in me to achieve this goal. I appreciate the depth at which he challenged me. Much thanks also to Dr Brett Degoldi, who helped with much of the initial preparation for the study, and continued to offer valuable advice when needed.

Within the School of Psychology, I would firstly like to thank Lis Pike, who's encouragement meant a great deal, and to Val Roche who helped in getting me started. Thanks also to Craig Speelman, for his timely assistance, and finally to Ken Forster in Tucson, for his valuable comments and good wishes, and for showing enthusiasm and passion for this field. Lastly to Virginia Holmes for guiding me to Perth.

There are many people that can take some credit for the completion of this thesis. My parents, Ann and Colin are my greatest supporters, and without their help over the years I would not have had the opportunities that have brought me to this year. My dear friend Viv has also been a source of support that I could not have done without.

The support, encouragement and advice from Lisa Vogler has been immeasurable. Not only have we shared a common passion in cognitive psychology for many years, her friendship has always been a guiding force.

Support and advice from Alison Clark has been an important part of the last two years, and I thank her for all the times she came and picked me up when I fell over. The compassionate ear of Santina was also much appreciated. As was the support of Natalie Harker, who had to endure much of my stresses, and who pushed me over the finish line.

Others I have great appreciation for are Carolyn, for all the hugs, and my partner in crime, and closest friend, Agnieszka, who helped keep me in the “real” world.

Finally to all the people who participated in my experiments, especially the people in neuropathology at Royal Perth Hospital, and to my boss Phil, and to my family away from home, the people at Underwater World.



## TABLE OF CONTENTS

TITLE.....	i
ABSTRACT.....	ii
DECLARATION.....	iv
ACKNOWLEDGEMENTS.....	vi
TABLE OF CONTENTS.....	vii
LIST OF TABLES.....	ix

### **1. Introduction**

1.1 Overview.....	1
1.2 Semantic Priming.....	1
1.3 Orthographic priming.....	4
1.3.1 Priming results for orthographic pairs.....	6
1.3.2 The importance of the masking effect.....	9
1.4 Lexical and non-lexical effects.....	10
1.5 Theoretical models and orthographic priming.....	13
1.5.1 Theory of Partial activation.....	14
1.5.2 An alternative to activation model.....	15
1.6 Interruption theory of masking.....	17
1.7 Reasons to review semantic priming in the Forster and Davis design.....	18
1.8 Hypothesis.....	19
<b>2. Experiment 1.....</b>	<b>19</b>
2.1 Method.....	19
2.2 Results (part 1).....	22
2.3 Results (part 2).....	22
2.4 Discussion.....	25

2.4.1 Failure to replicate form priming.....	25
2.4.2 Orthographic retroactive priming effect.....	27
2.4.3 Problems for the orthographic retroactive effect.....	28
2.4.4 Can partial activation theory account for the data?.....	29
<b>3. Experiments 2 and 3.....</b>	<b>30</b>
3.1 Overview.....	30
3.2 Masked semantic priming for undetectable primes.....	31
3.2.1 Criticisms of masked semantic priming.....	32
3.3 Hypothesis.....	33
3.4 Method.....	35
3.4.1 Experiment 2.....	35
3.4.2 Experiment 3.....	38
3.5 Results.....	39
3.5.1 Experiment 2.....	39
3.5.2 Experiment 3.....	40
3.6 Discussion.....	41
3.6.1 Awareness of primes and semantic facilitation.....	41
3.6.2 Inhibition and strategies.....	42
3.6.3 The nature of SOA and semantic priming for short SOAs.....	43
3.6.4 Were primes partially activated or fully activated?.....	45
3.6.5 Retroactive priming.....	45
<b>4. Conclusion.....</b>	<b>46</b>
4.1 General findings, problems, and future work.....	46
References.....	49
Appendices.....	53

**LIST OF TABLES**

Table 1	
Experiment 1: Mean response times for word conditions for group 1.....	23
Table 2	
Experiment 1: Mean response times and priming effect for for word conditions...	24
Table 3	
Experiment 2: Response times and priming effects for word conditions for each SOA condition.....	39
Table 4	
Experiment 3: Number of correct responses for prime detection for each SOA condition.....	40
Table 5	
Comparison of priming effects for high and low prime detection groups.....	44

## 1. Introduction

### 1.1 Overview

One of the most complex cognitive tasks we effortlessly carry out each day is reading. A detailed arrangement of lines and curves becomes a rich and meaningful composition, capable of representing any information we choose to externally store or pass on to others. Many questions are yet to be answered in relation to the human language system. One area of study seeks to understand the processes occurring within the perceptual system when we recognise a written word. This work has relied to a large degree on word priming studies, in which perception of one word is influenced by the presence of another. As will be shown below, word priming studies often use a visual mask to make a particular word stimulus more difficult to detect. The primary purpose of this paper is to examine what kind of an effect a mask can have on the processing of a word.

### 1.2 Semantic Priming

An early aspect of priming studies was to investigate how words were stored in memory. Tulving (1972) proposed two types of permanent memory: *episodic* and *semantic*. Episodic memory contains information about when, where and how items in memory are received, while semantic memory contains knowledge about the world and language. It incorporates the phenomenon of a mental *lexicon*, similar to a mental dictionary.

A common finding in word recognition studies is that people are faster to recognise a word when it appears in close proximity to a semantically related word. This is referred to as a semantic priming effect. For example, Meyer and Schvaneveldt (1971) showed that words were more easily recognised when following semantically related elements, such that for the pair *bread* and *butter*, the second word was recognised as a word faster than in the pair *flash* and *butter*. This commonly used procedure is referred to as a lexical decision task. Participants must decide if a letter string is a familiar word, or a meaningless non-word, such as *fost*. The word item the participant responds to is referred to as the *target*, while the preceding word is the *prime* stimulus.

It has also been demonstrated that a semantic priming effect is not obtained every time a semantically related prime and target appear together (eg. Neely & Durgunoglu, 1985). The factors governing semantic priming are not fully understood, but there are several accounts offered for the effect. These are; spreading activation, semantic matching, compound cuing, and expectancy (see Neely, 1991).

Spreading activation (eg. Collins and Loftus, 1975) occurs when a word stimulus activates its representation in the lexicon, and then raises the activation of neighbouring lexical entries in the semantic system. If these lexical neighbours appear in close proximity to the original stimulus, their recognition is facilitated. This process is fast acting, occurs automatically and without consciousness. Posner and Snyder (1975) proposed a dual processing model in which both automatic spreading activation and slower attentional mechanisms operated on word recognition. The attentional mechanisms can produce a facilitation effect when attention is drawn to

semantically related pairs, but inhibition occurs when items are presented upon which attention is not focused.

Importantly, Neely (1977) showed these inhibition effects were dependent in part on the time lapse between the prime and target presentations. For example, at longer time intervals ( $> 250$  ms), the target in the pair *bird-robin* was recognised faster than when appearing with an *xxxx* prime, but the target in *bird-arm* was recognised slower than the *xxxx* condition. This indicates the “word-ness” of the prime was in some way disruptive to the recognition process. However, when the prime was presented for less than 250 ms, *bird-arm* was not slower than *xxxx-arm*, hence inhibition had seemingly disappeared. Any facilitation achieved for a prime-target interval below 250 ms was therefore assumed to operate only on the automatic processes, and was therefore free from inhibition. When attentional mechanisms are allowed to operate, the automatic process still occurs, but the end priming result depends on the strength of the inhibitory processes. That is, both mechanisms operate independently.

The interval between the prime and the target is therefore an important dimension to the semantic priming effect. The time between the onset of the prime and the onset of the target is referred to as the *stimulus onset asynchrony* (SOA).

A closer look at the mechanisms proposed for semantic priming will reveal how the facilitation and inhibition processes work. In a semantic matching strategy (eg. de Groot, 1984), participants determine if the prime and target are semantically related after lexical access has occurred for the target. A similar process occurs for compound cuing (Ratcliff and McKoon, 1988), where the target acts as the cue to determine if the two words form a familiar compound. Semantically related pairs are

considered to form a more familiar compound pair than unrelated pairs. Inhibition is in part dependent on the proportion of related and unrelated pairs in the experiment, which affects the participants' expectation about the appearance of related primes (de Groot, 1984).

According to the expectancy model (eg. Becker, 1980), the presentation of a word stimulus generates an *expectancy set* of words that are semantically related to the prime stimulus. Upon presentation of a target word, the expectancy set is searched, and if a match is found a facilitation effect is obtained. In contrast to semantic matching and compound cuing, the expectancy priming effect occurs *before* the target is identified. There is evidence for both matching and expectancy mechanisms operating (Neely, Keefe, Ross 1989).

However, no expectancy or matching strategies are considered to function for an SOA less than 200 ms (denHeyer, Briand, & Smith, 1985; Neely, 1977; Neely et al., 1989). All SOAs used here are below 200 ms, so this paper is primarily concerned with the conditions of automatic spreading activation.

### **1.3 Orthographic priming**

As mentioned in the previous section, semantic memory incorporates a lexicon. Semantic priming studies show that once a word has been identified, its semantic properties can be used to assist the processing of subsequently encountered words. This has in turn provided evidence that words are stored on the basis of meaning. A second type of word effect, *orthographic priming*, has been used to

examine the processes involved with the *access* of the lexical system, where access is referring to the processes leading up to the identification of a word.

This reflects a general assumption that has been used to view word recognition; pre and post access processes. Pre-access refers to processes occurring before a lexical word unit has been selected, and post-access subsequently applies to processes occurring beyond this selection stage. To clarify this important concept, the term *lexical access* therefore refers to the instance when the processing system finds a representation in the lexical memory that is a match for the representation generated by the input stimulus

A final type of priming to be incorporated below is *repetition*. Repetition priming is one word presented more than once, usually just twice, as in *house-house*. Strong priming effects are most often obtained in a repetition condition.

Orthographic priming (also referred to as form priming) is effectively the facilitation occurring in a word pair sharing letter overlap, such as *fable-table* or *table-table*, when compared with an all letters different control pair such as *brush-table*. Orthographic overlap can also incorporate phonological overlap, and the two can be separated. In a pair such as *fable-table*, there is both graphemic and phonetic overlap, however both graphemic only and phonetic only pairs are possible; *couch-touch* and *mate-eight* respectively. Research on orthographic priming has attempted to tease apart the visual and phonetic aspects of words, to determine the saliency of these two dimensions in orthographic facilitation (eg. Evett & Humphreys, 1981).

While priming has been found in terms of both graphemic access (eg. Evett & Humphreys, 1981) and phonemic access (eg. Meyer and Schvaneveldt, 1974), there is considerable evidence to suggest lexical access occurs via graphemic processing



(see Coltheart, 1978). Such support can be seen in Evett & Humphreys (1981). Here, word pairs containing both graphemic and phonetic similarities eg. *bribe-TRIBE*, were compared with graphemic only pairs such as *couch-TOUCH*. It was expected that a phonemic priming effect would result in the phonetic-graphemic pairs being greater than the graphemic alone pairs. However, both pairs showed equal facilitation and importantly, phonemic priming did not add to graphemic processing. Evett and Humphreys suggested graphemic priming was preferable because phonemic priming could either take longer or be optional.

### 1.3.1 Priming results for orthographic pairs

Meyer, Schvaneveldt and Ruddy (1974) were among the first to report a form priming effect, where lexical decision times were faster for words such as *bribe-tribe*, compared to *fence-tribe*. Hillinger (1980) obtained a similar result. These studies reported priming in conditions where both prime and target could be clearly seen. Under similar conditions, subsequent attempts to replicate these findings have failed.

Colombo (1986) failed to find a facilitation effect for Italian rhyming pairs using a lexical decision task. Primes were presented for 240 ms and 640 ms, making them readable by participants. Humphreys et al. (1987) found no priming for primes presented for 200 ms, which also allowed participants to identify the primes.

Martin and Jensen (1988) again failed to find phonological effects in a lexical decision task when primes could be seen, for pairs such as *fool-spool*. Primes were presented for 200 ms with SOAs of 250 ms and 550 ms, again allowing participants to reliably read primes, and finally, Peterson, Dell, and O'Seaghdha (1989) reported that effects were less robust when primes and targets were clearly seen.

Orthographic priming however, seems to be more robust in a masked condition, in which the prime is severely visually masked to the point where it cannot regularly be reported. There are two prominent designs in which masked orthographic priming effects have been reported. These are Forster and Davis (1984) and Forster, Davis, Schoknecht and Carter (1987), using a lexical decision task, and Evett and Humphreys (1981) and Humphreys, Evett, and Taylor, (1982) using the tachistoscopic identification task. In the Evett and Humphreys design, four stimuli are presented: a forward mask, a lower case prime, an upper case target, and a backward mask. Participants are asked to identify any words they can report seeing. The stimuli are presented consecutively at a constant inter-stimulus interval, and these times are adjusted to meet individual threshold levels. In the Evett and Humphreys research, the average exposure time was 33 ms, which allowed 30-40% of targets to be identified. Primes were not usually reported due to the masking conditions. They found that more targets were correctly identified for pairs such as *couch-TOUCH* and *file-TILE*, compared to pairs *flown-COUCH* and *loft-FILE* respectively.

The second design is that of Forster and Davis (1984), (referred to now as the *Forster and Davis design*). Here, participants are presented with a row of hashes for 500 ms, followed immediately by a 50-60 ms lower case prime, followed by an upper case target, also of 500ms duration. The target acts as a backward mask. Participants are instructed to perform a lexical decision on the target. Forster and Davis failed to find substitution (1 letter different) priming for short pairs such as *lack-LOCK* but did find reliable priming for longer pairs such as *bontrast-CONTRAST* (Forster et al., 1987). This effect of length was interpreted as a density effect, in that form priming only occurs when the target had very few neighbours, where neighbours is defined as

the number of words that can be generated from the word by changing any one letter. This effect was supported by facilitation for low density short word pairs such as *able-axle* and *sefa-sofa*.

Since form priming appears to be at least slightly more robust in masked conditions, determining why might be revealing to the underlying processes of recognition. A first approach is to examine various accounts for an absence of facilitation in clear conditions, when primes are easily identified.

Colombo (1986) provided a competitive activation explanation (eg. McClelland and Rumelhart, 1981) for her results, where no orthographic priming occurred. According to the activation model, when a prime is presented, the activation of several orthographically similar word units rises. Once the prime word reaches a certain level of activation, it starts to inhibit the other word units. When the related target appears, it is one of the pre-inhibited words, and so its recognition is delayed. This approach will be examined in more detail below.

Taking an entirely different approach, Peterson et al.(1989) suggested inhibition was caused by phonological competition between the prime and target. According to their view, it was difficult to respond to the target because the phonemes of the prime cause a confusion in phonological encoding.

Alternatively, Humphreys et al., (1987), who found no priming for 200 ms primes, attributed the result to bias produced by an episodic trace of the prime. That is, an episodic representation can change the nature of the priming effect, possibly by changing the guessing strategy. They also offered the suggestion that any activation within the system for word units orthographically similar to the prime is somehow

switched off after the prime is explicitly identified, so that persisting activation will only remain for a lexical entry with an identical match to the stimuli.

Along similar lines, to account for the more reliable effects in masked conditions, Forster and Davis (1984) stated that masking the prime prevented the word from being *accessed* in the lexicon, which reduced or eliminated the formation of an episodic memory trace of the prime. The contamination from the influences of these episodic representations was therefore removed by the mask.

### 1.3.2 The importance of the masking effect

It is evident that the reasons for inconsistent form priming effects in clear conditions are still being examined, but it does remain that form priming has produced a more stable pattern of results when the prime is heavily masked. This aspect alone does not of course answer all the questions of how word recognition is achieved. Forster and Davis (1991) reported that it is still not clear why form priming effects are strongest only when the prime is heavily masked, referring to a distinction between lexical and non lexical priming effects. This will be addressed in the following section. There is also a second issue in relation to the nature of the masked form priming effect that is a major focus of this work. That is, *what effect does the mask have on the processing of the prime?* Forster et al., (1987) addressed this issue, acknowledging that masking of a prime may have no effect on lexical access, rather, it may be the processes of the output that are disrupted. This means that the effect may not be truly revealing to the underlying word recognition processes. Experiment 2 will take up this issue of the distinction between a masking effect that can either

uneffect or disrupt processing of a prime. However, an issue to contend with first is the important distinction between lexical and non-lexical priming effects.

#### **1.4 Lexical and non-lexical effects**

A critical consideration in form priming results is whether or not the facilitation effects are a lexical effect (Davis & Forster, 1994). This means, as Davis and Forster state, a difference between experimental and control targets could be attributed to a genuine facilitation effect of the identity condition (lexical effect), or to interference occurring in the control condition (non-lexical effect). At the outset, there is obviously an important difference between the form pairs and their control pairs, in that the form pairs share visual features, while the control pairs most often have no letters in common. Such a situation does not occur in semantic priming pairs, creating an important difference between these two types of tests. The term *lexical effect* generally refers to processing occurring at the word level, and unless orthographic priming effects can be show to be lexical, their usefulness to understanding underlying word recognition processes becomes limited. The distinction between these two accounts remains unclear, but evidence has been presented for both cases.

Early findings in form priming were considered to be lexical effects. Evett and Humphreys (1981) rejected a visual interference effect. That is, priming was not due to raw visual similarity but due to the letters themselves, based on the finding that there was no correlation between the graphemic priming effect and prime-target letter contour overlap. Humphreys et al. (1987) also noted form priming is not just energy

summation between letters since the two stimuli, prime and target, are usually in difference case.

There is other strong evidence for priming being an effect higher than the raw visual level, (ie. non-lexical). First, support has been given from the occurrence of phonological priming, as seen in Humphreys et al. (1982). Also, Forster and Davis (1984) found no repetition effects for non-words, such that *tovid-TOVID* was no faster in recognition times than *brass-TOVID* in a lexical decision task. Forster and Davis draw the conclusion that the repetition effect in this design was lexical. The subsequent finding by Forster et al. (1987) that density was an important dimension in form priming also called for a lexical interpretation, given that density should be defined at the word level.

Despite the above evidence, that some level of access to lexical entries is occurring in form priming, there are grounds on which to argue for non-lexical interpretations of some form priming results. Humphreys et al. (1987), asked if orthographic priming (in their naming task) was a genuine facilitation or a by product of letter intrusion errors. That is, target responses may have been based on amalgamation of letters between the prime and target. It was concluded that intrusion errors did play a role, given targets preceded by a form related prime had the same benefit over the graphemic control condition as did targets preceded by a row of x's. Therefore, the main orthographic priming effect was described as *protection from interference*. Humphreys et al. still argued that visual similarity was not a factor, on the basis of Evett and Humphreys (1981), where visual similarity did not influence the magnitude of priming. Their conclusion was that priming was apparently based on

processes operating at levels higher than a purely visual level, but still possibly through pre-lexical (non word) levels.

This claim by Humphreys et al. (1987) against a purely visual explanation was subsequently disputed by Davis and Forster (1994), who found evidence for non lexical effects, due to letter *fusion*. In a study on prime-target legibility, they constructed stimuli that were a direct overlap of prime and target items, that is, one word was placed on top of another. These stimuli were then tested to see if either word was detectable within the fused compound stimuli. They found that for the items where the fusion of the prime and target letters allowed for the extraction of a word, accuracy in the identification task was higher for these items. So, even if no letters overlapped, recognition was dependent on legibility of a prime-target fusion. This was not the case for the lexical decision task. However, it was not the task itself but the duration of the target that was crucial. This study cautioned results from the four field identification task described above, in terms of legibility effects, due to interference at the visual level.

To conclude, there is strong evidence for genuine lexical priming effects when talking about the facilitation of form related pairs in the masking designs where these effects have been most commonly reported. But there is also evidence for non lexical explanations, particularly in the naming task utilised by Humphreys and Evett. This is partly the reason that the masked form priming design used in this study is a replication of that used by Forster and Davis.

## 1.5 Theoretical models and orthographic priming

It has been revealed that masking is an important component of a priming design in which a form priming effect is more readily obtained. There are two theoretical models of word recognition that have been principally applied to orthographic priming data; *activation* (Morton, 1970; McClelland and Rumelhart, 1981, 1982) and *serial search* (Forster, 1976; 1989). From the outset, activation models provide straightforward account of form priming according to Forster (1987).

A closer examination of these activation models will reveal why. Looking first at Morton's logogen model, it is proposed that within the lexicon, there is a separate unit for each word, referred to as a logogen. Each logogen is defined by a set of characteristics, which include letter position, graphemic, phonetic and semantic information. Each time one of those characteristics appears, the logogen activation level increases. When it reaches a threshold level of activation, the logogen is identified as a match to the stimulus, and suppresses other logogens. Higher frequency words have lower threshold levels, and are thus recognised faster, and a recently fired word has a reduced threshold.

McClelland and Rumelhart's interactive model is different to the logogen on the basis of feedback during the recognition process. The model is divided into three levels of detectors; features, letters and words. A word space of up to four letters is processed simultaneously. The process begins when an input stimulus activates feature detectors that are consistent with the letters of the visual input. Over time, as letter detectors grow stronger, they activate all word detectors that comply with letter structures, meaning several word detectors may rise. In an example offered by McClelland and Rumelhart, the presentation of the word *WORK* may result in the



activation of the letter detectors *W*, *O*, and *R*, but perhaps for the final letter, in the very initial stages, equal activation occurs for both the *K* and *R* letter detectors, because *K* and *R* share many features. At the word level, activation will now occur for several words, such as *work*, *word*, *wear*, *weak* etc. Because *work* is the most consistent with the visual information, its activation will be to some degree higher than any other word detector's activation level. As the activation for *work* continues to increase due to greater consistency with activation at both feature and letter levels, it will begin to inhibit word detectors that are visually most similar to it. The stronger the activation of a competitor, the stronger the level of inhibition directed at that competitor. The detectors for words such as *word* and *weak* fall sharply down to below resting levels. Processing occurs at all levels at the same time, and both top down and bottom up processes are assumed, with knowledge of words co-determining the nature and time of perception.

### 1.5.1 Theory of Partial activation

Why do activation models such as Morton (1969) and McClelland & Rumelhart (1981) provide a straightforward account of form priming? As stated, word stimuli generate a list of possible candidates as a match for the stimulus input, through increases in activation of several logogens or word detectors. Until a word is identified, logogens and word detector nodes are said to be *partially activated*. When this partial activation persists until the presentation of a subsequent target word, recognition of the target is facilitated, (see Forster, 1987). The crucial issue here is *partial activation*, which provides the basis of form priming in activation models.

### 1.5.2 An alternative to activation model.

An alternative to activation accounts are search models (eg. Forster, 1976).

Forster proposed a bin model, where bins are sublists of words. In the original design, the lexicon consisted of a master lexicon, with three access files organised on orthography, phonology and semantic properties. Upon presentation of a word, a serial search of word lists within the lexicon is carried out until a match is found, at which point the entry for that word is "opened". If the same word is subsequently presented, facilitation occurs because the entry is already in an open state. Lexical lists are frequency ordered, with higher frequency words appearing at the top. Support for a search process of frequency ordered lists is seen in Murray and Forster (1994), who found lexical decision times to be a direct linear function of estimated rank list position.

In light of orthographic priming evidence, Forster et al. (1987) claimed that search models could account for form priming in terms of the best match hypothesis. That is, form priming is a type of repetition effect, where X primes Y if X is mistakenly taken to be an instance of Y. However, Forster (1987) subsequently rejected this claim when he found *attitude* and *antitude* equally facilitated *APTITUDE*. Under the best match hypothesis, he claimed priming should not have occurred with the prime *attitude*, because *apitude* would never be taken as the best match for *attitude*.

Therefore, to account for the form priming effect, Forster (1987) stated that entries in a search model could no longer be viewed as open or closed, instead proposing a division of the open state into higher and lower levels of openness, acknowledging the similarity to an activation model in which word detectors are at

different levels of activation. To account for the form priming effect, it was proposed that when the lexicon is searched, entries with similar orthographic features to the prime are flagged, then later rechecked if a match is not found. If a lexical item is flagged, facilitation will occur for an orthographic target because information will be extracted from that entry faster, because it is *partially* opened. Forster also maintained that form priming still has repetition like properties, in finding that activation persists across intervening words, which is not to be expected for activation models, where persisting activation across several words would create excess “noise”. This is supported by McClelland and Rumelhart’s (1981) suggestion that presentation of a new stimulus wipes out the remaining traces of the previous stimulus.

In summary, there is evidence that when primes are severely masked, they can have a robust form facilitation effect. It can also be argued that this effect is lexically based, in that it is a genuine priming effect and not protection from interference. Activation models provide a good account for form priming, based on partial activation of orthographically similar words. Alternatively, the search model has failed to provide a stronger account. While further investigation is still needed, the accepted position in this work is that masked orthographic priming occurs through a partial activation account as described by McClelland and Rumelhart’s interactive-activation model. That is, the presentation of a masked word partially activates word detectors for orthographically similar words which persist in a partially activated state until the target is presented. This position will be examined further by looking at the effect the mask may have on the prime by incorporating semantic pairs into the Forster and Davis design.

## 1.6 Interruption theory of masking

Central to the partial activation account of form priming is an interruption theory of the mask. That is, processing is seen as a two part process. The first stage involves the build up of a visual representation, and the second stage the gathering of information from the representation. The mask is considered to cause a processing interruption either before or during the second stage of processing, which leaves the initial stage unaffected. The mask therefore allows for an examination of the earliest processes of word recognition without contamination of the later processes. The second stage of processing can be seen as essential in leading to identification of the word. This addresses a central issue being examined here. That is, for form priming to occur, either activation or near activation of the prime must not occur, otherwise orthographically related words (targets) will be strongly inhibited. It is also noted that a prime must be accessed in order to have a semantic priming effect. As Coltheart (1978) stated, "a words semantic representation can only be obtained by consultation of it's lexical entry", p. 152. Therefore, it would be predicted that a semantic priming effect will not be found under the same conditions of a lexical form priming effect.

Forster reports finding no semantic priming effects in his masked design (personal communication-2/5/97), in which orthographic priming is reliably obtained. Such a result fits well with a partial activation account for the orthographic result, where the mask interrupts processing. However, there are three lines of evidence to suggest further examination of *prime access* in the Forster and Davis design is necessary, and that these issues must be accounted for if a partial activation account of form priming is to be upheld. The three issues are that in some cases, the prime appears to be fully accessed and others it appears not to be. Second, Evett and

Humphreys (1981) achieved both a semantic and orthographic priming effect under the same conditions, which would not be expected in a partial activation account, and finally, there is a large body of literature that reports semantic priming effects under masked condition. This last issue relates to work on unconscious processing, to be further examined in experiments 2 and 3.

### **1.7 Reasons to review semantic priming in the Forster and Davis design.**

The first line of evidence to raise questions about the absence of a semantic priming effect in the Forster and Davis design is the finding by Forster et al. (1987) that *make-MADE* pairs primed equally well as its repetition pair *made-MADE*, but no priming occurred for *male-MADE*. Forster et al. concluded that the *make-MADE* result provided strong support for a post-access interpretation within the Forster and Davis design, contradicting a pre-access account required for form priming. As in repetition priming, semantic information seemed to sum with form information in the pair *make-MADE*. Forster also noted that the identity pairs were high density, meaning the form priming component should be at best very small. He stated, “this (result) clearly implies that priming occurs after the prime has been recognised, not during the recognition of the prime.” (Forster, 1987, p. 130). The first experiment reported here is to replicate the Forster and Davis design, testing for both orthographic and semantic priming effects. Repetition pairs are also included, considered as the more robust priming effect.

## 1.8 Hypothesis.

The assumptions, mentioned above, of the first experiment are that form priming is best explained by partial activation. Also, partial activation of a prime, should not allow identification of the word, and a semantic priming effect between prime and target should therefore not be expected.

The expected outcome of the first experiment is to replicate both published and unpublished results obtained under the Forster and Davis design. Namely, the hypothesis states that priming effects will be obtained for form related pairs, for repetition pairs, but not for semantically related pairs.

## 2. Experiment 1

### 2.1 Method

#### Design and materials

The masked priming design was a replication of that first used by Forster and Davis (1984). The within participant factor was prime-target relationship. A list of 30 sets of four words was generated. Within each set was a target word, such as *TABLE*, and three primes, allowing for three different prime-target relationships; orthographic (eg. *fable-TABLE*), semantic (eg. *chair-TABLE*) and neutral (eg. *horse-TABLE*). A repetition condition (eg. *army-ARMY*) was also included as a separate set.

Target words were low density, having between 1 and 3 neighbours, with an average of 1.6. All words within a set were the same length, so targets could only be

selected if they had at least one neighbour, and a strong semantic associate of the same length. All form primes differed from the target by one letter, and were all words themselves. The semantic primes had at most 1 letter position overlap with the targets, as did the neutral primes. Word length varied from 4 to 7 letters, with an average of 5.2. Items were also balanced on frequency as much as possible. These criteria made item selection difficult, but 30 sets deemed suitable were generated.

Each participant saw all 30 target words, rotated so that for 10 trials, the target appeared with its form prime, for 10 trials with the semantic prime, and for 10 trials with the neutral prime. The 30 participants were also divided into three groups of 10, creating three versions, with versions being a between participants factor. For each version, the type of prime was rotated so that all appeared with each of the targets. That is, participants in version 1 saw *TABLE* appear with *fable*, in version 2 it appeared with *chair*, and in version 3 with *horse*. Each version was balanced on associative strength for semantic pairs, target density, word length, letter overlap, and frequency where possible.

A repetition condition was also included for all participants. However, because of the difficulty in creating the 30 word sets which satisfied all the criteria, the final group of 10 repetition pairs was not rotated through the versions, instead the same set of 10 repetitions pairs was seen by all 30 participants.

Non word pairs were included for the lexical decision task, but were not included in the final analysis. All non word targets had word primes, and were balanced on length with the word pairs. Participants were given 20 non word pairs, making the word-non word target ratio 2-1, and the total number of trials 60.

Participants were told the first 10 trials were practice items and did not count towards

the final result. In actual fact they were given 11 practice items, to eliminate possible stress of the “first” trial.

### **Participants**

Thirty participants took part, mostly psychology students from Edith Cowan University. The ages ranged from 17 to 46, with a mean age of 28. Male and female participants numbered 10 and 20 respectively.

### **Apparatus**

Participants used Dmastr, a program developed by Ken Forster, which records reaction times and errors. The majority of the participants (24) were run on computers in the Psychology Department computer lab at Edith Cowan University, and the remaining on another computer in a private room.

### **Procedure**

Participants were run individually and in groups of up to six. Each participant was told they would see a row of hashes on the screen, followed by an upper case letter string. The upper case letter string would either be a word they would easily recognise, or a non-word. They were told that all non-words were pronounceable (ie. pseudowords), but they did not have any meaning. As in the Forster and Davis (1984) design, the Dmastr program in fact presented the participants with two letter strings. A row of hashes was presented for 500 ms, followed immediately by the masked prime, appearing in lower case letters for approximately 52ms. The upper case target immediately followed the prime, also remaining on the screen for 500ms, (eg. #####-chair-TABLE). When seeing a word, participants were instructed to press the right shift key, and when seeing a non-word, to press the left shift key. Upon making a response, the computer waited for the participants to press the space bar before



presenting the next item, so participants were told they could proceed at their own pace. Participants were instructed to respond as quickly and accurately as possible, but not to be concerned at making an occasional error. However if they were making numerous errors it was suggested they “slow down”. When participants made a correct response, the word “correct” appeared on the screen below the target, along with the reaction time in milliseconds. Participants were told there was no right or wrong time, but that response time was given so they could keep competitive with themselves. In the event of an error, the word “wrong” appeared on the screen, with no reaction time given.

A small number of participants (2-3) were possibly suspicious prior to testing that a prime stimulus was being presented, but no other participants reported an awareness of the primes, and were surprised when informed during the debriefing that they had been shown two letter strings rather than one.

## **2.2 Results (part 1)**

Only word item responses were used in the analysis. Errors were also excluded, along with any response between 200 ms and 2000 ms. A response under 200ms is considered too fast for the human response mechanism, and times longer than 2000ms are treated as a failure to respond. The standard deviation was then determined for each participant across all conditions, and any scores more than 2SDs from the mean were brought back to the 2SD value. Table 1. shows the means for each of the four word conditions for the first 30 participants.

**Table 1.**  
**Mean response times for word conditions for group 1.**

	Mean RT (ms)			
	neut.	form	sem.	rep.
Group 1	565.7	557.9	555.6	534.7
SD	64.6	72.6	73.3	70.0
SE	11.8	13.3	13.4	12.8

Tests for homogeneity were performed, as well as a 4x3 repeated measure ANOVA. The between subjects factor versions was not significant, but a main effect was found for pairs ( $F(3,26) = 2.95, p < .05$ ), with a post hoc analysis revealing a priming effect for the repetition condition ( $t(29) = 2.48, p < .05$ ). No interaction effects were found between word pairs and versions.

## **Replication of Experiment 1**

### **Participants**

Unexpectedly, no form priming was obtained in Experiment 1, in conflict with Forster et al. (1987). A further 30 participants were therefore given the same task. Participants were predominantly university science students or graduates, from Murdoch University and the University of Western Australia, between the ages of 17 and 34, with a mean age of 25 years. Male and female participants numbered 13 and 17 respectively.

## Procedure

Unlike the first group of participants, all testing was done on a one to one basis, in a semi darkened private room. Three testing locations were used, but all were matched for light conditions using a light meter. The second group was instructed in the same way as the first group. One participant suspected there was two words being presented, due to previous use of Dmastr. All other participants were again surprised when informed two words were presented, and no participants reported an awareness of the primes.

## 2.3 Results (part 2)

The same elimination and cut off procedures was applied to the data for the second group, as well as a test for homogeneity of variance. Table 2. shows mean reaction times for the combined group of sixty participants.

Table 2.  
Mean response times and priming effect for  
comparison with the neutral condition for word conditions.

	Mean RT (ms)			
	neut.	form	sem.	rep.
n = 60	536.7	522.9	525.5	501.0
Priming		-13.8	-11.2	-35.7
SD	67.3	69.9	67.9	69.5
SE	8.7	9.0	8.8	9.0

A 4x3 repeated measures ANOVA revealed the between subject factor *versions* was again not significant, but there was main effect for pairs ( $F(3,26) = 10.07, p < .001$ ). Again, post hoc analysis revealed a priming effect only for the repetition condition (36ms).

## 2.4 Discussion

### 2.4.1 Failure to replicate form priming

In the first experiment, it was asked if semantic priming would occur in the Forster and Davis design, which it did not. Presentation conditions were identical, but items differed to some degree, in that unlike most of the Forster and Davis pairs, all primes were words. A significant facilitation effect was obtained for repetition in both the first and combined groups, but unexpectedly, a form priming effect was not obtained.

The absence of a form priming effect has two implications for an interactive-activation model. Firstly, this result could be considered supportive to a model in which inhibition occurs between competing words before the onset of the target. Such an account presented earlier by Colombo (1986), as an explanation for an absence for form priming effects. In the example pair *shot-SHOE*, it is expected that *shot* will initially increase the level of the detector for *shoe* by some degree. Between the onset of the prime and the onset of the target, the detector for *shoe* can do one of two things. It can either remain partially activated, or it can be inhibited by the more strongly activated match for the prime, ie. *shot*. If *shoe* remains partially activated, a priming effect might be expected when the target *SHOE* is subsequently presented. However,

no priming occurs. This could therefore simply mean that *shoe* has received inhibition prior to target onset.

Form priming can still occur however if the prime is a non-word. Much of Forster's pairs included non word primes, such as *sefa-SOFA*. Here, *sefa* partially activates *sofa*, but perhaps without producing a stronger entry that inhibits the target detector, given that *sefa* does not have it's own word detector. This account was also offered by Grainger and Jacobs (1993), in support of the interactive activation model.

Even though no form priming for word targets was obtained here, a form priming effect was found for low density short words (Forster et al., 1987) and for long words (Forster, 1987), having a minimum of 8 letters. However, short word-word form priming is reported in only one experiment, and given the findings here, further replication seems necessary. Also, it is possible that long word primes may not activate a single higher candidate, similar to a non word, perhaps due to a processing limitation based on length when the word is presented briefly.

If it does appear that form priming is generally not obtainable in this design when the prime is a word, then it allows for the possibility that the primes in both form priming pairs and repetition pairs are being accessed (when they are words), because they have reached a sufficiently high level of activation to inhibit other competitors. However, the word prime in *table-CHAIR* does not appear to be accessed. This could be due to the fact that semantic primes have no orthographic overlap with the target, which may be crucial for prime access. That is, the orthographically related target has a backward effect on the processing of the prime, meaning the prime is accessed *after* the onset of the target. This is not consistent with an interruption theory of masking discussed above. An orthographic retroactive

mechanism is the second implication of the absence of form priming for all word-word pairs.

#### 2.4.2 Orthographic retroactive priming effect

In determining why *chair-TABLE* does not show a semantic priming effect while *made-MAKE* does appear to, an explanation may lie in the presence of backward or retroactive priming effect on the prime. For example, when *made* appears, several similar words are also activated, including both *made* and *make*. However, *made* is stronger than *make*, so the detector for *make* may begin to receive inhibition, meaning the activation level (for *make*) may fall, even before the onset of the target, although this is not important for this account. What is important is that the onset of the target *MAKE* again causes activation in several candidates, with *make* receiving the strongest activation, but *made* is also given further activation. This second feed of activation toward the prime must be sufficient to reach threshold, in which case a spreading activation process could spread to the as yet unrecognised *MAKE*. The ongoing processing of the target is thus facilitated since its entry has already been activated, through a semantic priming spreading activation effect.

Two processes have been described for orthographic priming, although both are dependent on the absence of a priming effect when primes are words. Firstly, when the prime is an orthographic word neighbour of the target, the detectors for the target appear to be inhibited before the target is identified, indicating that the prime may even reach threshold. Secondly, the access of the prime may be dependent on an orthographic retroactive process, occurring only for orthographically similar or identical targets. Word-word form priming therefore only occurs when the pairs are

semantically related, as in *made-MAKE*, making this effect essentially a semantic one.

Some suggestion that form related pairs might have an increased level of detection compared to primes in an all letters different condition can be seen in Forster and Davis (1984). In testing what information was available from the primes, participants looked at all letters different pairs, and identity pairs. They were asked to say if words were the same or different, and make a lexical decision response on the prime. While the lexical decision task only obtained chance levels performance, participants scored above chance on the same different task, with 61% overall correct (including non-words). Forster and Davis suggested this effect was due to participants matching a single letter in the prime and target when the pairs were identical. It is also possible that prime detection was increased from an orthographic retroactive effect. If prime detection for *male-make*, *made-make* and *make-make* were equal, (and higher than primes such as *made-shot*), it would provide such support, indicating the effect did not depend on identity primes, or on semantic overlap, but on an orthographic retroactive effect.

#### **2.4.3 Problems for the orthographic retroactive effect**

Despite the above suggestion that primes are accessed when they are orthographically related to the target, there are problems in accepting the orthographic retroactive effect. Forster et al. (1987) examined a similar account for the example *able-AXLE* when considering form priming in an activation model. However, they identified the problem of different activation levels associated with different word frequencies. That is, lower frequency words may not receive a sufficient level of

activation from the retroactive effect to always ensure they reach threshold, where as higher frequency words will.

As mentioned, the account described above can explain the repetition effect seen in experiment 1, where a retroactive effect results in access of the prime before the target is recognised. However, in a repetition pair there is no inhibition of the target word as there is in *made-MAKE*. This is because a prime such as *army* will activate and inhibit the detector for a word such as *arms*, but because the target is itself *army*, there is no inhibition to overcome as would be expected in *made-MAKE*. Repetition should therefore be faster than the *made-MAKE* pair, but Forster et al. (1987) indicated an equal priming effect.

#### 2.4.4 Can partial activation theory account for the data?

To review, in conflict to much of Forster's results, form priming effects were not obtained here, which can offer support to a interactive-activation model when inhibitory processes operate between competing candidate words, before the onset or recognition of the target.

As expected, a repetition effect was obtained in experiment 1, along with an absence of any semantic facilitation. Support can also given to the activation account if one assumes that orthographic overlap between prime and target causes a retroactive activation effect on the prime, increasing its level of activation to threshold. Such a processes explains the priming effect for *made-MAKE* (primarily as a semantic priming effect) as well as the absence of priming for orthographic word-word pairs sharing no semantic overlap, and semantically related words with no orthographic overlap.



While support is given for the activation model, it was mentioned above that an account of masked form priming in this model relied on an interruption theory of masking. Without form priming in word-word conditions, it was seen that some priming results suggest the mask does not act in this way. Rather, primes appear to be accessed *after* the onset of the target. If it is indeed the case the mask does not stop processing of the prime, then an alternative possibility exists in which processing of the prime is allowed to proceed, perhaps always to threshold level. This issue is taken up in the next experiment, which will draw attention to the third line of evidence warranting further examination of the masked semantic priming paradigm: a large body of literature reporting masked semantic priming effects for heavily masked words. The interruption theory of masking is of paramount importance to theories examining the access of words considered unconscious, in that processing is seen to extend beyond the mask (Holander, 1986).

### **3. Experiments 2 and 3**

#### **3.1 Overview**

As mentioned, a final line of evidence to cause a reconsideration of semantic priming in the Forster and Davis design comes from a large body of literature examining the semantic processing of undetectable stimuli, (eg. Fishler and Goodman, 1978; Fowler et al., 1981; Balota, 1983; Marcel, 1983; Greenwald et al, 1989; Klinger and Greenwald, 1995), all of which claim to have obtained semantic processing of severely masked words.

Why are these studies relevant to the priming design examined here? A crucial feature of these studies is that the primes are undetectable. This is the case with the Forster and Davis design, where primes are masked so as to eliminate an explicit memory trace of the word. The question being asked here is, what is the relationship between access of a lexical entry, and the existence of the an explicit memory trace? It is reasonable to assume that if there is an explicit trace, then access has occurred, but if there is no explicit trace, can it be assumed access did not occur? An alternative possibility is that access does indeed occur, but no explicit trace is present. This is described as a separation of processing and consciousness, which is an underlying theme of subliminal or unconscious perception work. At first, it might appear that there is no reason to look for a measure of lexical access other than simply testing for a semantic priming effect. However, given there are other designs which found semantic priming in similar conditions to Forster, it is possible that like those designs, access of primes may also be occurring in the Forster and Davis design. This would require that the processes of semantic priming are blocked by another factor, perhaps a non lexical interference effect related to conditions specific to the task. Further examination of semantic priming in the Forster and Davis design is therefore warranted.

### **3.2 Masked semantic priming for undetectable primes**

Within research on unconscious processing of words, there are two opposing views of masking. First, the suppression of a stimulus only allows for primitive feature information to be extracted (Blake, 1989), hence an interruption account.

Alternatively, masking does not restrict visual processing, but effects the ability to consciously report what has been masked, (see Marcel, 1983).

Fishler and Goodman (1978) were one of the first to report a masked semantic priming effect. Here, facilitation occurred when a prime was presented at 40ms and backward masked. Balota (1983), Marcel (1983) and Fowler et al. (1981) found masked semantic effect using a dichoptic design, where a word is presented to the non-dominant eye and a pattern mask to the dominant eye.

### **3.2.1 Criticisms of masked semantic priming**

In contrast to these findings is the view that semantic priming can only occur when primes are detectable, even if only partially detectable. To determine if a prime is detectable or not, masked semantic priming experiments usually include some type of threshold detection test. Here, individual thresholds are set to determine the SOA required in the priming exercise in order for the prime to be equally undetectable to each individual.

This issue of prime detectability was addressed by Cheeseman and Merikle (1984), who said detection tests had not been rigorous enough, and that the commonly used presence-absence task was inadequate. Cheeseman and Merikle (1985) subsequently made a distinction between subjective and objective thresholds. Subjective is where participants make their own judgement about being able to see something or not, such as saying yes or no in a presence-absence test. When participants thought they were not seeing the primes, it could be shown that they were still performing above chance level. Objective tests used forced choice word discrimination, aimed at minimising response bias. Similar criticism came from a

review by Holander (1986), claiming again that the primes reported as being below conscious identification were in fact partially visible.

Masked semantic priming studies carried out more recently have attempted to address these criticisms, with more rigorous threshold testing measures, and the use of objective thresholds over subjective thresholds, (eg. Kemp-Wheeler and Hill, 1988; Greenwald, Klinger and Liu, 1989; Klinger and Greenwald, 1995). All these studies still reported semantic priming effects for below or at near objective threshold levels.

Another recent criticism in the area of prime detectability suggests primes are more detectable when occurring in close proximity to an associated target, (Dark, 1988; Briand et al., 1988; Bernstein, 1989). This finding could potentially confound masked semantic designs where thresholds were established in a different context to the priming task. Also, it could create a difference in detection between a control and semantic condition. However, Klinger and Greenwald (1995) found no evidence that prime-target relatedness affected prime detection judgements, for a heavily masked prime. They suggested that retroactive priming had been found in previous studies because the primes were partially visible. So while this work has addressed much of its criticisms, the question remains as to whether a word can be truly undetectable and yet still processed at a semantic level.

### **3.3 Hypothesis**

The second experiment manipulates the SOA in the Forster masked priming design, by creating a testing situation where the primes becomes progressively easier to detect.

This task aims to achieve the following. If primes in the original Forster and Davis design are partially and not fully activated, and the mask acts as an interruptive device, then at some point during experiment two, the activation level of the primes should begin to reach the full threshold level of activation. The method of assessing this event will be the appearance of a semantic priming effect. Experiment 3 tests participants ability to detect the masked primes.

There are 3 hypotheses associated with experiments 2 and 3. Firstly, it is hypothesised that a semantic priming effect will emerge for one of the SOA conditions in experiment 2. The second hypothesis states that for a particular SOA in experiment 3, participants will rise above chance level of performance in their ability to correctly make a lexical decision on the prime. A comparison between experiments 2 and 3 could yield one of two possible trends. Firstly, the SOA associated with the appearance of a semantic priming could roughly correspond to the SOA condition in experiment 3 where subjects rose above chance level in the prime detection task. Secondly, and more generally, any of several other results could be obtained, where semantic priming occurs before or after participants show an above chance performance on prime detection, or alternatively, no semantic priming will occur for any SOA.

Finally, it is hypothesised that word primes in experiment 3 will not initially be detected to a higher degree when appearing with a semantically related target, compared to primes appearing with a neutral target. For example, the prime in *table-CHAIR* will not be recognised to a greater degree in the lexical decision task than the prime in *house-CHAIR*. However, this will only be the case when neutral prime

detection is at chance levels. When primes do become more visible, the semantically related primes are expected to show higher lexical decision discrimination.

### 3.4 Method

#### 3.4.1 Experiment 2

##### Design

The same Forster and Davis design from Experiment 1 was used here, with a slight modification of the SOA, resulting in SOA being a second within participants factor, along with prime-target relationship. Again, participants were given semantic, neutral and repetition pairs, with orthographic pairs being omitted. A list of 60 related word pairs (eg. *bread-BUTTER*) was generated using norms from Postman and Kepple (1970), Monash Free Word Associations (1974), and independent judges. Words were chosen on the basis of being primary associates, with a small number being strong secondary associates. Sixty pairs of neutral words (eg. *nature-LENGTH*) were also generated. Half of these 120 items were used in experiment 2, and the other half in experiment 3. Also, 30 words were used for the repetition condition (eg *lizard-LIZARD*) in experiment 2. Words were divided at first on a random basis to six SOA conditions between experiments 2 and 3, but some exchanges were made to help meet certain balancing criteria - see below.

Unlike experiment 1 in which all prime and target pairs shared the same number of letters, length differences between semantic primes and targets varied by up to 2 letters. Word length ranged from 4 to 8 letters, and length was balanced between semantic and neutral pairs. Length was also balanced for each SOA condition, and each version. Unlike experiment 1, targets always appeared with only

the one prime, so there was no rotation. This allowed for fewer semantic pairs, ensuring all pairs has high associative strength. Target density was between 0 and 3, and the best attempts were made to also balance on frequency across each SOA condition.

Three SOA conditions were given, which increased in steps, at one third and two thirds of the way through the experiment. Participants were not informed of these increments in SOA during the experiment. For each of the three SOAs, there were 30 participants, each seeing 10 semantic, 10 neutral, and 10 repetition pairs. They also saw 15 non-word pairs, where the prime was always a word. Rotation occurred through the SOAs, so that different word pairs occurred in each of the three SOAs.

### **Participants**

Participants were the 30 who participated in the replication of experiment 1. They were given experiments 1,2 and 3 in succession, over one sitting.

### **Materials/Apparatus**

The same Dmastr program in Experiment 1 was used here.

### **Procedure**

Participants had just completed experiment 1 and were familiar and practiced with the program. They were told that the second task was very similar to the first, in which they would be making the same word/non word judgements. However, they were told that on some trials they would see some lower case letters appearing between the hashes and the upper case letters. These letters would only appear very briefly, and they would not always be present (in actual fact they were always present). Participants were then told that the lower case letters were obviously there to have some kind of impact on the task, but they were asked to do their best to ignore

them, and to do the task in the same way as the previous test. The decision to give the participants some prior knowledge of the primes was taken because as the SOA increased, pilot testing suggested that all participants would eventually be seeing the primes to some degree towards the end. It was felt that participants were better off if the realisation that a second word was being present was not a “surprise”, which could have been a distraction during the task if participants began trying to determine if something was changing or not. By informing the participants that other letters would occur at times, they were also not surprised if they did not notice the prime.

As in experiment 1, Forster’s masked design was used eg. #####(500ms)-prime(~52ms)-TARGET(500ms), however the SOA was increased by adding a blank field between the prime and the target. The smallest blank field allowable by Dmastr was one tick, or 17ms. The first SOA condition included a one tick blank field, the second condition two ticks, and the third condition four ticks. That is, SOA for the presentation of #####-prime-blank field-TARGET, was approximately 70ms, 86ms and 120ms. Four ticks was chosen over three since pilot testing suggested three ticks was not much higher than 2, but 4 showed considerably more detection yet still not %100. So, participants saw semantic, neutral, repetition and non word pairs within each of the three blocks of incrementing SOAs.

Participants were reminded to again respond as quickly and accurately as possible. No practice items were provided since the essential task was exactly the same as the previous, and test time was estimated at 7 minutes. Participants were instructed to take a brief break at any time, however few participants took more than one break, and breaks were only a few seconds for participants to rest their eyes. After completing experiment 2, participants were asked if they noticed any lower case



letters or words appearing between the hashes and upper case letters, and asked if they felt this was a distraction to them.

### **3.4.2 Experiment 3**

#### **Design**

The structure of the presentation was identical in terms of SOA changes, however, repetition pairs were removed, and the number of non word target pairs was increased to match the number of word trial. Therefore, within each of the three SOA conditions, participants saw 10 semantic pairs, 10 neutral pairs, and 20 non word pairs.

#### **Participants**

The participants were the same as for experiment 2.

#### **Procedure**

Participants were told that the last task was very similar to experiment 2, but this time there would always be a letter string appearing between the hashes and upper case letters. The task was to decide if the lower case letter string was a word or a non word. They were to respond in the same way using the shift keys. All the upper case letter strings in experiment 3 were now words, and participants were specifically instructed that their word/non word discrimination was no longer based on the upper case letters. They were told that this task was considerably more difficult than the previous, and that sometimes they may not even be able to see the lower case letters. However, they were informed that half the letters strings were words, and half non words, so that even by purely guessing, they could get half right. Participants were specifically told to make a response on every trial, even if they had no idea what the word was. For this task, accuracy was more important than speed, and the suggestion

was made to participants that for unseeable items they should act on “impulse” rather than “thinking about it”. Before beginning, participants were again reassured that the task was designed to be difficult, and not to be discouraged if they were making many errors. They were informed the task would become easier towards the end. Ten practice items were given, and before beginning the real trials a final check was made on their understanding of the task, given they were responding to items they could not at first “see”. Again, immediate feedback on responses was given on screen during the task, and expected completion time was given as 6 minutes. Participants were debriefed upon completion.

### 3.5 Results

#### 3.5.1 Experiment 2

As in experiment 1, only word item responses were used in the analysis, and the same procedure used for score cutoffs and adjustments. Table 3. shows the means for each of the three word conditions for each SOA condition.

Table 3.  
Mean response times for word conditions, for each  
SOA condition. (N=neutral.; S=semantic.; R=repetition.)  
Priming effect for S and R compared to N condition.

SOA	70			86			120		
	N	S	R	N	S	R	N	S	R
RT	522.7	523.8	478.3	509.6	512.6	473.3	506.4	502.3	462.2
Priming		+1.1	-44.4		+3.0	-36.3		-4.1	-44.2
SD	71.48	50.63	49.27	52.96	52.92	59.16	54.06	56.48	47.71
SE	13.05	9.25	9.00	9.67	9.66	10.80	9.87	10.31	8.71

A 3x3x3 repeated measures ANOVA was applied to the data. Tests for homogeneity of variance were significant for SOA. The between participants variable versions was not significant. The only significant result was a main effect for pairs ( $F(2,27) = 36.55, p < .001$ ). Subsequent t tests revealed there was a significant priming effect in the repetition condition for all SOA conditions: 70ms SOA ( $t(29) = 4.29, p < .001$ ), 86ms SOA ( $t(29) = 4.49, p < .001$ ), and 120ms SOA ( $t(29) = 4.35, p < .001$ ).

There were no significant semantic priming effects for any of the SOA condition, and priming effects remained fairly stable across SOA, for both the semantic and repetition pairs.

### 3.5.2 Experiment 3

In experiment 3 correct responses to a lexical decision task on the prime were re-coded as 1, and errors as 0, eliminating response times from any of the analysis. Tests for homogeneity of variance was significant for word pairs. Table 4. shows the overall correct response rate to primes in each of the three SOA condition, as well as a breakdown of the responses to prime types in relation to the target.

Table 4. Number of correct responses for the three SOA conditions out of 40 total response, and proportion of correct responses by prime type out of 10. (S=Sem., N=Neut., NW=Non Word).

SOA	70			86			120		
No. Correct/40	22.5			24.0			29.8		
% Correct	56.3			60.0			74.5		
	S	N	NW	S	N	NW	S	N	NW
No. Correct/10	8.5	6.9	3.2	8.5	8.0	3.7	9.3	8.7	5.8

A repeated measures ANOVA showed significant effects for word pairs ( $F(2,27) = 173.11, p < .001$ ), SOA ( $F(2,27) = 38.00, p < .001$ ), pairs x SOA ( $F(4,25) = 4.35, p < .005$ ). This indicates that subjects clearly improved in their ability to detect primes for each of the SOA conditions. Post hoc analysis revealed a post hoc analysis between the semantic and neutral primes revealed a significant difference for SOA conditions 70ms,  $t(29) = -4.64, p < 0.001$ , and 120ms,  $t(29) = -2.31, p < 0.05$ . There was no significant difference at the 86ms condition. This indicates that for two of the SOA conditions, participants were better at detecting semantic primes over neutral primes.

### **3.6 Discussion**

#### **3.6.1 Awareness of primes and semantic facilitation**

The results indicate no semantic priming effects for any of the SOA conditions. Clearly, the participants ability to do a lexical decision on the prime in each SOA condition increases significantly, to the degree that overall correct responses are at 70%, which should certainly qualify primes as partially detectable and above the participants detection thresholds, especially since participants were able to name some of the prime words towards the end.

The absence of semantic priming in experiment 1 were discussed, in terms of a below threshold activation level of the prime. When considering the longest SOA in experiment 2 (120ms, with prime duration at 60ms), why was no semantic priming effect obtained? According to a spreading activation theory, a word that is detected

should cause automatic activation to neighbouring entries, especially in this case where targets were predominantly primary associates of the prime.

### 3.6.2 Inhibition and strategies

Neely (1977) found inhibitory processes appearing only at an SOA greater than 250 ms. This indicated that no attentional strategies were operating. Further evidence suggests a lack of conscious strategies below 200ms (de Groot, 1984; den Heyer et al., 1983). It does appear however, that unless a semantic activation process is considered absent, there is an inhibitory process of some nature that is counteracting the semantic priming effect.

In a masked semantic priming paradigm where primes are near or below detection threshold and hence below conscious awareness (but still being accessed), one view already discussed suggests the mask prevents any processes controlled by conscious mechanism. This leaves only automatic processing that are revealing to “pure” cognitive processes and mechanisms. In light of this view, Dagenbach et al. (1989) pointed out that in these suppressed stimuli tests, participants can be consciously trying to attend to the prime. Even if they cannot see the prime, the *efforts* to “see” it might have an effect on prime processing and hence an effect on target processing, perhaps resulting in an inhibitory effect. They also suggests that different tasks containing different information could result in different strategies used by the participants. Such a claim is discouraging, in that it makes the comparison of any different priming designs confounding, including the comparison here between experiments 2 and 3. For instance, in experiment 2, participants were told that a second word (the prime) would sometimes be present, even though they were asked to

ignore this word. In assessing detection of a word stimulus, it is difficult to have the person unaware that suppressed words are being presented. Experiment 3 was designed to overcome this by doing detection assessments after the priming task. However, in experiment 2 participants were attending to the target, and in experiment 3, attention was drawn to the prime. It is possible this different task induced certain strategies which mean the prime detection in experiment 3 is not an accurate representation of prime detection in experiment 2. Priming tasks in which individual thresholds are not assessed therefore hold same advantage, as in the Forster and Davis design where participants can be easily temporarily deceived into thinking they are seeing only one letter string. At the same time however, assessment of level of detection for a masked stimuli can be important knowledge for the experimenter to have when considering unconscious perception.

### **3.6.3 The nature of SOA and semantic priming for short SOAs**

A similar design to that used here can be seen in Durante and Hirshman (1994), who tested for priming effects and prime detection at the same time. They presented participants with a masked prime and target, but on some trials participants were instructed to perform a lexical decision on the prime, while on other trials they were instructed to name the prime, or any letters of the prime. Using two SOA conditions, 33ms and 66ms, they found that as prime detection increased, masked semantic priming decreased. They suggested that the relationship between prime duration and semantic priming might be U-shaped.

Support for a U-shaped relationship might be seen in Klinger and Greenwald (1995). They divided participants into two groups, those obtaining a high level of

prime detection, and those obtaining a low score. Upon comparing the priming effects of the two groups, it was found that the high detection group had a lower priming effect than the low detection group, a result which could be accounted for by placing each group in an appropriate place on a U-shaped curve of activation as a function of SOA.

In light of this analysis, a similar comparison was carried out on participants here, using two methods. The thirty participants were placed in rank order for overall correct response rate in experiment 3. The highest and lowest 10 participants formed the high and low groups respectively. Table 5. shows the mean response times for both groups in experiment 2.

Table 5.  
Mean response times for word conditions, for  
each SOA condition. (N=neutral.; S=semantic.;  
R=repetition.) Priming effect for S and R is  
compared with N condition.

SOA	Mean RT (ms)								
	70			86			120		
	N	S	R	N	S	R	N	S	R
High detection	532.7	526.0	473.9	515.7	518.8	473.0	492.9	500.5	466.2
Priming		-6.7	-58.8		+3.1	-42.7		+7.6	-26.7
Low detection	521.0	515.6	475.0	492.7	509.6	428.8	491.9	507.5	461.1
Priming		-5.4	-46		+16.9	-63.9		+15.6	-30.8

There appears to be little difference on the semantic priming task for both the high and low detection tests. Although this analysis is based on a small number of participants, it suggests that while there was certainly a variation in people's ability to

detect the primes, there is no indication of the use of different strategies either based on or triggered by the participants ability to detect masked primes.

### **3.6.4 Were primes partially activated or fully activated?**

What processes are occurring in experiment 2? Participants perhaps all used the same strategies, which may have had some kind inhibitory effect on the semantically related pairs. If this is the case, then is this strategy perhaps used in the original design where SOA is 50-60ms. That is, priming may be absent not because the prime is failing to reach threshold, but because subjects are in some way using a strategy to recognise the target, and this strategy acts as an inhibitory effect for semantically related pairs. This would call into question the claim by Forster that his masked priming design is strategy free, in which a person cannot help but submit to universal automatic process of the cognitive system.

An alternative and perhaps more likely explanation is that threshold activation of primes simply did not occur in experiment 2 (or occurred only for a very small number of primes), and that the procedure used in experiment 3 is an invalid way of assessing the level of detection in the actual priming task.

### **3.6.5 Retroactive priming**

A final issue to consider is retroactive priming. There is growing evidence that a retroactive priming effect may result in a different degree of suppression between a related and an unrelated masked prime (eg. Bernstein, 1989). It is therefore important to asses such a difference in each priming design.



The results for experiment 3 showed that for two of the three SOA conditions, semantic primes were lexically distinguished more often than the neutral primes, providing evidence for the enhancement of primes in the semantic condition. This does not mean that prime detection in experiment 2 is invalidated, because prime detection was carried out under the same conditions. It does however call into question the validity of a neutral prime.

## **4. Conclusion**

### **4.1 General findings, problems, and future studies**

The aim of this study was to examine aspects of the masking effect on the prime in the Forster priming design, within the framework of the interactive activation model and an interruption theory of masking. An assessment of the level of information that is extracted from a masked stimulus has important implications for how word recognition functions.

The unexpected absence of form priming in experiment 1 gave support to the interactive activation model, in that inhibition may have been operating between orthographically related primes in a candidate list. If primes were effectively inhibiting competing words, then it was considered that the primes may have been accessed, or were close to being accessed. However, because no semantic priming effects were obtained for pairs such as chair-table, it was assumed the primes were not reaching threshold activation levels. An explanation as to why primes in orthographic pairs appeared to be accessed, while primes for semantic pairs were not, was

considered in terms of a retroactive orthographic priming effect. This was able to account for much of the data, although not without problems. The important aspect emerging from the discussion was that primes appeared to be accessed after the onset of the target, opposing an assumption for an interruption theory of masking. While no strong evidence emerged to dispute the interactive activation model, the second and third experiments focussed on testing support for the interruption account of the mask.

Unfortunately, no semantic priming effects were obtained in experiment 2, providing little basis on which to consider the conditions where a mask interruption effect might disappear. There are two possible reasons why semantic priming did not occur. One states that prime access did occur at some SOA value, perhaps even as early as 60 ms. However the resulting facilitatory effect of a spreading activation mechanism was inhibited by another conscious processes, possibly a strategy used to carry out the task, although the nature of such a strategy is unknown. This opposes an interruption theory of the mask, and suggests primes are always accessed, independently to the target. Support for this argument requires the verification of strategic inhibitory processes that impact on priming tasks with very short SOAs.

The second account for an absence of semantic priming provides perhaps the most important finding here. That is, prime detection tasks are often invalid measures of the level of prime detection occurring during the testing stage. While prime access occurred readily in the detection task, it cannot be assumed this same level of access applies when participants switch their attention to the target. This is an important issue that needs to be addressed in future work.

Although not significant, some evidence was found for a semantic retroactive effect operating on prime detection, where primes are more detectable when occurring

with semantically related targets than when appearing with non related targets. There has been an insufficient amount of work done on this issue to estimate the implications for semantic priming paradigms, and the validity of the neutral prime as a control condition.

Finally, future work might also benefit from the examination of both semantic and orthographic priming within the same design, in particular with studies particularly look at unconscious processing. Knowing the conditions in which both types of priming do and do not occur would provide valuable insight into current models of recognition.

## REFERENCES

- Balota, D.A. (1983). Automatic semantic activation and episodic memory encoding. *Journal of Verbal Learning and Verbal Behaviour*, 22, 88-104.
- Becker, C.A. (1980) Semantic context effects in visual word recognition: An analysis of semantic strategies. *Memory & Cognition*, 8(6), 493-512.
- Bernstein, I.H., Bissonnette, V., Vyas, A., & Barclay, P. (1989). Semantic priming: Subliminal perception or context? *Perception and Psychophysics*, 45, 153-161.
- Blake, R. (1989). A neural theory of binocular rivalry. *Psychological Review*, 96, 145-167.
- Briand, K., den Heyer, K. and Dannenbring, G.L. (1988) Retroactive semantic priming in a lexical decision task. *Quarterly Journal of Experimental Psychology*, 40A (2), 341-359.
- Cheeseman, J., & Merikle, P.M. (1984). Priming with and without awareness. *Perception and Psychophysics*, 36, 387-395.
- Cheeseman, J. & Merikle, P.M. (1985). Word recognition and consciousness. In D. Besner, T.G. Waller, & G.E. MacKinnon (Eds.), *Reading research: Advances in theory and practice* Vol. 5, (pp. 311-352). New York: Academic Press.
- Collins, A.M. and Loftus, E.F. (1975) A spreading-activation theory of semantic processing. *Psychological Review*, 82(6), 407-428.
- Colombo, L. (1986). Activation and inhibition with orthographically similar words. *Journal of Experimental Psychology: Human Perception and Performance*, 12, 226-234.
- Coltheart, M. (1978). Lexical access in simple reading tasks. In G. Underwood (Ed.), *Strategies of information processing*. New York: Academic Press.
- Dagenbach, D., Carr, T.H. and Wilhelmsen, A. (1989). Task-Induced strategies and near-threshold priming: Conscious influences on unconscious perception. *Journal of Memory and Language*, 28, 412-443.
- Dark, V. (1988). Semantic priming, prime reportability, and retroactive priming are interdependent. *Memory and Cognition*, 16, 299-308.
- Davis, C. and Forster, K.I. (1994). Masked orthographic priming: The effect of prime-target legibility. *The Quarterly Journal of Experimental Psychology*, 47A (3), 673-697.

- de Groot, A.M.B. (1984) Primed lexical decision: Combined effects of the proportion of related prime-target pairs and the stimulus-onset asynchrony of prime and target. *Quarterly Journal of Experimental Psychology*, 36A, 253-280.
- den Heyer, K. (1985) On the nature of the proportion effect in semantic priming. *Acta Psychologica*, 60, 25-38.
- den Heyer, K., Briand, K. And Dannenbring, G. (1983) Strategic factors in a lexical decision task: evidence for automatic and attention-driven processes. *Memory & Cognition*, 11, 374-381.
- Durante, R. and Hirshman, E. (1994). Retrospective priming and masked semantic priming : The interfering effects of prime activation. *Journal of Memory and Language*, 33, 112-127.
- Evett, L.J, and Humphreys, G.W. (1981). The use of abstract graphemic information in lexical access. *Quarterly Journal of Experimental Psychology*, 33A, 325-350.
- Fishler, I, and Goodman, G.O. (1978). Latency of association activation in memory. *Journal of Experimental Psychology: Human Perception and Performance*, 4, 455-470.
- Forster, K.I. (1976). Accessing the mental lexicon. In R.J. Wales and E. Walked (Eds.), *New approaches to language mechanisms*. Amsterdam: North-Holland.
- Forster, K.I. (1987). Form-priming with masked primes: The best-match hypothesis. In Coltheart (Ed.), *Attention and Performance*, XII (pp.105-125). Howe: Lawrence Erlbaum Associated Ltd.
- Forster, K.I. (1989). Basic issues in lexical processing. In W. Marslen-Wilson (Ed.), *Lexical representation and process* (pp. 75-107). Cambridge, MA: MIT Press.
- Forster, K.I. (1994). Computational Modeling and Elementary Process Analysis in *Visual Word Recognition*. *Journal of Experimental Psychology: Human Perception and Performance*, Vol.20, No. 6, 1292-1310.
- Forster, K.I. and Davis, C. (1984). Repetition priming and frequency attenuation in lexical access. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 10, 680-698.
- Forster, K.I. and Davis, C.W. (1991). The density constraint on form-priming in the naming task: Interference effects from a masked prime. *Journal of Memory and Language*, 30, 1-25.
- Forster, K.I., Davis, C.W., Schoknecht, C. and Carter, R. (1987). Masked priming with graphemically related forms: Repetition or activation? *Quarterly Journal of Experimental Psychology*, 39A, 211-251.

- Fowler, C.A., Wolford, G., Slade, R., & Tassinary, L. (1981). Lexical access with and without awareness. *Journal of Experimental Psychology: General*, 110, 341-362.
- Grainger, J. and Jacobs, A.M. (1993). Masked partial-word priming in visual word recognition: Effects of positional letter frequency. *Journal of Experimental Psychology: Human Perception and Performance*, 19, 951-964.
- Greenwald, A.G., Klinger, M.R., & Liu, T.J. (1989). Unconscious processing of dichoptically masked words. *Memory & Cognition*, 17, 35-47.
- Hillinger, M.L. (1980). Priming effects with phonemically similar words: The encoding bias hypothesis reconsidered. *Memory and Cognition*, 8, 115-123.
- Holender, D. (1986) Semantic activation without conscious identification in dichotic listening, parafoveal vision, and visual masking: A survey and appraisal. *Behavioural and Brain Sciences*, 9, 1-66.
- Humphreys, G.W., Evett, L.J., Quinlan, P.T., and Besner, D. (1987). Orthographic priming: Qualitative differences between priming form identified and unidentified primes. In M. Coltheart (Ed.), *Attention and Performance*, XII (pp.105-125). Hove: Lawrence Erlbaum Associated Ltd.
- Humphreys, G.W., Evett, L.J., Taylor, D.E. (1982). Automatic phonological priming in visual word recognition. *Memory and Cognition*, Vol 10(6), 576-590.
- Kemp-Wheeler, S.M. and Hill, A.B. (1988). Semantic priming without awareness: Some methodological considerations and replications. *The Quarterly Journal of Experimental Psychology*, 40A, (4), 671-692.
- Klinger, M and Greenwald, A. (1995). Unconscious Priming of Association Judgements. *Journal of experimental Psychology: Learning, Memory and Cognition*. Vol 21,(3), 569-581.
- McClelland, J.L. and Rumelhart, D.E. (1981). An interactive activation model of context effects in letter perception: Part 1. An account of basic findings. *Psychological Review*, 88, 375-407.
- Marcel, A.J. (1983). Conscious and unconscious perception: Experiments on visual masking and word recognition. *Cognitive Psychology*, 15, 197-237.
- Martin, R.C., & Jensen, C.R., (1988). Phonological priming in the lexical decision task: A failure to replicate. *Memory and Cognition*, 16 (6), 505-521.
- Meyer, D.M., and Schvandeveltdt, R.W. (1971). Facilitation in recognising pairs of words: Evidence of a dependence between retrieval operations. *Journal of Experimental Psychology*, 90, 227-234.

- Meyer, D.M., Schvandevelde, R.W., & Ruddy, M.G. (1974). Functions of graphemic and phonemic codes in visual word-recognition. *Memory & Cognition*, 2, 309-321.
- Morton, J. (1970). A functional model of human memory. In D.A. Norman (Ed.), *Models of human memory*. New York: Academic Press.
- Murry, W.M., & Forster, K.I. (1994). Frequency-ordered search and the effect of frequency on lexical decision time. *Unpublished manuscript*.
- Neely, J.H. (1977). Semantic priming and retrieval from Lexical Memory: Roles of inhibitionless spreading activation and limited-capacity attention. *Journal of Experimental Psychology: General*, Vol. 106, No. 3, 226-254.
- Neely, J.H., and Durgunoglu, A.Y. (1985) Dissociative episodic and semantic priming effects in episodic recognition and lexical decision tasks. *Journal of Memory and Language*, 24, 466-489.
- Neely, J.H., Keefe, D.E. and Ross, K.L. (1989). Semantic priming in the lexical decision task: Roles of prospective prime-generated expectancies and retrospective semantic matching. *Journal of Experimental Psychology: Learning, Memory and Cognition*, 15 (6), 1003-1019.
- Neely, J.H. (1991) Semantic priming effects in visual word recognition: A selective review of current findings and theories. In D. Besner & G. W. Humphreys (Eds.) *Basic processing in reading: Visual word recognition* (pp. 264-336). Hillsdale, NJ: Erlbaum.
- Peterson, R.R., Dell, G.S., & O'Seaghdha, P.G. (1989). A connectionist Model of Form-related Priming Effects. *Proceedings of the Eleventh Annual Conference of the Cognitive Science Society* (pp. 196-203). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
- Posner, M.I. and Snyder, C.R.R. (1975a). Attention and cognitive control. In R.L. Solso (Ed), *Information processing and cognition: The Loyola symposium*. Hillsdale, N.J.: Erlbaum.
- Postman, L. and Keppel, G. (1970). *Norms of Word Associations*. New York: Academic Press.
- Ratcliff, R. and McKoon, G. (1988) A retrieval theory of priming in memory. *Psychological Review*, 95(3), 385-408.
- Rumelhart, D.E. and McClelland, J.L. (1982). An interactive activation model of context effects in letter perception: Part 2. The contextual enhancement effect and some tests and extensions of the model. *Psychological Review*, 89, 60-94.

Thomson, D.M. (1976). *Monash free association norms*. Monash University: Clayton.

Tulving, E. (1972). Episodic and Semantic Memory. In E. Tulving & Donaldson (Eds.), *Organisation of Memory*, pp381-403. N.Y: Academic Press.



## **APPENDIX A**

## Experiment 1 - Version 1

s4 f40 n70 a

```
$000 "Welcome! To move to the next instruction line, press the space bar";
000 "You will be presented with letters in the centre of the screen";
000 "Your task is to decide if the item in UPPER CASE is a word";
000 "If it is a word press the RIGHT shift key, ";
000 "if it is NOT a word press the LEFT shift key. ";
000 "Remember to respond as quickly and accurately as possible. ";
000 "Place your fingers on the shift keys now, ready to begin. Then press space bar. ";
000 "Here are some items for practice. Press the space bar to move forward. ";
+250 "####/%3"yell"/*"FISH"/ ;
000 "Remember, respond as quickly and accurately as possible. (Press space) ";
+250 "####/%3"book"/*"PAGE"/ ;
-250 "####/%3"exam"/*"KEST"/ ;
+250 "####/%3"data"/*"SWIM"/ ;
+250 "####/%3"soar"/*"PLUG"/ ;
-250 "####/%3"bold"/*"FLIT"/ ;
+250 "#####/%3"super"/*"MOUSE"/ ;
-250 "#####/%3"fault"/*"OFFED"/ ;
-250 "####/%3"back"/*"KACE"/ ;
000 "That's the end of the practice items. Go on when ready..." ;
-250 "####/%3"wren"/*"SINT"/ ;$
+011 "####/%3"stop"/*"CITY"/ ;
+012 "####/%3"slip"/*"TREE"/ ;
-051 "####/%3"hype"/*"KETS"/ ;
+013 "#####/%3"change"/*"RUBBER"/ ;
+014 "#####/%3"entail"/*"JUNGLE"/ ;
-052 "#####/%3"gloss"/*"PURTE"/ ;
+015 "#####/%3"ozone"/*"QUEEN"/ ;
+016 "#####/%3"crust"/*"BLADE"/ ;
-053 "#####/%3"baren"/*"QUIST"/ ;
+017 "#####/%3"finger"/*"AVENUE"/ ;
+018 "#####/%3"socks"/*"DREAM"/ ;
-054 "#####/%3"feast"/*"RAPIS"/ ;
+019 "#####/%3"flack"/*"RADIO"/ ;
+020 "#####/%3"human"/*"MONTH"/ ;
-055 "#####/%3"mystro"/*"NATISE"/ ;
+021 "#####/%3"bunny"/*"FUNNY"/ ;
+022 "#####/%3"fiddle"/*"MIDDLE"/ ;
-061 "#####/%3"wisdom"/*"FOLLAR"/ ;
+023 "#####/%3"thread"/*"THREAT"/ ;
+024 "####/%3"shot"/*"SHOE"/ ;
-062 "####/%3"bake"/*"NAST"/ ;
+025 "####/%3"clue"/*"CLUB"/ ;
+026 "##### "/*3"blood"/*"FLOOD"/ ;
-063 "#####/%3"creed"/*"TOTOR"/ ;
+027 "#####/%3"rivet"/*"RIVER"/ ;
```

+028 "#####"/%3"chilli"/\*"CHILLY"/;  
-064 "#####"/%3"right"/\*"LOSTE"/;  
+029 "#####"/%3"gather"/\*"FATHER"/;  
+030 "#####"/%3"quilt"/\*"QUIET"/;  
-065 "#####"/%3"billow"/\*"DEVITE"/;  
+031 "#####"/%3"winter"/\*"SUMMER"/;  
+032 "#####"/%3"liver"/\*"HEART"/;  
-071 "#####"/%3"rates"/\*"TINCH"/;  
+033 "#####"/%3"tight"/\*"LOOSE"/;  
+034 "#####"/%3"atom"/\*"BOMB"/;  
-072 "#####"/%3"open"/\*"GEAD"/;  
+035 "#####"/%3"canary"/\*"PARROT"/;  
+036 "#####"/%3"patient"/\*"SURGERY"/;  
-073 "#####"/%3"juor"/\*"SAIS"/;  
+037 "#####"/%3"garden"/\*"FLOWER"/;  
+038 "#####"/%3"cigar"/\*"SMOKE"/;  
-074 "#####"/%3"enter"/\*"PLACS"/;  
+039 "#####"/%3"round"/\*"EARTH"/;  
+040 "#####"/%3"smash"/\*"BREAK"/;  
-075 "#####"/%3"grave"/\*"VALLES"/;  
+041 "#####"/%3"peace"/\*"PEACE"/;  
+042 "#####"/%3"sailor"/\*"SAILOR"/;  
-081 "#####"/%3"trim"/\*"LAXY"/;  
+043 "#####"/%3"shoot"/\*"SHOOT"/;  
+044 "#####"/%3"crust"/\*"CRUST"/;  
-082 "#####"/%3"batch"/\*"FOLER"/;  
+045 "#####"/%3"pillow"/\*"PILLOW"/;  
+046 "#####"/%3"enjoy"/\*"ENJOY"/;  
-083 "#####"/%3"revise"/\*"FANDER"/;  
+047 "#####"/%3"army"/\*"ARMY"/;  
+048 "#####"/%3"wetter"/\*"WETTER"/;  
-084 "#####"/%3"buddy"/\*"ZASTA"/;  
+049 "#####"/%3"motor"/\*"MOTOR"/;  
+050 "#####"/%3"health"/\*"HEALTH"/;  
-085 "#####"/%3"mower"/\*"CRUSS"/;  
\$000 LB"THATS THE END OF PART 1";\$

## Experiment 1 - Version 2

s4 f40 n70 a

\$000 "Welcome! To move to the next instruction line, press the space bar";  
000 "You will be presented with letters in the centre of the screen";  
000 "Your task is to decide if the letters in UPPER CASE are a word";  
000 "If it is a word press the RIGHT shift key,";  
000 "if it is NOT a word press the LEFT shift key.";  
000 "Remember to respond as quickly and accurately as possible.";  
000 "Place your fingers on the shift keys now, ready to begin. Then press space bar.";  
000 "Here are some items for practice. Press the space bar to move forward.";  
+250 "#####/%3"yell"/\*"FISH"/;  
000 "Remember, respond as quickly and accurately as possible. (Press space)";  
+250 "#####/%3"book"/\*"PAGE"/;  
-250 "#####/%3"exam"/\*"KEST"/;  
+250 "#####/%3"data"/\*"SWIM"/;  
+250 "#####/%3"soar"/\*"PLUG"/;  
-250 "#####/%3"bold"/\*"FLOT"/;  
+250 "#####/%3"super"/\*"MOUSE"/;  
-250 "#####/%3"fault"/\*"OFFED"/;  
-250 "#####/%3"back"/\*"KACE"/;  
000 "That's the end of the practice items. Go on when ready..." ;  
-250 "#####/%3"wren"/\*"SINT"/ ;\$  
+031 "#####/%3"friend"/\*"SUMMER"/;  
+032 "#####/%3"movie"/\*"HEART"/;  
-071 "#####/%3"rates"/\*"TINCH"/;  
+033 "#####/%3"muddy"/\*"LOOSE"/;  
+034 "#####/%3"date"/\*"BOMB"/;  
-072 "#####/%3"open"/\*"GEAD"/;  
+035 "#####/%3"divide"/\*"PARROT"/;  
+036 "#####/%3"leather"/\*"SURGERY"/;  
-073 "#####/%3"juor"/\*"SAIS"/;  
+037 "#####/%3"hassle"/\*"FLOWER"/;  
+038 "#####/%3"input"/\*"SMOKE"/;  
-074 "#####/%3"enter"/\*"PLACS"/;  
+039 "#####/%3"diary"/\*"EARTH"/;  
+040 "#####/%3"right"/\*"BREAK"/;  
-075 "#####/%3"gravel"/\*"VALLES"/;  
+011 "#####/%3"cite"/\*"CITY"/;  
+012 "#####/%3"free"/\*"TREE"/;  
-051 "#####/%3"hype"/\*"KETS"/;  
+013 "#####/%3"robber"/\*"RUBBER"/;  
+014 "#####/%3"bungle"/\*"JUNGLE"/;  
-052 "#####/%3"gloss"/\*"PURTE"/;  
+015 "#####/%3"queer"/\*"QUEEN"/;  
+016 "#####/%3"blame"/\*"BLADE"/;  
-053 "#####/%3"baren"/\*"QUIST"/;  
+017 "#####/%3"avenge"/\*"AVENUE"/;

+018 "#####"/%3"cream"/\*"DREAM"/;  
-054 "#####"/%3"feast"/\*"RAPIT"/;  
+019 "#####"/%3"ratio"/\*"RADIO"/;  
+020 "#####"/%3"mouth"/\*"MONTH"/;  
-055 "#####"/%3"mystro"/\*"NATISE"/;  
+021 "#####"/%3"comic"/\*"FUNNY"/;  
+022 "#####"/%3"center"/\*"MIDDLE"/;  
-061 "#####"/%3"wisdom"/\*"FOLLAR"/;  
+023 "#####"/%3"needle"/\*"THREAD"/;  
+024 "#####"/%3"foot"/\*"SHOE"/;  
-062 "#####"/%3"bake"/\*"NAST"/;  
+025 "#####"/%3"golf"/\*"CLUB"/;  
+026 "#####"/%3"water"/\*"FLOOD"/;  
-063 "#####"/%3"creed"/\*"TOTOR"/;  
+027 "#####"/%3"creek"/\*"RIVER"/;  
+028 "#####"/%3"frosty"/\*"CHILLY"/;  
-064 "#####"/%3"right"/\*"LOSTE"/;  
+029 "#####"/%3"parent"/\*"FATHER"/;  
+030 "#####"/%3"noise"/\*"QUIET"/;  
-065 "#####"/%3"billow"/\*"DEVITE"/;  
+041 "#####"/%3"peace"/\*"PEACE"/;  
+042 "#####"/%3"sailor"/\*"SAILOR"/;  
-081 "#####"/%3"trim"/\*"LAXY"/;  
+043 "#####"/%3"shoot"/\*"SHOOT"/;  
+044 "#####"/%3"crust"/\*"CRUST"/;  
-082 "#####"/%3"batch"/\*"FOLER"/;  
+045 "#####"/%3"pillow"/\*"PILLOW"/;  
+046 "#####"/%3"enjoy"/\*"ENJOY"/;  
-083 "#####"/%3"revise"/\*"FANDER"/;  
+047 "#####"/%3"army"/\*"ARMY"/;  
+048 "#####"/%3"wetter"/\*"WETTER"/;  
-084 "#####"/%3"buddy"/\*"ZASTA"/;  
+049 "#####"/%3"motor"/\*"MOTOR"/;  
+050 "#####"/%3"health"/\*"HEALTH"/;  
-085 "#####"/%3"mower"/\*"CRUSS"/;  
\$000 LB"THANK YOU. That's the END.

<RJEXP1b>;\$

## Experiment 1 - Version 3

s4 f40 n70 a

```
$000 "Welcome! To move to the next instruction line, press the space bar";
000 "You will be presented with letters in the centre of the screen";
000 "Your task is to decide if the letters in UPPER CASE are a word";
000 "If it is a word press the RIGHT shift key,";
000 "if it is NOT a word press the LEFT shift key.";
000 "Remember to respond as quickly and accurately as possible.";
000 "Place your fingers on the shift keys now, ready to begin. Then press space bar.";
000 "Here are some items for practice. Press the space bar to move forward.";
+250 "####"/%3"yell"/*"FISH"/;
000 "Remember, respond as quickly and accurately as possible. (Press space) ";
+250 "####"/%3"book"/*"PAGE"/;
-250 "####"/%3"exam"/*"KEST"/;
+250 "####"/%3"data"/*"SWIM"/;
+250 "####"/%3"soar"/*"PLUG"/;
-250 "####"/%3"bold"/*"FLIT"/;
+250 "#####"/%3"super"/*"MOUSE"/;
-250 "#####"/%3"fault"/*"OFFED"/;
-250 "####"/%3"back"/*"KACE"/;
000 "That's the end of the practice items. Go on when ready...";
-250 "####"/%3"wren"/*"SINT"/;$
+021 "####"/%3"trial"/*"FUNNY"/;
+022 "#####"/%3"oxygen"/*"MIDDLE"/;
-061 "#####"/%3"wisdom"/*"FOLLAR"/;
+023 "#####"/%3"simmer"/*"THREAD"/;
+024 "####"/%3"visa"/*"SHOE"/;
-062 "####"/%3"bake"/*"NAST"/;
+025 "####"/%3"buzz"/*"CLUB"/;
+026 "#####"/%3"sight"/*"FLOOD"/;
-063 "#####"/%3"creed"/*"TOTOR"/;
+027 "#####"/%3"whole"/*"RIVER"/;
+028 "#####"/%3"pimple"/*"CHILLY"/;
-064 "#####"/%3"right"/*"LOSTE"/;
+029 "#####"/%3"choice"/*"FATHER"/;
+030 "#####"/%3"stand"/*"QUIET"/;
-065 "#####"/%3"billow"/*"DEVITE"/;
+031 "#####"/%3"bummer"/*"SUMMER"/;
+032 "#####"/%3"hears"/*"HEART"/;
-071 "#####"/%3"rates"/*"TINCH"/;
+033 "#####"/%3"goose"/*"LOOSE"/;
+034 "####"/%3"tomb"/*"BOMB"/;
-072 "####"/%3"open"/*"GEAD"/;
+035 "#####"/%3"carrot"/*"PARROT"/;
+036 "#####"/%3"purgery"/*"SURGERY"/;
-073 "####"/%3"juor"/*"SAIS"/;
+037 "#####"/%3"slower"/*"FLOWER"/;
```

+038 "#####"/%3"spoke"/\*"SMOKE"/;  
-074 "#####"/%3"enter"/\*"PLACS"/;  
+039 "#####"/%3"garth"/\*"EARTH"/;  
+040 "#####"/%3"bread"/\*"BREAK"/;  
-075 "#####"/%3"gravel"/\*"VALLES"/;  
+011 "#####"/%3"town"/\*"CITY"/;  
+012 "#####"/%3"leaf"/\*"TREE"/;  
-051 "#####"/%3"hype"/\*"KETS"/;  
+013 "#####"/%3"mallet"/\*"RUBBER"/;  
+014 "#####"/%3"forest"/\*"JUNGLE"/;  
-052 "#####"/%3"gloss"/\*"PURTE"/;  
+015 "#####"/%3"crown"/\*"QUEEN"/;  
+016 "#####"/%3"knife"/\*"BLADE"/;  
-053 "#####"/%3"baren"/\*"QUIST"/;  
+017 "#####"/%3"street"/\*"AVENUE"/;  
+018 "#####"/%3"sleep"/\*"DREAM"/;  
-054 "#####"/%3"feast"/\*"RAPIT"/;  
+019 "#####"/%3"music"/\*"RADIO"/;  
+020 "#####"/%3"april"/\*"MONTH"/;  
-055 "#####"/%3"mystro"/\*"NATISE"/;  
+041 "#####"/%3"peace"/\*"PEACE"/;  
+042 "#####"/%3"sailor"/\*"SAILOR"/;  
-081 "#####"/%3"trim"/\*"LAXY"/;  
+043 "#####"/%3"shoot"/\*"SHOOT"/;  
+044 "#####"/%3"crust"/\*"CRUST"/;  
-082 "#####"/%3"batch"/\*"FOLER"/;  
+045 "#####"/%3"pillow"/\*"PILLOW"/;  
+046 "#####"/%3"enjoy"/\*"ENJOY"/;  
-083 "#####"/%3"revise"/\*"FANDER"/;  
+047 "#####"/%3"army"/\*"ARMY"/;  
+048 "#####"/%3"wetter"/\*"WETTER"/;  
-084 "#####"/%3"buddy"/\*"ZASTA"/;  
+049 "#####"/%3"motor"/\*"MOTOR"/;  
+040 "#####"/%3"health"/\*"HEALTH"/;  
-085 "#####"/%3"mower"/\*"CRUSS"/;

\$000 LB"That's the end of Part 1";\$

Experiment 2 - Version 1

s5 f40 n135 a

\$000 "This second task is similar to the first. (press space)";  
000 "Task takes about 8 mins. Take a break at any point. (begin) ";\$

```
\
+011 "#####"/%3"contract"/%1"    "/*"PAPER"/;
+012 "#####"/%3"cabbage"/%1"    "/*"LETTUCE"/;
-161 "#####"/%3"barrel"/%1"    "/*"CEILIND"/;
+013 "#####"/%3"costume"/%1"    "/*"DRESS"/;
+014 "#####"/%3"leopard"/%1"    "/*"SPOTS"/;
-162 "#####"/%3"spoon"/%1"    "/*"LIDGE"/;
+015 "#####"/%3"sheep"/%1"    "/*"LAMB"/;
+016 "#####"/%3"dove"/%1"    "/*"BIRD"/;
-163 "#####"/%3"better"/%1"    "/*"SLIND"/;
+017 "#####"/%3"time"/%1"    "/*"CLOCK"/;
+018 "#####"/%3"oatmeal"/%1"    "/*"CEREAL"/;
-164 "#####"/%3"lord"/%1"    "/*"PASK"/;
+019 "#####"/%3"easier"/%1"    "/*"HARDER"/;
+020 "#####"/%3"venom"/%1"    "/*"SNAKE"/;
-165 "#####"/%3"repay"/%1"    "/*"SHEN"/;

+021 "#####"/%3"unit"/%1"    "/*"DOGS"/;
+022 "#####"/%3"unloved"/%1"    "/*"ENGAGED"/;
-166 "#####"/%3"empire"/%1"    "/*"SPALE"/;
+023 "#####"/%3"listen"/%1"    "/*"PRISON"/;
+024 "#####"/%3"forced"/%1"    "/*"MEMORY"/;
-167 "#####"/%3"medical"/%1"    "/*"VORIOUS"/;
+025 "#####"/%3"query"/%1"    "/*"SHINE"/;
+026 "#####"/%3"rhyme"/%1"    "/*"DOORS"/;
-168 "#####"/%3"society"/%1"    "/*"HASCH"/;
+027 "#####"/%3"verse"/%1"    "/*"PLAIN"/;
+028 "#####"/%3"nerve"/%1"    "/*"OLDER"/;
-169 "#####"/%3"care"/%1"    "/*"NAIN"/;
+029 "#####"/%3"warm"/%1"    "/*"HAIR"/;
+030 "#####"/%3"thick"/%1"    "/*"UNDER"/;
-170 "#####"/%3"plant"/%1"    "/*"SATE"/;

+031 "#####"/%3>window"/%1"    "/*"WINDOW"/;
+032 "#####"/%3"mess"/%1"    "/*"MESS"/;
-171 "#####"/%3"sware"/%1"    "/*"JEENS"/;
+033 "#####"/%3"modify"/%1"    "/*"MODIFY"/;
+034 "#####"/%3"fashion"/%1"    "/*"FASHION"/;
-172 "#####"/%3"title"/%1"    "/*"LIOM"/;
+035 "#####"/%3"width"/%1"    "/*"WIDTH"/;
+036 "#####"/%3"skill"/%1"    "/*"SKILL"/;
-173 "#####"/%3"surname"/%1"    "/*"PLATA"/;
+037 "#####"/%3"brain"/%1"    "/*"BRAIN"/;
+038 "#####"/%3"stars"/%1"    "/*"STARS"/;
-174 "#####"/%3"aunt"/%1"    "/*"QACK"/;
+039 "#####"/%3"after"/%1"    "/*"AFTER"/;
+040 "#####"/%3"tuna"/%1"    "/*"TUNA"/;
-175 "#####"/%3"oval"/%1"    "/*"REND"/;

\
+041 "#####"/%3"citizen"/%2"    "/*"PERSON"/;
+042 "#####"/%3"shotgun"/%2"    "/*"RIFLE"/;
```



-176 "#####"/%3"bronze"/%2" /\*"SHREAM"/;  
+043 "#####"/%3"people"/%2" /\*"CROWD"/;  
+044 "#####"/%3"afraid"/%2" /\*"SCARED"/;  
-177 "#####"/%3"shrub"/%2" /\*"TRAS"/;  
+045 "#####"/%3"nursery"/%2" /\*"BABY"/;  
+046 "#####"/%3"command"/%2" /\*"ORDER"/;  
-178 "#####"/%3"volly"/%2" /\*"LUDGE"/;  
+047 "#####"/%3"theif"/%2" /\*"STEAL"/;  
+048 "#####"/%3"injury"/%2" /\*"HURT"/;  
-179 "#####"/%3"story"/%2" /\*"MELL"/;  
+049 "#####"/%3"bread"/%2" /\*"BUTTER"/;  
+050 "#####"/%3"hard"/%2" /\*"SOFT"/;  
-180 "#####"/%3"advice"/%2" /\*"OBER"/;

+051 "#####"/%3"pistol"/%2" /\*"MAMMAL"/;  
+052 "#####"/%3"plastic"/%2" /\*"WIDER"/;  
-181 "#####"/%3"salute"/%2" /\*"REET"/;  
+053 "#####"/%3"wooden"/%2" /\*"DIRTY"/;  
+054 "#####"/%3"liquor"/%2" /\*"HAMMER"/;  
-182 "#####"/%3"gorilla"/%2" /\*"SPEDIFY"/;  
+055 "#####"/%3"pitch"/%2" /\*"CLOSER"/;  
+056 "#####"/%3"captain"/%2" /\*"STYLE"/;  
-183 "#####"/%3"depth"/%2" /\*"PRAPER"/;  
+057 "#####"/%3"cook"/%2" /\*"LOUD"/;  
+058 "#####"/%3"passage"/%2" /\*"IRON"/;  
-184 "#####"/%3"trail"/%2" /\*"WHET"/;  
+059 "#####"/%3"advise"/%2" /\*"ANIMAL"/;  
+060 "#####"/%3"fever"/%2" /\*"CLOSE"/;  
-185 "#####"/%3"machine"/%2" /\*"HIGHTAY"/;

+061 "#####"/%3"infant"/%2" /\*"INFANT"/;  
+062 "#####"/%3"victim"/%2" /\*"VICTIM"/;  
-186 "#####"/%3"betray"/%2" /\*"MUNOR"/;  
+063 "#####"/%3"humor"/%2" /\*"HUMOR"/;  
+064 "#####"/%3"shake"/%2" /\*"SHAKE"/;  
-187 "#####"/%3"task"/%2" /\*"SRAY"/;  
+065 "#####"/%3"pony"/%2" /\*"PONY"/;  
+066 "#####"/%3"wrong"/%2" /\*"WRONG"/;  
-188 "#####"/%3"wallet"/%2" /\*"SEUCE"/;  
+067 "#####"/%3"saving"/%2" /\*"SAVING"/;  
+068 "#####"/%3"green"/%2" /\*"GREEN"/;  
-189 "#####"/%3"enough"/%2" /\*"SHAB"/;  
+069 "#####"/%3"horse"/%2" /\*"HORSE"/;  
+070 "#####"/%3"long"/%2" /\*"LONG"/;  
-190 "#####"/%3"simple"/%2" /\*"TRISOD"/;

\  
+071 "#####"/%3"vigour"/%4" /\*"ENERGY"/;  
+072 "#####"/%3"tomb"/%4" /\*"DEATH"/;  
-191 "#####"/%3"gate"/%4" /\*"DACH"/;  
+073 "#####"/%3"volcano"/%4" /\*"LAVA"/;  
+074 "#####"/%3"cottage"/%4" /\*"HOUSE"/;  
-192 "#####"/%3"vote"/%4" /\*"FAUGT"/;  
+075 "#####"/%3"excuse"/%4" /\*"REASON"/;  
+076 "#####"/%3"violin"/%4" /\*"STRING"/;  
-193 "#####"/%3"jewel"/%4" /\*"BLAD"/;  
+077 "#####"/%3"speak"/%4" /\*"TALK"/;  
+078 "#####"/%3"doctor"/%4" /\*"NURSE"/;

-194 "#####"/%3"hunger"/%4" /\*"TRAY"/;  
 +079 "#####"/%3"preview"/%4" /\*"MOVIE"/;  
 +080 "#####"/%3"reflex"/%4" /\*"ACTION"/;  
 -195 "#####"/%3"ugly"/%4" /\*"WITE"/;  
  
 +081 "#####"/%3"plenty"/%4" /\*"TYRES"/;  
 +082 "#####"/%3"jeans"/%4" /\*"BATH"/;  
 -196 "#####"/%3"muscle"/%4" /\*"ROGGED"/;  
 +083 "#####"/%3"wonder"/%4" /\*"NEEDLE"/;  
 +084 "#####"/%3"destroy"/%4" /\*"APPLE"/;  
 -197 "#####"/%3"guitar"/%4" /\*"SCHEEN"/;  
 +085 "#####"/%3"rent"/%4" /\*"SALT"/;  
 +086 "#####"/%3"TRUE"/%4" /\*"SHARP"/;  
 -198 "#####"/%3"island"/%4" /\*"PINGE"/;  
 +087 "#####"/%3"dating"/%4" /\*"SILVER"/;  
 +088 "#####"/%3"starter"/%4" /\*"YELLOW"/;  
 -199 "#####"/%3"cross"/%4" /\*"MULT"/;  
 +089 "#####"/%3"nature"/%4" /\*"LENGHT"/;  
 +090 "#####"/%3"weather"/%4" /\*"SHORT"/;  
 -200 "#####"/%3"brown"/%4" /\*"PROT"/;  
  
 +091 "#####"/%3"dune"/%4" /\*"DUNE"/;  
 +092 "#####"/%3"wasp"/%4" /\*"WASP"/;  
 -201 "#####"/%3"chain"/%4" /\*"NOOSY"/;  
 +093 "#####"/%3"pupil"/%4" /\*"PUPIL"/;  
 +094 "#####"/%3"sweet"/%4" /\*"SWEET"/;  
 -202 "#####"/%3"troop"/%4" /\*"BRENCH"/;  
 +095 "#####"/%3"office"/%4" /\*"OFFICE"/;  
 +096 "#####"/%3"child"/%4" /\*"CHILD"/;  
 -203 "#####"/%3"cinema"/%4" /\*"RASE"/;  
 +097 "#####"/%3"whistle"/%4" /\*"WHISTLE"/;  
 +098 "#####"/%3"mother"/%4" /\*"MOTHER"/;  
 -204 "#####"/%3"moving"/%4" /\*"BADDLE"/;  
 +099 "#####"/%3"right"/%4" /\*"RIGHT"/;  
 +100 "#####"/%3"lizard"/%4" /\*"LIZARD"/;  
 -205 "#####"/%3"cowboy"/%4" /\*"EARLT"/;

\$000 LB"THATS THE END OF PART 2. ONE MORE TO GO.";\$

Experiment 2 - Version 2

s5 f40 n135 a

\$000 "This second task is similar to the first. (press space)";

000 "Task takes about 8 mins. Take a break at any point. (begin)";\$

\

+071	"#####"/%3"vigour"/%1"	"/*"ENERGY"/;
+072	"#####"/%3"tomb"/%1"	"/*"DEATH"/;
-191	"#####"/%3"gate"/%1"	"/*"DACH"/;
+073	"#####"/%3"volcano"/%1"	"/*"LAVA"/;
+074	"#####"/%3"cottage"/%1"	"/*"HOUSE"/;
-192	"#####"/%3"vote"/%1"	"/*"FAUGT"/;
+075	"#####"/%3"excuse"/%1"	"/*"REASON"/;
+076	"#####"/%3"violin"/%1"	"/*"STRING"/;
-193	"#####"/%3"jewel"/%1"	"/*"BLAD"/;
+077	"#####"/%3"speak"/%1"	"/*"TALK"/;
+078	"#####"/%3"doctor"/%1"	"/*"NURSE"/;
-194	"#####"/%3"hunger"/%1"	"/*"TRAY"/;
+079	"#####"/%3"preview"/%1"	"/*"MOVIE"/;
+080	"#####"/%3"reflex"/%1"	"/*"ACTION"/;
-195	"#####"/%3"ugly"/%1"	"/*"WITE"/;
+081	"#####"/%3"plenty"/%1"	"/*"TYRES"/;
+082	"#####"/%3"jeans"/%1"	"/*"BATH"/;
-196	"#####"/%3"muscle"/%1"	"/*"ROGGED"/;
+083	"#####"/%3"wonder"/%1"	"/*"NEEDLE"/;
+084	"#####"/%3"destroy"/%1"	"/*"APPLE"/;
-197	"#####"/%3"guitar"/%1"	"/*"SCHEEN"/;
+085	"#####"/%3"rent"/%1"	"/*"SALT"/;
+086	"#####"/%3"TRUE"/%1"	"/*"SHARP"/;
-198	"#####"/%3"island"/%1"	"/*"PINGE"/;
+087	"#####"/%3"dating"/%1"	"/*"SILVER"/;
+088	"#####"/%3"starter"/%1"	"/*"YELLOW"/;
-199	"#####"/%3"cross"/%1"	"/*"MULT"/;
+089	"#####"/%3"nature"/%1"	"/*"LENGTH"/;
+090	"#####"/%3"weather"/%1"	"/*"SHORT"/;
-200	"#####"/%3"brown"/%1"	"/*"PROT"/;
+091	"#####"/%3"dune"/%1"	"/*"DUNE"/;
+092	"#####"/%3"wasp"/%1"	"/*"WASP"/;
-201	"#####"/%3"chain"/%1"	"/*"NOOSY"/;
+093	"#####"/%3"pupil"/%1"	"/*"PUPIL"/;
+094	"#####"/%3"sweet"/%1"	"/*"SWEET"/;
-202	"#####"/%3"troop"/%1"	"/*"BRENCH"/;
+095	"#####"/%3"office"/%1"	"/*"OFFICE"/;
+096	"#####"/%3"child"/%1"	"/*"CHILD"/;
-203	"#####"/%3"cinema"/%1"	"/*"RASE"/;
+097	"#####"/%3"whistle"/%1"	"/*"WHISTLE"/;
+098	"#####"/%3"mother"/%1"	"/*"MOTHER"/;
-204	"#####"/%3"moving"/%1"	"/*"BADDLE"/;
+099	"#####"/%3"right"/%1"	"/*"RIGHT"/;
+100	"#####"/%3"lizard"/%1"	"/*"LIZARD"/;
-205	"#####"/%3"cowboy"/%1"	"/*"EARLT"/;
\		
+011	"#####"/%3"contract"/%2"	"/*"PAPER"/;
+012	"#####"/%3"cabbage"/%2"	"/*"LETTUCE"/;

-161 "#####"/%3"barrel"/%2" "/\*"CEILIND"/;  
+013 "#####"/%3"costume"/%2" "/\*"DRESS"/;  
+014 "#####"/%3"leopard"/%2" "/\*"SPOTS"/;  
-162 "#####"/%3"spoon"/%2" "/\*"LIDGE"/;  
+015 "#####"/%3"sheep"/%2" "/\*"LAMB"/;  
+016 "#####"/%3"dove"/%2" "/\*"BIRD"/;  
-163 "#####"/%3"better"/%2" "/\*"SLIND"/;  
+017 "#####"/%3"time"/%2" "/\*"CLOCK"/;  
+018 "#####"/%3"oatmeal"/%2" "/\*"CEREAL"/;  
-164 "#####"/%3"lord"/%2" "/\*"PASK"/;  
+019 "#####"/%3"easier"/%2" "/\*"HARDER"/;  
+020 "#####"/%3"venom"/%2" "/\*"SNAKE"/;  
-165 "#####"/%3"repay"/%2" "/\*"SHEN"/;

+021 "#####"/%3"unit"/%2" "/\*"DOGS"/;  
+022 "#####"/%3"unloved"/%2" "/\*"ENGAGED"/;  
-166 "#####"/%3"empire"/%2" "/\*"SPALE"/;  
+023 "#####"/%3"listen"/%2" "/\*"PRISON"/;  
+024 "#####"/%3"forced"/%2" "/\*"MEMORY"/;  
-167 "#####"/%3"medical"/%2" "/\*"VORIOUS"/;  
+025 "#####"/%3"query"/%2" "/\*"SHINE"/;  
+026 "#####"/%3"rhyme"/%2" "/\*"DOORS"/;  
-168 "#####"/%3"society"/%2" "/\*"HASCH"/;  
+027 "#####"/%3"verse"/%2" "/\*"PLAIN"/;  
+028 "#####"/%3"nerve"/%2" "/\*"OLDER"/;  
-169 "#####"/%3"care"/%2" "/\*"NAIN"/;  
+029 "#####"/%3"warm"/%2" "/\*"HAIR"/;  
+030 "#####"/%3"thick"/%2" "/\*"UNDER"/;  
-170 "#####"/%3"plant"/%2" "/\*"SATE"/;

+031 "#####"/%3>window"/%2" "/\*"WINDOW"/;  
+032 "#####"/%3"mess"/%2" "/\*"MESS"/;  
-171 "#####"/%3"sware"/%2" "/\*"JEENS"/;  
+033 "#####"/%3"modify"/%2" "/\*"MODIFY"/;  
+034 "#####"/%3"fashion"/%2" "/\*"FASHION"/;  
-172 "#####"/%3"title"/%2" "/\*"LIOM"/;  
+035 "#####"/%3"width"/%2" "/\*"WIDTH"/;  
+036 "#####"/%3"skill"/%2" "/\*"SKILL"/;  
-173 "#####"/%3"surname"/%2" "/\*"PLATA"/;  
+037 "#####"/%3"brain"/%2" "/\*"BRAIN"/;  
+038 "#####"/%3"stars"/%2" "/\*"STARS"/;  
-174 "#####"/%3"aunt"/%2" "/\*"QACK"/;  
+039 "#####"/%3"after"/%2" "/\*"AFTER"/;  
+040 "#####"/%3"tuna"/%2" "/\*"TUNA"/;  
-175 "#####"/%3"oval"/%2" "/\*"REND"/;

\  
+041 "#####"/%3"citizen"/%4" "/\*"PERSON"/;  
+042 "#####"/%3"shotgun"/%4" "/\*"RIFLE"/;  
-176 "#####"/%3"bronze"/%4" "/\*"SHREAM"/;  
+043 "#####"/%3"people"/%4" "/\*"CROWD"/;  
+044 "#####"/%3"afraid"/%4" "/\*"SCARED"/;  
-177 "#####"/%3"shrub"/%4" "/\*"TRAS"/;  
+045 "#####"/%3"nursery"/%4" "/\*"BABY"/;  
+046 "#####"/%3"command"/%4" "/\*"ORDER"/;  
-178 "#####"/%3"volly"/%4" "/\*"LUDGE"/;  
+047 "#####"/%3"theif"/%4" "/\*"STEAL"/;  
+048 "#####"/%3"injury"/%4" "/\*"HURT"/;

-179 "#####"/%3"story"/%4" /\*"MELL"/;  
 +049 "#####"/%3"bread"/%4" /\*"BUTTER"/;  
 +050 "#####"/%3"hard"/%4" /\*"SOFT"/;  
 -180 "#####"/%3"advice"/%4" /\*"OBER"/;  
  
 +051 "#####"/%3"pistol"/%4" /\*"MAMMAL"/;  
 +052 "#####"/%3"plastic"/%4" /\*"WIDER"/;  
 -181 "#####"/%3"salute"/%4" /\*"REET"/;  
 +053 "#####"/%3"wooden"/%4" /\*"DIRTY"/;  
 +054 "#####"/%3"liquor"/%4" /\*"HAMMER"/;  
 -182 "#####"/%3"gorilla"/%4" /\*"SPEDIFY"/;  
 +055 "#####"/%3"pitch"/%4" /\*"CLOSER"/;  
 +056 "#####"/%3"captain"/%4" /\*"STYLE"/;  
 -183 "#####"/%3"depth"/%4" /\*"PRAPER"/;  
 +057 "#####"/%3"cook"/%4" /\*"LOUD"/;  
 +058 "#####"/%3"passage"/%4" /\*"IRON"/;  
 -184 "#####"/%3"trail"/%4" /\*"WHIT"/;  
 +059 "#####"/%3"advise"/%4" /\*"ANIMAL"/;  
 +060 "#####"/%3"fever"/%4" /\*"CLOSE"/;  
 -185 "#####"/%3"machine"/%4" /\*"HIGHTAY"/;  
  
 +061 "#####"/%3"infant"/%4" /\*"INFANT"/;  
 +062 "#####"/%3"victim"/%4" /\*"VICTIM"/;  
 -186 "#####"/%3"betray"/%4" /\*"MUNOR"/;  
 +063 "#####"/%3"humor"/%4" /\*"HUMOR"/;  
 +064 "#####"/%3"shake"/%4" /\*"SHAKE"/;  
 -187 "#####"/%3"task"/%4" /\*"SRAY"/;  
 +065 "#####"/%3"pony"/%4" /\*"PONY"/;  
 +066 "#####"/%3"wrong"/%4" /\*"WRONG"/;  
 -188 "#####"/%3"wallet"/%4" /\*"SEUCE"/;  
 +067 "#####"/%3"saving"/%4" /\*"SAVING"/;  
 +068 "#####"/%3"green"/%4" /\*"GREEN"/;  
 -189 "#####"/%3"enough"/%4" /\*"SHAB"/;  
 +069 "#####"/%3"horse"/%4" /\*"HORSE"/;  
 +070 "#####"/%3"long"/%4" /\*"LONG"/;  
 -190 "#####"/%3"simple"/%4" /\*"TRISOD"/;

\$000 LB"THATS THE END OF PART 2. ONE MORE TO GO.";\$

Experiment 2 - Version 3

s5 f40 n135 a

S000 "This second task is similar to the first. (press space)";

000 "Task takes about 8 mins. Take a break at any point. (begin) " ;\$

+041 "#####"/%3"citizen"/%1" /\*"PERSON"/;  
+042 "#####"/%3"shotgun"/%1" /\*"RIFLE"/;  
-176 "#####"/%3"bronze"/%1" /\*"SHREAM"/;  
+043 "#####"/%3"people"/%1" /\*"CROWD"/;  
+044 "#####"/%3"afraid"/%1" /\*"SCARED"/;  
-177 "#####"/%3"shrub"/%1" /\*"TRAS"/;  
+045 "#####"/%3"nursery"/%1" /\*"BABY"/;  
+046 "#####"/%3"command"/%1" /\*"ORDER"/;  
-178 "#####"/%3"volly"/%1" /\*"LUDGE"/;  
+047 "#####"/%3"theif"/%1" /\*"STEAL"/;  
+048 "#####"/%3"injury"/%1" /\*"HURT"/;  
-179 "#####"/%3"story"/%1" /\*"MELL"/;  
+049 "#####"/%3"bread"/%1" /\*"BUTTER"/;  
+050 "#####"/%3"hard"/%1" /\*"SOFT"/;  
-180 "#####"/%3"advice"/%1" /\*"OBER"/;  
  
+051 "#####"/%3"pistol"/%1" /\*"MAMMAL"/;  
+052 "#####"/%3"plastic"/%1" /\*"WIDER"/;  
-181 "#####"/%3"salute"/%1" /\*"REET"/;  
+053 "#####"/%3"wooden"/%1" /\*"DIRTY"/;  
+054 "#####"/%3"liquor"/%1" /\*"HAMMER"/;  
-182 "#####"/%3"gorilla"/%1" /\*"SPEDIFY"/;  
+055 "#####"/%3"pitch"/%1" /\*"CLOSER"/;  
+056 "#####"/%3"captain"/%1" /\*"STYLE"/;  
-183 "#####"/%3"depth"/%1" /\*"PRAPER"/;  
+057 "#####"/%3"cook"/%1" /\*"LOUD"/;  
+058 "#####"/%3"passage"/%1" /\*"IRON"/;  
-184 "#####"/%3"trail"/%1" /\*"WHIT"/;  
+059 "#####"/%3"advise"/%1" /\*"ANIMAL"/;  
+060 "#####"/%3"fever"/%1" /\*"CLOSE"/;  
-185 "#####"/%3"machine"/%1" /\*"HIGHTAY"/;  
  
+061 "#####"/%3"infant"/%1" /\*"INFANT"/;  
+062 "#####"/%3"victim"/%1" /\*"VICTIM"/;  
-186 "#####"/%3"betray"/%1" /\*"MUNOR"/;  
+063 "#####"/%3"humor"/%1" /\*"HUMOR"/;  
+064 "#####"/%3"shake"/%1" /\*"SHAKE"/;  
-187 "#####"/%3"task"/%1" /\*"SRAY"/;  
+065 "#####"/%3"pony"/%1" /\*"PONY"/;  
+066 "#####"/%3"wrong"/%1" /\*"WRONG"/;  
-188 "#####"/%3"wallet"/%1" /\*"SEUCE"/;  
+067 "#####"/%3"saving"/%1" /\*"SAVING"/;  
+068 "#####"/%3"green"/%1" /\*"GREEN"/;  
-189 "#####"/%3"enough"/%1" /\*"SHAB"/;  
+069 "#####"/%3"horse"/%1" /\*"HORSE"/;  
+070 "#####"/%3"long"/%1" /\*"LONG"/;  
-190 "#####"/%3"simple"/%1" /\*"TRISOD"/;  
  
+071 "#####"/%3"vigour"/%2" /\*"ENERGY"/;  
+072 "#####"/%3"tomb"/%2" /\*"DEATH"/;

-191 "#####"/%3"gate"/%2" "/\*"DACH"/;  
+073 "#####"/%3"volcano"/%2" "/\*"LAVA"/;  
+074 "#####"/%3"cottage"/%2" "/\*"HOUSE"/;  
-192 "#####"/%3"vote"/%2" "/\*"FAUGT"/;  
+075 "#####"/%3"excuse"/%2" "/\*"REASON"/;  
+076 "#####"/%3"violin"/%2" "/\*"STRING"/;  
-193 "#####"/%3"jewel"/%2" "/\*"BLAD"/;  
+077 "#####"/%3"speak"/%2" "/\*"TALK"/;  
+078 "#####"/%3"doctor"/%2" "/\*"NURSE"/;  
-194 "#####"/%3"hunger"/%2" "/\*"TRAY"/;  
+079 "#####"/%3"preview"/%2" "/\*"MOVIE"/;  
+080 "#####"/%3"reflex"/%2" "/\*"ACTION"/;  
-195 "#####"/%3"ugly"/%2" "/\*"WITE"/;

+081 "#####"/%3"plenty"/%2" "/\*"TYRES"/;  
+082 "#####"/%3"jeans"/%2" "/\*"BATH"/;  
-196 "#####"/%3"muscle"/%2" "/\*"ROGGED"/;  
+083 "#####"/%3"wonder"/%2" "/\*"NEEDLE"/;  
+084 "#####"/%3"destroy"/%2" "/\*"APPLE"/;  
-197 "#####"/%3"guitar"/%2" "/\*"SCHEEN"/;  
+085 "#####"/%3"rent"/%2" "/\*"SALT"/;  
+086 "#####"/%3"TRUE"/%2" "/\*"SHARP"/;  
-198 "#####"/%3"island"/%2" "/\*"PINGE"/;  
+087 "#####"/%3"dating"/%2" "/\*"SILVER"/;  
+088 "#####"/%3"starter"/%2" "/\*"YELLOW"/;  
-199 "#####"/%3"cross"/%2" "/\*"MULT"/;  
+089 "#####"/%3"nature"/%2" "/\*"LENGTH"/;  
+090 "#####"/%3"weather"/%2" "/\*"SHORT"/;  
-200 "#####"/%3"brown"/%2" "/\*"PROT"/;

+091 "#####"/%3"dune"/%2" "/\*"DUNE"/;  
+092 "#####"/%3"wasp"/%2" "/\*"WASP"/;  
-201 "#####"/%3"chain"/%2" "/\*"NOOSY"/;  
+093 "#####"/%3"pupil"/%2" "/\*"PUPIL"/;  
+094 "#####"/%3"sweet"/%2" "/\*"SWEET"/;  
-202 "#####"/%3"troop"/%2" "/\*"BRENCH"/;  
+095 "#####"/%3"office"/%2" "/\*"OFFICE"/;  
+096 "#####"/%3"child"/%2" "/\*"CHILD"/;  
-203 "#####"/%3"cinema"/%2" "/\*"RASE"/;  
+097 "#####"/%3"whistle"/%2" "/\*"WHISTLE"/;  
+098 "#####"/%3"mother"/%2" "/\*"MOTHER"/;  
-204 "#####"/%3"moving"/%2" "/\*"BADDLE"/;  
+099 "#####"/%3"right"/%2" "/\*"RIGHT"/;  
+100 "#####"/%3"lizard"/%2" "/\*"LIZARD"/;  
-205 "#####"/%3"cowboy"/%2" "/\*"EARLT"/;

\  
+011 "#####"/%3"contract"/%4" "/\*"PAPER"/;  
+012 "#####"/%3"cabbage"/%4" "/\*"LETTUCE"/;  
-161 "#####"/%3"barrel"/%4" "/\*"CEILIND"/;  
+013 "#####"/%3"costume"/%4" "/\*"DRESS"/;  
+014 "#####"/%3"leopard"/%4" "/\*"SPOTS"/;  
-162 "#####"/%3"spoon"/%4" "/\*"LIDGE"/;  
+015 "#####"/%3"sheep"/%4" "/\*"LAMB"/;  
+016 "#####"/%3"dove"/%4" "/\*"BIRD"/;  
-163 "#####"/%3"better"/%4" "/\*"SLIND"/;  
+017 "#####"/%3"time"/%4" "/\*"CLOCK"/;  
+018 "#####"/%3"oatmeal"/%4" "/\*"CEREAL"/;

-164 "#####"/%3"lord"/%4" /\*"PASK"/;  
 +019 "#####"/%3"easier"/%4" /\*"HARDER"/;  
 +020 "#####"/%3"venom"/%4" /\*"SNAKE"/;  
 -165 "#####"/%3"repay"/%4" /\*"SHEN"/;  
  
 +021 "#####"/%3"unit"/%4" /\*"DOGS"/;  
 +022 "#####"/%3"unloved"/%4" /\*"ENGAGED"/;  
 -166 "#####"/%3"empire"/%4" /\*"SPALE"/;  
 +023 "#####"/%3"listen"/%4" /\*"PRISON"/;  
 +024 "#####"/%3"forced"/%4" /\*"MEMORY"/;  
 -167 "#####"/%3"medical"/%4" /\*"VORIOUS"/;  
 +025 "#####"/%3"query"/%4" /\*"SHINE"/;  
 +026 "#####"/%3"rhyme"/%4" /\*"DOORS"/;  
 -168 "#####"/%3"society"/%4" /\*"HASCH"/;  
 +027 "#####"/%3"verse"/%4" /\*"PLAIN"/;  
 +028 "#####"/%3"nerve"/%4" /\*"OLDER"/;  
 -169 "#####"/%3"care"/%4" /\*"NAIN"/;  
 +029 "#####"/%3"warm"/%4" /\*"HAIR"/;  
 +030 "#####"/%3"thick"/%4" /\*"UNDER"/;  
 -170 "#####"/%3"plant"/%4" /\*"SATE"/;  
  
 +031 "#####"/%3>window"/%4" /\*"WINDOW"/;  
 +032 "#####"/%3"mess"/%4" /\*"MESS"/;  
 -171 "#####"/%3"sware"/%4" /\*"JEENS"/;  
 +033 "#####"/%3"modify"/%4" /\*"MODIFY"/;  
 +034 "#####"/%3"fashion"/%4" /\*"FASHION"/;  
 -172 "#####"/%3"title"/%4" /\*"LIOM"/;  
 +035 "#####"/%3"width"/%4" /\*"WIDTH"/;  
 +036 "#####"/%3"skill"/%4" /\*"SKILL"/;  
 -173 "#####"/%3"surname"/%4" /\*"PLATA"/;  
 +037 "#####"/%3"brain"/%4" /\*"BRAIN"/;  
 +038 "#####"/%3"stars"/%4" /\*"STARS"/;  
 -174 "#####"/%3"aunt"/%4" /\*"QACK"/;  
 +039 "#####"/%3"after"/%4" /\*"AFTER"/;  
 +040 "#####"/%3"tuna"/%4" /\*"TUNA"/;  
 -175 "#####"/%3"oval"/%4" /\*"REND"/;

\$000 LB"THATS THE END OF PART 2. ONE MORE TO GO.";\$



Experiment 3 - Version 1

s5 f40 n120 a

\$000 "Last test. Yippee! Proceed when instructed. (press space)";

000 "Remember, the first ten items are just practice. ";

000 "And in this task, accuracy is more important than speed. ";

000 "Takes about 5 mins. Break if needed. (begin) ";

+000 "#####"/%3\*"ivory"/%1"     "/"THROW"/;  
+000 "#####"/%3\*"jackal"/%1"     "/"FARING"/;  
-000 "#####"/%3\*"resait"/%1"     "/"GIANTS"/;  
+000 "#####"/%3\*"glaze"/%1"     "/"ELUSIVE"/;  
+000 "#####"/%3\*"poke"/%1"     "/"CRIME"/;  
-000 "#####"/%3\*"tustain"/%1"     "/"INCOME"/;  
+000 "#####"/%3\*"culture"/%1"     "/"LACTIC"/;  
+000 "#####"/%3\*"lottery"/%1"     "/"TINY"/;  
-000 "#####"/%3\*"fitcom"/%1"     "/"PUNT"/;  
000 "That's the end of the practice items. Proceed when ready. ";  
+000 "#####"/%3\*"safari"/%1"     "/"SHIP"/;\$

+101 "#####"/%3\*"glory"/%1"     "/"POWER"/;  
+102 "#####"/%3\*"rubble"/%1"     "/"STONES"/;  
-206 "#####"/%3\*"lebacy"/%1"     "/"SILENT"/;  
-207 "#####"/%3\*"optoon"/%1"     "/"METRIC"/;  
+103 "#####"/%3\*"truck"/%1"     "/"DRIVER"/;  
+104 "#####"/%3\*"lion"/%1"     "/"TIGER"/;  
-208 "#####"/%3\*"pumlish"/%1"     "/"FARMER"/;  
-209 "#####"/%3\*"mestion"/%1"     "/"PASTOR"/;  
+105 "#####"/%3\*"victory"/%1"     "/"DEFEAT"/;  
+106 "#####"/%3\*"stomach"/%1"     "/"ACHE"/;  
-210 "#####"/%3\*"senbor"/%1"     "/"GOOD"/;  
-211 "#####"/%3\*"bental"/%1"     "/"ZERO"/;  
+107 "#####"/%3\*"deluge"/%1"     "/"RAIN"/;  
+108 "#####"/%3\*"pretty"/%1"     "/"GIRL"/;  
-212 "#####"/%3\*"erotion"/%1"     "/"LAVISH"/;  
-213 "#####"/%3\*"cencise"/%1"     "/"NINETY"/;  
+109 "#####"/%3\*"trousers"/%1"     "/"PANTS"/;  
+110 "#####"/%3\*"table"/%1"     "/"CHAIR"/;  
-214 "#####"/%3\*"excust"/%1"     "/"COFFEE"/;  
-215 "#####"/%3\*"nocket"/%1"     "/"FINISH"/;

+111 "#####"/%3\*"flavour"/%1"     "/"BEER"/;  
+112 "#####"/%3\*"puzzle"/%1"     "/"BALLET"/;  
-216 "#####"/%3\*"medipal"/%1"     "/"GRAPE"/;  
-217 "#####"/%3\*"jacbet"/%1"     "/"PRINT"/;  
+113 "#####"/%3\*"stuck"/%1"     "/"FAULT"/;  
+114 "#####"/%3\*"wire"/%1"     "/"FLOUR"/;  
-218 "#####"/%3\*"anotter"/%1"     "/"OXYGEN"/;  
-219 "#####"/%3\*"ligerty"/%1"     "/"SAMPLE"/;  
+115 "#####"/%3\*"straw"/%1"     "/"CHEESE"/;  
+116 "#####"/%3\*"country"/%1"     "/"BOTTLE"/;  
-220 "#####"/%3\*"orbot"/%1"     "/"TASTE"/;  
-221 "#####"/%3\*"knook"/%1"     "/"INCUR"/;  
+117 "#####"/%3\*"sandal"/%1"     "/"BLOW"/;  
+118 "#####"/%3\*"organ"/%1"     "/"FRUIT"/;  
-222 "#####"/%3\*"shale"/%1"     "/"ABSENT"/;

-223 "#####"/%3\*"jafer"/%1" "/OBJECT"/;  
+119 "#####"/%3\*"lucky"/%1" "/PLANE"/;  
+120 "#####"/%3\*"sorrow"/%1" "/OPEN"/;  
-224 "#####"/%3\*"supor"/%1" "/NOVEL"/;  
-225 "#####"/%3\*"danch"/%1" "/PHOTO"/;

\  
+121 "#####"/%3\*"welfare"/%2" "/SOCIAL"/;  
+122 "#####"/%3\*"square"/%2" "/CIRCLE"/;  
-226 "#####"/%3\*"fransit"/%2" "/SPACE"/;  
-227 "#####"/%3\*"noorish"/%2" "/CLOUD"/;  
+123 "#####"/%3\*"mountain"/%2" "/HIGH"/;  
+124 "#####"/%3\*"ghost"/%2" "/WHITE"/;  
-228 "#####"/%3\*"haphen"/%2" "/BERRY"/;  
-229 "#####"/%3\*"reloil"/%2" "/ANGLE"/;  
+125 "#####"/%3\*"lift"/%2" "/CARRY"/;  
+126 "#####"/%3\*"justice"/%2" "/PEACE"/;  
-230 "#####"/%3\*"hostory"/%2" "/ILLNESS"/;  
-231 "#####"/%3\*"awaised"/%2" "/SARDINE"/;  
+127 "#####"/%3\*"vanity"/%2" "/MIRROR"/;  
+128 "#####"/%3\*"jury"/%2" "/JUDGE"/;  
-232 "#####"/%3\*"inlert"/%2" "/BUMPY"/;  
-233 "#####"/%3\*"rittal"/%2" "/FLESH"/;  
+129 "#####"/%3\*"drama"/%2" "/PLAY"/;  
+130 "#####"/%3\*"always"/%2" "/NEVER"/;  
-234 "#####"/%3\*"jogeer"/%2" "/CATTLE"/;  
-235 "#####"/%3\*"mector"/%2" "/TENNIS"/;

+131 "#####"/%3\*"comfort"/%2" "/NEARER"/;  
+132 "#####"/%3\*"family"/%2" "/PILOT"/;  
-236 "#####"/%3\*"miggie"/%2" "/PETROL"/;  
-237 "#####"/%3\*"wanter"/%2" "/MOBILE"/;  
+133 "#####"/%3\*"favour"/%2" "/THEORY"/;  
+134 "#####"/%3\*"fire"/%2" "/DRINK"/;  
-238 "#####"/%3\*"driser"/%2" "/METRE"/;  
-239 "#####"/%3\*"mirits"/%2" "/SOUTH"/;  
+135 "#####"/%3\*"result"/%2" "/LOUNGE"/;  
+136 "#####"/%3\*"sing"/%2" "/GRASS"/;  
-240 "#####"/%3\*"tuse"/%2" "/WHOLE"/;  
-241 "#####"/%3\*"luch"/%2" "/UNION"/;  
+137 "#####"/%3\*"decision"/%2" "/FISH"/;  
+138 "#####"/%3\*"variety"/%2" "/MONEY"/;  
-242 "#####"/%3\*"coost"/%2" "/BASIN"/;  
-243 "#####"/%3\*"ambir"/%2" "/YIELD"/;  
+139 "#####"/%3\*"ruler"/%2" "/HERE"/;  
+140 "#####"/%3\*"climb"/%2" "/CLOAK"/;  
-244 "#####"/%3\*"stadle"/%2" "/FANG"/;  
-245 "#####"/%3\*"prinde"/%2" "/MEGA"/;

\  
+141 "#####"/%3\*"street"/%4" "/ROAD"/;  
+142 "#####"/%3\*"opinion"/%4" "/IDEA"/;  
-246 "#####"/%3\*"uselest"/%4" "/MURDER"/;  
-247 "#####"/%3\*"edelid"/%4" "/NEITHER"/;  
+143 "#####"/%3\*"metal"/%4" "/STEEL"/;  
+144 "#####"/%3\*"prayer"/%4" "/CHURCH"/;  
-248 "#####"/%3\*"waight"/%4" "/ROBUST"/;  
-249 "#####"/%3\*"repish"/%4" "/LEAGUE"/;

+145 "#####"/%3\*"smooth"/%4"    "/"ROUGH"/;  
 +146 "#####"/%3\*"oven"/%4"    "/"STOVE"/;  
 -250 "#####"/%3\*"neek"/%4"    "/"RACE"/;  
 -251 "#####"/%3\*"jelt"/%4"    "/"RIOT"/;  
 +147 "#####"/%3\*"very"/%4"    "/"MUCH"/;  
 +148 "#####"/%3\*"goat"/%4"    "/"MILK"/;  
 -252 "#####"/%3\*"sraph"/%4"    "/"BULK"/;  
 -253 "#####"/%3\*"squld"/%4"    "/"NAVY"/;  
 +149 "#####"/%3\*"bloom"/%4"    "/"FLOWER"/;  
 +150 "#####"/%3\*"answer"/%4"    "/"QUESTION"/;  
 -254 "#####"/%3\*"pidlow"/%4"    "/"FUMES"/;  
 -255 "#####"/%3\*"shience"/%4"    "/"MICRO"/;  
  
 +151 "#####"/%3\*"tasty"/%4"    "/"CLERK"/;  
 +152 "#####"/%3\*"land"/%4"    "/"BRASS"/;  
 -256 "#####"/%3\*"bandbar"/%4"    "/"SIGHT"/;  
 -257 "#####"/%3\*"edening"/%4"    "/"LOCAL"/;  
 +153 "#####"/%3\*"player"/%4"    "/"SEASON"/;  
 +154 "#####"/%3\*"master"/%4"    "/"BREATH"/;  
 -258 "#####"/%3\*"fichion"/%4"    "/"TEACHER"/;  
 -259 "#####"/%3\*"lastung"/%4"    "/"PREDICT"/;  
 +155 "#####"/%3\*"affair"/%4"    "/"CLEAN"/;  
 +156 "#####"/%3\*"mean"/%4"    "/"SUGAR"/;  
 -260 "#####"/%3\*"innor"/%4"    "/"BOAT"/;  
 -261 "#####"/%3\*"droll"/%4"    "/"HAWK"/;  
 +157 "#####"/%3\*"mercury"/%4"    "/"CLOTHES"/;  
 +158 "#####"/%3\*"island"/%4"    "/"MOON"/;  
 -262 "#####"/%3\*"portoon"/%4"    "/"MORNING"/;  
 -263 "#####"/%3\*"nolder"/%4"    "/"PERFUME"/;  
 +159 "#####"/%3\*"cabinet"/%4"    "/"ROOM"/;  
 +160 "#####"/%3\*"bend"/%4"    "/"SLIP"/;  
 -264 "#####"/%3\*"fol"/%4"    "/"GROUP"/;  
 -265 "#####"/%3\*"maply"/%4"    "/"WORSE"/;

\$000 LB"THANKS FOR PLAYING! THAT'S THE END.";\$

Experiment 3 - Version 2

s5 f40 n130 a

\$000 "Last test. Yippee! Proceed when instructed. (press space)";

000 "Remember, the first ten items are just practice. ";

000 "And in this task, accuracy is more important than speed.";

000 "Takes about 5 mins. Break if needed. (begin) ";

+000 "#####"/%3\*"ivory"/%1"     "/"THROW"/;  
 +000 "#####"/%3\*"jackal"/%1"    "/"FARING"/;  
 -000 "#####"/%3\*"resait"/%1"    "/"GIANTS"/;  
 +000 "#####"/%3\*"glaze"/%1"     "/"ELUSIVE"/;  
 +000 "#####"/%3\*"poke"/%1"     "/"CRIME"/;  
 -000 "#####"/%3\*"tustain"/%1"   "/"INCOME"/;  
 +000 "#####"/%3\*"culture"/%1"   "/"LACTIC"/;  
 +000 "#####"/%3\*"lottery"/%1"   "/"TINY"/;  
 -000 "#####"/%3\*"fitcom"/%1"    "/"PUNT"/;  
 000 "That's the end of the practice items. Proceed when ready. ";  
 +000 "#####"/%3\*"safari"/%1"     "/"SHIP"/;\$

\  
 +141 "#####"/%3\*"street"/%1"    "/"ROAD"/;  
 +142 "#####"/%3\*"opinion"/%1"   "/"IDEA"/;  
 -246 "#####"/%3\*"uselest"/%1"   "/"MURDER"/;  
 -247 "#####"/%3\*"edelid"/%1"    "/"NEITHER"/;  
 +143 "#####"/%3\*"metal"/%1"     "/"STEEL"/;  
 +144 "#####"/%3\*"prayer"/%1"    "/"CHURCH"/;  
 -248 "#####"/%3\*"waight"/%1"    "/"ROBUST"/;  
 -249 "#####"/%3\*"repish"/%1"    "/"LEAGUE"/;  
 +145 "#####"/%3\*"smooth"/%1"    "/"ROUGH"/;  
 +146 "#####"/%3\*"oven"/%1"     "/"STOVE"/;  
 -250 "#####"/%3\*"neck"/%1"     "/"RACE"/;  
 -251 "#####"/%3\*"jelt"/%1"     "/"RIOT"/;  
 +147 "#####"/%3\*"very"/%1"     "/"MUCH"/;  
 +148 "#####"/%3\*"goat"/%1"     "/"MILK"/;  
 -252 "#####"/%3\*"sraph"/%1"     "/"BULK"/;  
 -253 "#####"/%3\*"squld"/%1"     "/"NAVY"/;  
 +149 "#####"/%3\*"bloom"/%1"     "/"FLOWER"/;  
 +150 "#####"/%3\*"answer"/%1"    "/"QUESTION"/;  
 -254 "#####"/%3\*"pidlow"/%1"    "/"FUMES"/;  
 -255 "#####"/%3\*"shience"/%1"   "/"MICRO"/;

+151 "#####"/%3\*"tasty"/%1"     "/"CLERK"/;  
 +152 "#####"/%3\*"land"/%1"     "/"BRASS"/;  
 -256 "#####"/%3\*"bandbar"/%1"   "/"SIGHT"/;  
 -257 "#####"/%3\*"edening"/%1"    "/"LOCAL"/;  
 +153 "#####"/%3\*"player"/%1"    "/"SEASON"/;  
 +154 "#####"/%3\*"master"/%1"    "/"BREATH"/;  
 -258 "#####"/%3\*"fichion"/%1"   "/"TEACHER"/;  
 -259 "#####"/%3\*"lastung"/%1"   "/"PREDICT"/;  
 +155 "#####"/%3\*"affair"/%1"    "/"CLEAN"/;  
 +156 "#####"/%3\*"mean"/%1"     "/"SUGAR"/;  
 -260 "#####"/%3\*"innor"/%1"     "/"BOAT"/;  
 -261 "#####"/%3\*"droll"/%1"     "/"HAWK"/;  
 +157 "#####"/%3\*"mercury"/%1"   "/"CLOTHES"/;  
 +158 "#####"/%3\*"island"/%1"    "/"MOON"/;  
 -262 "#####"/%3\*"portoon"/%1"   "/"MORNING"/;  
 -263 "#####"/%3\*"nolder"/%1"    "/"PERFUME"/;

+159 "#####"/%3\*"cabinet"/%1" " /"ROOM"/;  
+160 "#####"/%3\*"bend"/%1" " /"SLIP"/;  
-264 "#####"/%3\*"foll"/%1" " /"GROUP"/;  
-265 "#####"/%3\*"maply"/%1" " /"WORSE"/;

+101 "#####"/%3\*"glory"/%2" " /"POWER"/;  
+102 "#####"/%3\*"rubble"/%2" " /"STONES"/;  
-206 "#####"/%3\*"lebacy"/%2" " /"SILENT"/;  
-207 "#####"/%3\*"optoon"/%2" " /"METRIC"/;  
+103 "#####"/%3\*"truck"/%2" " /"DRIVER"/;  
+104 "#####"/%3\*"lion"/%2" " /"TIGER"/;  
-208 "#####"/%3\*"pumlish"/%2" " /"FARMER"/;  
-209 "#####"/%3\*"mestion"/%2" " /"PASTOR"/;  
+105 "#####"/%3\*"victory"/%2" " /"DEFEAT"/;  
+106 "#####"/%3\*"stomach"/%2" " /"ACHE"/;  
-210 "#####"/%3\*"senbor"/%2" " /"GOOD"/;  
-211 "#####"/%3\*"bental"/%2" " /"ZERO"/;  
+107 "#####"/%3\*"deluge"/%2" " /"RAIN"/;  
+108 "#####"/%3\*"pretty"/%2" " /"GIRL"/;  
-212 "#####"/%3\*"erotion"/%2" " /"LAVISH"/;  
-213 "#####"/%3\*"cencise"/%2" " /"NINETY"/;  
+109 "#####"/%3\*"trousers"/%2" " /"PANTS"/;  
+110 "#####"/%3\*"table"/%2" " /"CHAIR"/;  
-214 "#####"/%3\*"excust"/%2" " /"COFFEE"/;  
-215 "#####"/%3\*"nocket"/%2" " /"FINISH"/;

+111 "#####"/%3\*"flavour"/%2" " /"BEER"/;  
+112 "#####"/%3\*"puzzle"/%2" " /"BALLET"/;  
-216 "#####"/%3\*"medipal"/%2" " /"GRAPE"/;  
-217 "#####"/%3\*"jacet"/%2" " /"PRINT"/;  
+113 "#####"/%3\*"stuck"/%2" " /"FAULT"/;  
+114 "#####"/%3\*"wire"/%2" " /"FLOUR"/;  
-218 "#####"/%3\*"anotter"/%2" " /"OXYGEN"/;  
-219 "#####"/%3\*"ligerty"/%2" " /"SAMPLE"/;  
+115 "#####"/%3\*"straw"/%2" " /"CHEESE"/;  
+116 "#####"/%3\*"country"/%2" " /"BOTTLE"/;  
-220 "#####"/%3\*"orbot"/%2" " /"TASTE"/;  
-221 "#####"/%3\*"knook"/%2" " /"INCUR"/;  
+117 "#####"/%3\*"sandal"/%2" " /"BLOW"/;  
+118 "#####"/%3\*"organ"/%2" " /"FRUIT"/;  
-222 "#####"/%3\*"shale"/%2" " /"ABSENT"/;  
-223 "#####"/%3\*"lafer"/%2" " /"OBJECT"/;  
+119 "#####"/%3\*"lucky"/%2" " /"PLANE"/;  
+120 "#####"/%3\*"sorrow"/%2" " /"OPEN"/;  
-224 "#####"/%3\*"supor"/%2" " /"NOVEL"/;  
-225 "#####"/%3\*"danch"/%2" " /"PHOTO"/;

+121 "#####"/%3\*"welfare"/%4" " /"SOCIAL"/;  
+122 "#####"/%3\*"square"/%4" " /"CIRCLE"/;  
-226 "#####"/%3\*"fransit"/%4" " /"SPACE"/;  
-227 "#####"/%3\*"noorish"/%4" " /"CLOUD"/;  
+123 "#####"/%3\*"mountain"/%4" " /"HIGH"/;  
+124 "#####"/%3\*"ghost"/%4" " /"WHITE"/;  
-228 "#####"/%3\*"haphen"/%4" " /"BERRY"/;  
-229 "#####"/%3\*"reloil"/%4" " /"ANGLE"/;  
+125 "#####"/%3\*"lift"/%4" " /"CARRY"/;

+126 "#####"/%3\*"justice"/%4"    "/"PEACE"/;  
 -230 "#####"/%3\*"hstory"/%4"    "/"ILLNESS"/;  
 -231 "#####"/%3\*"awaised"/%4"    "/"SARDINE"/;  
 +127 "#####"/%3\*"vanity"/%4"    "/"MIRROR"/;  
 +128 "#####"/%3\*"jury"/%4"       "/"JUDGE"/;  
 -232 "#####"/%3\*"inlert"/%4"     "/"BUMPY"/;  
 -233 "#####"/%3\*"rittal"/%4"     "/"FLESH"/;  
 +129 "#####"/%3\*"drama"/%4"     "/"PLAY"/;  
 +130 "#####"/%3\*"always"/%4"     "/"NEVER"/;  
 -234 "#####"/%3\*"jogeer"/%4"     "/"CATTLE"/;  
 -235 "#####"/%3\*"mector"/%4"     "/"TENNIS"/;  
  
 +131 "#####"/%3\*"comfort"/%4"    "/"NEARER"/;  
 +132 "#####"/%3\*"family"/%4"    "/"PILOT"/;  
 -236 "#####"/%3\*"miggie"/%4"     "/"PETROL"/;  
 -237 "#####"/%3\*"wanter"/%4"     "/"MOBILE"/;  
 +133 "#####"/%3\*"favour"/%4"     "/"THEORY"/;  
 +134 "#####"/%3\*"fire"/%4"       "/"DRINK"/;  
 -238 "#####"/%3\*"driser"/%4"     "/"METRE"/;  
 -239 "#####"/%3\*"mirits"/%4"     "/"SOUTH"/;  
 +135 "#####"/%3\*"result"/%4"     "/"LOUNGE"/;  
 +136 "#####"/%3\*"sing"/%4"       "/"GRASS"/;  
 -240 "#####"/%3\*"tuse"/%4"       "/"WHOLE"/;  
 -241 "#####"/%3\*"luch"/%4"       "/"UNION"/;  
 +137 "#####"/%3\*"decision"/%4"    "/"FISH"/;  
 +138 "#####"/%3\*"variety"/%4"    "/"MONEY"/;  
 -242 "#####"/%3\*"coost"/%4"     "/"BASIN"/;  
 -243 "#####"/%3\*"ambir"/%4"     "/"YIELD"/;  
 +139 "#####"/%3\*"ruler"/%4"     "/"HERE"/;  
 +140 "#####"/%3\*"climb"/%4"     "/"CLOAK"/;  
 -244 "#####"/%3\*"stadle"/%4"     "/"FANG"/;  
 -245 "#####"/%3\*"prinde"/%4"     "/"MEGA"/;

\$000 LB"THANKS FOR PLAYING! THAT'S THE END.";\$

Experiment 3 - Version 3

s5 f40 n130 a

\$000 "Last test. Yippee! Proceed when instructed. (press space)";  
000 "Remember, the first ten items are just practice. ";  
000 "And in this task, accuracy is more important than speed.";  
000 "Takes about 5 mins. Break if needed. (begin) ";

+000 "#####"/%3\*"ivory"/%1"     "/"THROW"/;  
+000 "#####"/%3\*"jackal"/%1"    "/"FARING"/;  
-000 "#####"/%3\*"resait"/%1"    "/"GIANTS"/;  
+000 "#####"/%3\*"glaze"/%1"     "/"ELUSIVE"/;  
+000 "#####"/%3\*"poke"/%1"     "/"CRIME"/;  
-000 "#####"/%3\*"rustain"/%1"    "/"INCOME"/;  
+000 "#####"/%3\*"culture"/%1"    "/"LACTIC"/;  
+000 "#####"/%3\*"lottery"/%1"    "/"TINY"/;  
-000 "#####"/%3\*"fitcom"/%1"     "/"PUNT"/;  
000 "That's the end of the practice items. Proceed when ready. ";  
+000 "#####"/%3\*"safari"/%1"     "/"SHIP"/;\$

\  
+121 "#####"/%3\*"welfare"/%1"    "/"SOCIAL"/;  
+122 "#####"/%3\*"square"/%1"     "/"CIRCLE"/;  
-226 "#####"/%3\*"fransit"/%1"    "/"SPACE"/;  
-227 "#####"/%3\*"noorish"/%1"     "/"CLOUD"/;  
+123 "#####"/%3\*"mountain"/%1"    "/"HIGH"/;  
+124 "#####"/%3\*"ghost"/%1"     "/"WHITE"/;  
-228 "#####"/%3\*"haphen"/%1"     "/"BERRY"/;  
-229 "#####"/%3\*"reloil"/%1"     "/"ANGLE"/;  
+125 "#####"/%3\*"lift"/%1"       "/"CARRY"/;  
+126 "#####"/%3\*"justice"/%1"     "/"PEACE"/;  
-230 "#####"/%3\*"hostory"/%1"     "/"ILLNESS"/;  
-231 "#####"/%3\*"awaised"/%1"     "/"SARDINE"/;  
+127 "#####"/%3\*"vanity"/%1"     "/"MIRROR"/;  
+128 "#####"/%3\*"jury"/%1"       "/"JUDGE"/;  
-232 "#####"/%3\*"inlert"/%1"     "/"BUMPY"/;  
-233 "#####"/%3\*"rital"/%1"       "/"FLESH"/;  
+129 "#####"/%3\*"drama"/%1"       "/"PLAY"/;  
+130 "#####"/%3\*"always"/%1"     "/"NEVER"/;  
-234 "#####"/%3\*"jogeer"/%1"     "/"CATTLE"/;  
-235 "#####"/%3\*"mector"/%1"     "/"TENNIS"/;

+131 "#####"/%3\*"comfort"/%1"    "/"NEARER"/;  
+132 "#####"/%3\*"family"/%1"     "/"PILOT"/;  
-236 "#####"/%3\*"miggie"/%1"     "/"PETROL"/;  
-237 "#####"/%3\*"wanter"/%1"     "/"MOBILE"/;  
+133 "#####"/%3\*"favour"/%1"     "/"THEORY"/;  
+134 "#####"/%3\*"fire"/%1"       "/"DRINK"/;  
-238 "#####"/%3\*"driser"/%1"     "/"METRE"/;  
-239 "#####"/%3\*"mirits"/%1"     "/"SOUTH"/;  
+135 "#####"/%3\*"result"/%1"     "/"LOUNGE"/;  
+136 "#####"/%3\*"sing"/%1"       "/"GRASS"/;  
-240 "#####"/%3\*"tuse"/%1"       "/"WHOLE"/;  
-241 "#####"/%3\*"luch"/%1"       "/"UNION"/;  
+137 "#####"/%3\*"decision"/%1"    "/"FISH"/;  
+138 "#####"/%3\*"variety"/%1"     "/"MONEY"/;  
-242 "#####"/%3\*"coost"/%1"     "/"BASIN"/;  
-243 "#####"/%3\*"ambir"/%1"     "/"YIELD"/;

+139 "#####"/%3\*"ruler"/%1"    "/"HERE"/;  
+140 "#####"/%3\*"climb"/%1"    "/"CLOAK"/;  
-244 "#####"/%3\*"stadle"/%1"   "/"FANG"/;  
-245 "#####"/%3\*"prinde"/%1"   "/"MEGA"/;

\  
+141 "#####"/%3\*"street"/%2"   "/"ROAD"/;  
+142 "#####"/%3\*"opinion"/%2"   "/"IDEA"/;  
-246 "#####"/%3\*"uselest"/%2"   "/"MURDER"/;  
-247 "#####"/%3\*"edelid"/%2"    "/"NEITHER"/;  
+143 "#####"/%3\*"metal"/%2"     "/"STEEL"/;  
+144 "#####"/%3\*"prayer"/%2"    "/"CHURCH"/;  
-248 "#####"/%3\*"waight"/%2"   "/"ROBUST"/;  
-249 "#####"/%3\*"repish"/%2"    "/"LEAGUE"/;  
+145 "#####"/%3\*"smooth"/%2"    "/"ROUGH"/;  
+146 "#####"/%3\*"oven"/%2"     "/"STOVE"/;  
-250 "#####"/%3\*"neek"/%2"     "/"RACE"/;  
-251 "#####"/%3\*"jelt"/%2"     "/"RIOT"/;  
+147 "#####"/%3\*"very"/%2"     "/"MUCH"/;  
+148 "#####"/%3\*"goat"/%2"     "/"MILK"/;  
-252 "#####"/%3\*"sraph"/%2"     "/"BULK"/;  
-253 "#####"/%3\*"squld"/%2"     "/"NAVY"/;  
+149 "#####"/%3\*"bloom"/%2"     "/"FLOWER"/;  
+150 "#####"/%3\*"answer"/%2"    "/"QUESTION"/;  
-254 "#####"/%3\*"pidlow"/%2"    "/"FUMES"/;  
-255 "#####"/%3\*"shience"/%2"   "/"MICRO"/;

+151 "#####"/%3\*"tasty"/%2"     "/"CLERK"/;  
+152 "#####"/%3\*"land"/%2"     "/"BRASS"/;  
-256 "#####"/%3\*"bandbar"/%2"   "/"SIGHT"/;  
-257 "#####"/%3\*"edening"/%2"   "/"LOCAL"/;  
+153 "#####"/%3\*"player"/%2"    "/"SEASON"/;  
+154 "#####"/%3\*"master"/%2"    "/"BREATH"/;  
-258 "#####"/%3\*"fichion"/%2"   "/"TEACHER"/;  
-259 "#####"/%3\*"lastung"/%2"   "/"PREDICT"/;  
+155 "#####"/%3\*"affair"/%2"    "/"CLEAN"/;  
+156 "#####"/%3\*"mean"/%2"     "/"SUGAR"/;  
-260 "#####"/%3\*"innor"/%2"     "/"BOAT"/;  
-261 "#####"/%3\*"droll"/%2"     "/"HAWK"/;  
+157 "#####"/%3\*"mercury"/%2"   "/"CLOTHES"/;  
+158 "#####"/%3\*"island"/%2"    "/"MOON"/;  
-262 "#####"/%3\*"portoon"/%2"   "/"MORNING"/;  
-263 "#####"/%3\*"nolder"/%2"    "/"PERFUME"/;  
+159 "#####"/%3\*"cabinet"/%2"   "/"ROOM"/;  
+160 "#####"/%3\*"bend"/%2"     "/"SLIP"/;  
-264 "#####"/%3\*"foll"/%2"     "/"GROUP"/;  
-265 "#####"/%3\*"maply"/%2"     "/"WORSE"/;

\  
+101 "#####"/%3\*"glory"/%4"    "/"POWER"/;  
+102 "#####"/%3\*"rubble"/%4"    "/"STONES"/;  
-206 "#####"/%3\*"lebacy"/%4"    "/"SILENT"/;  
-207 "#####"/%3\*"optoon"/%4"    "/"METRIC"/;  
+103 "#####"/%3\*"truck"/%4"     "/"DRIVER"/;  
+104 "#####"/%3\*"lion"/%4"     "/"TIGER"/;  
-208 "#####"/%3\*"pumlish"/%4"   "/"FARMER"/;  
-209 "#####"/%3\*"mestion"/%4"   "/"PASTOR"/;  
+105 "#####"/%3\*"victory"/%4"   "/"DEFEAT"/;



+106 "#####"/%3\*"stomach"/%4"    "/"ACHE"/;  
 -210 "#####"/%3\*"senbor"/%4"    "/"GOOD"/;  
 -211 "#####"/%3\*"bental"/%4"    "/"ZERO"/;  
 +107 "#####"/%3\*"deluge"/%4"    "/"RAIN"/;  
 +108 "#####"/%3\*"pretty"/%4"    "/"GIRL"/;  
 -212 "#####"/%3\*"erotio"/%4"    "/"LAVISH"/;  
 -213 "#####"/%3\*"cencise"/%4"    "/"NINETY"/;  
 +109 "#####"/%3\*"trousers"/%4"    "/"PANTS"/;  
 +110 "#####"/%3\*"table"/%4"    "/"CHAIR"/;  
 -214 "#####"/%3\*"excust"/%4"    "/"COFFEE"/;  
 -215 "#####"/%3\*"nocket"/%4"    "/"FINISH"/;  
  
 +111 "#####"/%3\*"flavour"/%4"    "/"BEER"/;  
 +112 "#####"/%3\*"puzzle"/%4"    "/"BALLET"/;  
 -216 "#####"/%3\*"medipal"/%4"    "/"GRAPE"/;  
 -217 "#####"/%3\*"jacbet"/%4"    "/"PRINT"/;  
 +113 "#####"/%3\*"stuck"/%4"    "/"FAULT"/;  
 +114 "#####"/%3\*"wire"/%4"    "/"FLOUR"/;  
 -218 "#####"/%3\*"anotter"/%4"    "/"OXYGEN"/;  
 -219 "#####"/%3\*"ligerty"/%4"    "/"SAMPLE"/;  
 +115 "#####"/%3\*"straw"/%4"    "/"CHEESE"/;  
 +116 "#####"/%3\*"country"/%4"    "/"BOTTLE"/;  
 -220 "#####"/%3\*"orbot"/%4"    "/"TASTE"/;  
 -221 "#####"/%3\*"knook"/%4"    "/"INCUR"/;  
 +117 "#####"/%3\*"sandal"/%4"    "/"BLOW"/;  
 +118 "#####"/%3\*"organ"/%4"    "/"FRUIT"/;  
 -222 "#####"/%3\*"shale"/%4"    "/"ABSENT"/;  
 -223 "#####"/%3\*"lafer"/%4"    "/"OBJECT"/;  
 +119 "#####"/%3\*"lucky"/%4"    "/"PLANE"/;  
 +120 "#####"/%3\*"sorrow"/%4"    "/"OPEN"/;  
 -224 "#####"/%3\*"supor"/%4"    "/"NOVEL"/;  
 -225 "#####"/%3\*"danch"/%4"    "/"PHOTO"/;

\$000 LB"THANKS FOR PLAYING! THAT'S THE END.";\$