How visually presented brand names are represented in the mental lexicon.

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How Visually Presented Brand Names are Represented in the Mental Lexicon

By

Darren Schmidt

A Thesis
Submitted to the Faculty of Graduate Studies and Research through the Department of Psychology in Partial Fulfillment of the Requirements for the Degree of Master of Arts at the University of Windsor

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ABSTRACT

Word types are represented independently within the mental lexicon. Much of the research supporting this assumption has been accomplished through studying those with neurological impairment in naming. These studies indicate that mental representations of proper nouns differ from those of common nouns: The differences might lie in the fact that proper nouns are tokens (have one meaning), whereas common nouns are types (have more than one meaning). Brand names are assumed to be another special category with representations between these two word-types, but research on these special words is not as plentiful and their status as a distinct category is not as widely received. This study investigates brand name representation in the mental lexicon to determine whether they are intermediate between proper and common nouns as demonstrated in behavioral data from word recognition experiments. The results showed that common nouns demonstrated faster reaction times and proper nouns and brand names performed similarly to each other. This behavioral data adds to the current knowledge of type versus token responses and that brand names could be similar to proper nouns, but differences are evident. Further research is needed to understand this unresolved issue.
ACKNOWLEDGEMENTS

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CHAPTER 1
INTRODUCTION

Mental Lexicon

Overview

The processes involved in language use have been studied for many years, but controversy remains regarding these processes. Some theorists have claimed that language represents too complex a phenomenon to admit an operational definition, whereas others have attempted such a definition. In 1921, Edward Sapir, as seen in Poole, defines language as a "purely human and non-instinctive method of communicating ideas, emotions, and desires by means of a system of voluntarily produced symbols (1999, p. 3)". In contrast, in 1990, Robins, as seen in Poole, presents a more restrictive definition of language as a "form of human communication by means of a system of symbols principally transmitted by vocal sounds (1999, p. 5)". Despite the differences in these definitions, there is a general agreement between these authors and most theorists that language involves the use of symbols to communicate. The restrictions in Robins' definition notwithstanding, many people who study language believe that these symbols include phonetic segments (or speech sounds), orthographic segments (or print), or kinetic segments (or gestures) (Fromkin, Rodman, Hultin, & Logan, 1997, p. 18-20, 159, 160, 32). This more inclusive definition with a broad range of symbol types is adopted in this thesis.

Much of the language research that is conducted is aimed at describing the characteristics, the mental processes, and/or the neurological underpinnings of these symbols. When the symbols under investigation are words and their related mental processes are being described, the research is said to address the mental lexicon. The
mental lexicon is a storehouse of information a reader or listener has attained about language (Treisman, 1960). This information includes the sound (phonology), look (orthography), and meaning (semantics). These key elements are typically studied somewhat independently and, of the three, semantics is the least understood (Buchanan, Westbury, & Burgess, 2001).

Semantics and Word Recognition

The focus of this thesis is on semantics and by semantics I mean the broad definition that includes the physical and emotional characteristics of the referent (e.g., the fluffy cuteness of kitten), the semantic neighborhood of the referent (is those words most associated, such as dog and cat), and its syntactic characteristics (e.g., kitten is a common noun, CN or Darren is a proper name, PN). Typically, CNs are words like cat, dog, wrench, or stapler. Typical PNs are names (e.g., Darren, Lori, or Chris), places (e.g., Windsor, Ontario), and may include dates to the extent that they signify a specific event. This information is assumed to be stored in the semantic lexicon, a dictionary-like storage system with capacity, processes, and access all long-standing questions of debate and of particular relevance in this thesis.

The lexicon contains mental representations (i.e., memories) of the numerous words in a person’s vocabulary. In the visual word recognition system there are assumed to be multiple lexicons each storing information relevant to specific word characteristics, such as sound, visual appearance, and meaning. Psycholinguists study how these lexicons are arranged through a variety of word recognition tasks that are assumed to be dependent on lexical access (Gleason & Ratner, 1998, pp. 425).
According to most models of visual word recognition, words may be accessed through a serial search or through parallel access (or direct access). In the serial search models, word representations are arranged along some measure (e.g., frequency, Forester, 1976) and are scanned one at a time until the necessary lexical entry is found. In the parallel access models, more than one entry can be accessed at one time (Gleason & Ratner, 1998, p. 24). In both types of models, there is assumed to be spreading activation followed by inhibition of neighboring items (Sears, Hino, & Lupker, 1999). For example, in the semantic system when the name of a concept is encountered, the node or nodes representing that concept are activated, and the activation spreads to other connecting/related nodes. This spread of activation gives rise to laboratory phenomena such as semantic priming effects in lexical decision (Meyer & Schvaneveldt, 1971) in which a word like nurse is recognized faster following the related word doctor than when it follows an unrelated word like bread. In a system that allows for spreading activation there must also be a mechanism in place to allow a reader to determine the precise identity of a given word. That being the case, in many models it is assumed that before a single word is accessed this spread of activation must be resolved so that the relevant word has activation above some base line (Buchanan et al., 1999). This resolution is thought of by many as the spread of inhibition (Buchanan et al., 2002).

The above understanding of the processes involved in lexical access brings with it predictions about word recognition processes that depend on the number of neighbors for a specific word. Within the lexicon, a neighbor can be considered to be any representation close enough to the target word to receive this spreading activation. This so-called neighborhood effect has been most extensively studied with respect to the

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orthographic neighborhoods in the orthographic lexicon (Grainger, 1990; Grainger, 1988). Studies on this topic report the general finding that word recognition processes are faster for those words that have many orthographic neighbors as opposed to those with few. This thesis evaluates semantics through by focusing on word class effects in a normal population. Word class effects have been described as revealing the relative specificity of a particular word representation and therefore provide a potentially informative window onto the characteristics of semantic neighborhoods.

Models of Word Representations

Questions on the specificity of word representation center on the extent to which these memories are *types* or *tokens* (Hittmair-Delazar, Denes, Semenza, and Mantovan (1994). A *type*, or category, refers to an object (e.g., horse) and a *token* refers to an individual (e.g., Secretariat). A type will have many semantic neighbors and in terms of activation will likely produce a broader spread than will a token, which has only a single referent. For example, the word *horse* refers to any number of horses, of any breed, and will have a neighborhood of words related to any number of horses of any breed. In contrast, the name *Secretariat* refers to the triple-crown winner and will have representations within a more restrictive range. Several theorists have acknowledged these distinctions in models of word representations: Representation Model (Cohen & Burke, 1993), Node Structure Theory (Mackay, 1987), and The Token Reference Model (Semenza & Zettin, 1988). Of these three, the last forms the theoretical foundation of this paper.
**Representation Model**

In the Representation Model, described in Cohen and Burke (1993), some word types are more meaningful than others. A common proper noun (PN) like John is less meaningful and subsequently harder to recall than a less common PN such as Shania (Cohen & Faulkner, 1986). The name John refers to so many people that on its own it rarely specifies a particular man, whereas for most Canadians the name Shania refers to a specific popular country singer. It is assumed that with names like John there are multiple links that may inhibit the accessibility of the name during attempted recall whereas a name like Shania will produce less interference from neighbors and therefore will be easier to recall.

**Node Structure Theory**

In The Node Structure Theory (NST) words are produced by associated connections (i.e., nodes). For example, the proper name Baker and the occupation baker are separated by their own propositional and lexical nodes. The occupation baker is connected to a number of nodes relating to that occupation including bakes bread, gets up early, and kneads dough, and these nodes are connected to other nodes such as John is a baker. While this node may be connected to the PN John Baker, the John Baker node is also connected to a number of semantic propositions about him. However, only a single node connects John Baker to Baker since this refers to only one family name and family names rarely have other relevant semantic information (MacKay, 1987). In this model, the greater number of connections for the occupation baker than the name Baker adds strength to the occupation node relative to the PN node and differences in processing are
assumed to reflect differences in connection strengths among the nodes that favor the CN
over the PN.

_The Token Reference Model_

Semenza and Zettin (1988) discuss the type versus token relationship in terms of
how words are represented, accessed, and activated. As mentioned above, _type_, or
category, refers to an object (e.g., horse) and _token_ refers to one entity (e.g., Secretariat).
A type will have many semantically related neighbors (e.g., colors of the same breed) and
consequently a broader spread of activation (e.g., breeds of horses) than will tokens with
only a single referent (e.g., Secretariat) with its more constrained semantic neighborhood
and relatively narrow spread of activation.

Although the Representation, Node Structure, and Token Reference Models are
similar in many ways, the Token Reference Model will be used since it goes beyond the
scope of word representation and word connections to include neuropsychological
findings and findings from memory related research. This model defines types and tokens
on a spectrum suggesting that both have their own placement within the mental lexicon.

At its simplest level, the distinction between types and tokens is similar to the
distinction between noun types (i.e., CN and PN). It is assumed that CNs are types that
are assumed to represent objects (i.e., horse), whereas PN are tokens assumed to
represent one place or individual (i.e., Secretariat) (Schmidt & Buchanan, 2004).
Distinctions between grammatical classes (i.e., nouns versus verbs) are assumed to be
preserved in the mental lexicon (Gontijo et. al., 2002; Treisman, 1960) and The Token

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Reference Model extends this preservation to include distinctions between subclasses (i.e., CN versus PN).

Empirical Distinctions Between Noun Types

If noun types are represented differently within the mental lexicon there should be empirical support for this distinction in the form of behavioral data. Behavioral data suggest that PNs, or tokens, have a single high probability referent (Cipolotti, McNeil, & Warrington, 1993) and CNs, or types, should have many exemplars (Schmidt & Buchanan, 2004). In the latter case, a single referent designates all the entities sharing a set of attributes (Lucchelli & De Renzi, 1992; Semenza & Zettin, 1988) such as common objects (Hittmair-Delazer, et. al, 1994; Jackendoff, 1983; Semenza & Sgaramella, 1993). Data from developmental studies have revealed different acquisition trajectories that may reflect this distinction (Rochford & Williams, 1962).

Other data suggest that certain word-types are acquired at different periods. It seems that PNs appear to be acquired later in life compared to CNs, which are evident at earlier stages. Childhood studies have indicated that young children begin to learn by naming numerous objects (Gershkoff-Stowe, 2002) in a developmental phase that is sometimes referred to as a “vocabulary spurt” (Gershkoff-Stowe & Smith, 1997). But, during the course of childhood development, language (i.e., vocabulary) crystallizes (i.e., information learned in academic institutions) (Horn & Cattell, 1967) forming new word types (i.e., learning individuals’ names) from new experiences. Therefore, over the course of a lifetime a higher proportion of CNs are learned early, but knowledge of PNs continues to accumulate.
These PN and CN differences also extend to the neurological level: Some authors have argued that brand names (BNs) might be a subset of PNs (Gontijo et. al., 2002) and that, depending on the features, could be represented in the left (Schweinberger, et. al., 2002) or right hemisphere (Van Lancker & Ohnesorge, 2002). Others have argued that nouns are generally represented in the left temporal lobe and other word types such as verbs are located in the left frontal region (Damasio & Tranel, 1993; Miozzo, Soardi, & Cappa, 1994; Daniele et. al., 1994). The bulk of evidence indicates that some PNs are represented in both hemispheres (Ohnesorge & Van Lancker, 2001; Zaidel, 1990) and it appears that those represented in the right hemisphere are more emotionally laden than those that are not (Van Lancker, 1991; Van Lancker & Canter, 1982; Van Lancker & Ohnesorge, 2002; Rapcsak, Comer, & Rubens, 1993; Gelder et. al., 2003; Sperry, Zaidel, & Zaidel, 1979; Schweinberger et. al., 2002).

The main source of data relevant to the question of noun type lateralization and the representational distinction between PNs and CNs comes from naming differences in cases of acquired aphasia (McNeil, Cipolotti, & Warrington, 1994), anomia (Avila et. al., 2001), and Pick's disease (Blumenfeld, 2002). Aphasia is a total or partial loss of the ability to produce or understand language (Schmidt & Buchanan, 2004). Anomia is a specific type of aphasia in which patients demonstrate an inability to name objects or lexical items (Hadar, Jones, & Mate-Kole, 1987). Pick's disease leads to a common type of frontotemporal dementia with pathological changes that include neuronal loss, especially in the cortical areas (Blumenfeld, 2002). Dissociations in impaired processing of noun types have been reported in all three patient populations (aphasia, anomia, and Pick's disease) with mixed findings and no firm support for any extant model.
In one instance, BMW suffered a stroke and as a result he was severely impaired in his spoken language with mild impairment in comprehension (Schmidt & Buchanan, 2004). His written production showed gross impairments in naming CN with intact PN and date production. Although BMW may be the cleanest example of a neurological patient showing CN/PN dissociations he is by no means the only patient with left hemisphere damage to demonstrate the dissociation (see for example, Milders, 2000; McNeil, Cipollotti, & Warrington, 1994; Semenza & Sgaramella, 1993; Cipolotti, McNeil, & Warrington, 1993; Lyons, Hanley, & Kay, 2002; Yasudi & Uno, 1998; Van Lacker & Klein, 1990; Warrington & Clegg, 1993; Cipolotti, 2000). The reverse dissociation (i.e., impaired PN and intact CN processing) has also been reported in a handful of patients, mostly those with right hemisphere damage (Lucchelli & De Renzi, 1992; Cipolotti, 2000; Hittmair-Delazer, et. al., 1994; Papagno & Capitani, 1998; and Semenza & Zettin, 1988, 1989). The undeniable presence of this dissociation implies that the two noun types are represented or processed in different manners and perhaps in different areas within the brain (Kohn & Goodglass, 1985; Hittmair-Delazer, et. al, 1994; Milders, 2000; Cipolotti, 2000; Semenza & Zettin, 1988, 1989). Such findings require a basis in a theoretical model of word recognition that can be extended to normal or intact performance. This link has not been easy to make but the proposed study represents an attempt to move this area of research forward by investigating noun type dissociations in intact-college-aged readers through the inclusion of a third noun type that may be intermediate between CNs and PNs.
Brand Names

This study looked at BNs and how they are represented within the mental lexicon. This investigation will uncover the respective lexical representational strengths of BNs, PNs, and CNs to determine whether BNs are intermediate between PNs and CNs. So far, much of the research on BNs is based on marketing and advertisement studies and not on lexical analyses.

The study of BNs (e.g., Nike) began approximately 80 years ago to understand the nature of how BNs are recognized by humans. Poffenberger and Franken (1923) discovered that by grouping products together that shared a commonality with a given font created a stronger bond to each product. Product choice could be influenced by unintentional, unconscious memory (i.e., implicit memory) (Butler & Berry, 2001) and/or explicit memory processes (Butler & Berry, 2002). Consumers may intentionally try to retrieve information about a product; however, new brands are unlikely to evoke strong attitudes because consumers may likely draw their attention unconsciously to those items most familiar to them (Coates, Butler, & Berry, 2004) or more meaningful (Kohli, Harich, & Leuthhesser, 2004). From a marketing and business perspective, the understanding of how BNs are processed is extremely important (Kohli et al., 2004). It is also important from a theoretical perspective to the extent that research about BNs can inform models of normal word recognition.

There are very few experiments on how BNs are processed. In one study, Gontijo, Rayman, Zhang, and Zaidel (2002) contrasted performance on BNs with performance on CNs on a lateralized lexical decision task (LLDT). In this task, words and nonwords were presented to either the right or left visual field and participants responded by pressing a
computer key indicating whether the item was a real word or nonword. In addition to visual field, manipulation they also manipulated the appearance of the items by changing the case. There were case effects for BNs but not for CNs and BNs were also found to be less lateralized than CNs.

Since BNs produce performance similar to CNs in some cases and not in other cases, Gontijo et al., (2002) argue that they might have their own special status. They tested this hypothesis by contrasting performance of BNs to PNs and discovered that unlike PNs, BNs do not appear to be processed in the right hemisphere. This difference between BNs and PNs was attributed to differences in personal relevance of these items. They tested this by giving 40 participants (from the same study) a chance to rate brands on a scale from 1 to 7 (1 not relevant to 7 very relevant). There was no indication that BN were personally relevant.

The term personal relevance is generally defined as those items most “familiar” in terms of familiar faces (i.e., a friend), voices (i.e., the President of the United States), names (i.e., a colleague), and surroundings (i.e., a famous bridge), however it is also sometimes characterized or referred to, in neuropsychology, as affective valence (Gerard et al., 1973; Van Lancker, 1991) or degree of intensity of emotional content (Van Lancker, 1991). Therefore, those words that are more emotionally laden to a person, such as one’s spouse’s name, or those places, which are more culturally based such as the Empire State Building, are considered personally familiar. Personally relevant items can also be perceived as biographical, iconic, imagistic, historic, auditory associations (Van Lancker & Ohnesorge, 2002), linguistic expressions, handwriting, or topographical associations (Van Lancker, 1991). But those items perceived as most familiar might be
from simple exposure tied in with the individual’s personal attitudes (i.e., bias, awareness, avoidance, or forgetting stimuli) (Gerard, et. al., 1973; Kunst-Wilson & Zajonc, 1980; Zajonc, 1968).

The Gontijo et. al. (2002) study provides an initial answer to questions regarding the similarity of BNs, CNs, and PNs. Overall, these three types of nouns appear to be processed differently. These differences can be understood through the Token Reference Model (Semenza & Zettin, 1988). For instance, in terms of type versus token responses, CNs can be considered as types and PNs can be considered tokens. Brand names appear to be in the middle. Although they do not represent a particular object, as do PNs, they represent a more restrictive field than do CNs. By extension, the three types of nouns should produce different patterns of performance on the same tests of word recognition with BNs falling somewhere intermediate between PNs and CNs. This research extends the Gontijo et. al. (2002) paradigm by presenting all three-noun types (CN, PN, and BN) in a within-subject experiment that will examine case effects to determine what kind of lexical properties BNs possess.
CHAPTER 2

EXPERIMENTAL DESIGN

Variable Selection Pretest

The first phase of this study is a familiarity test to determine the average familiarity of each PN, CN, and BN in the main experiment. This familiarity rating assisted in stimulus set construction to ensure that effect obtained cannot be attributed to artifacts like word frequency or familiarity (note that word frequency data do not exist for BNs and for many PNs but familiarity ratings are accepted as a reasonable facsimile). This norming procedure also allowed me to be sure that the participants know all BNs.

Methodology

Participants

Eleven students from the University of Windsor were recruited by sign-up/sign-in sheet located in the University’s Psychology department (see Appendices F and G). The students received one bonus course credit for their voluntary participation. The students were debriefed at the end of the experiment (see Appendix D).

Materials

A total of 110 words will be presented. The stimuli consisted of CNs (e.g., cat, dog, cow), PNs (e.g., Darren, Annette, Lori), and BNs (e.g., Google, Apple, Nike) (see Appendix C). Each word-type was chosen through random selection of items and people located in the Psychology lab. The list consists of 30 PNs, 30 BNs, and 50 CNs.
Procedure

Participants were asked to respond to a computer-generated list delivered through a program called Direct RT on a Compact Presario 9500. They were asked to view the center of the computer screen, read each item as it appears, and determine the relative familiarity of the word. The participants were given explicit instructions that they read from the computer screen: “You will be presented with a common noun, proper noun, or brand names on the computer screen. This is a familiarity test. Please rate each word on a scale of 0 (not familiar) to 3 (very familiar). You will make your decision by pressing either 0, 1, 2, or 3 on the keypad. Please go as quickly as possible, while being as accurate as possible. Press the space bar to continue”. They were invited to ask for clarification if they did not understand the instructions. Upon completion of the familiarity ratings for the 110 randomly presented items participants saw the words “thanks you’ve been great” and left the testing room.

Results

The mean familiarity ratings (0-least familiar to 3-most familiar) of the three-word types did not differ (BN = 258, CN = 283, PN = 265). were calculated in Number Cruncher Statistical System (NCSS) (Hintze, 1998). See Appendix C for the word list.

Priming Study

Design

The purpose of this design is to clarify the type versus token relationship for CNs, PNs, and BNs. This understanding will in turn assist me in my continued examination of people with language impairment. In addition, the findings will add to our very impoverished understanding of how BNs are lexically represented through its
connections. These experiments will also provide further extensions to the research on PN versus CN processing through case effects in lexical decision.

Methodology

Participants

A total of fifty-five students (33 in experiment 1 and 22 in experiment 2) from the University of Windsor were recruited by sign-up/sign-in sheet located in the University’s Psychology Department (see Appendices F and G). The students were recruited on a voluntary basis and were eligible to receive one bonus course credit. The students were debriefed at the end of the experiment (see Appendix E).

Materials

The stimuli were drawn from a list of real words (i.e., PNs, CNs, and BNs), from the familiarity test, and nonwords (see Appendix C). The 30 most familiar BNs, PNs, and CNs were selected for the priming study (see Appendix C). The nonwords were constructed by transforming real English words through the replacement of letters with the provision that the nonwords be pronounceable at bi-gram, tri-gram, and whole item levels. These nonwords were generated for PNs (e.g., mazgie), CNs (e.g., wat), and BNs (e.g., cadxes) (see Appendix C).

Overall Design

The study design consists of two Experiments: Experiment 1 presents targets in lower case with primes presented in either alternating/lower case (AL) or upper case (UC) depending on random assignment of subject to case condition. Experiment 2 presents the identical items but in this experiment both target and prime are presented in AL. Each subject was exposed to only one case.
Variables and Analysis

The dependent variable was reaction times (RT) measured in milliseconds (ms). Lexical decision RTs for each participant was analyzed in Number Cruncher Statistical System (NCSS) (Hintze, 1998). All participants and all trials with RTs that fell below 300 or above 3000 ms were marked as outliers and not analyzed. Error responses were also discarded (see Table 3 in appendix H). The experiment consisted of three manipulations: Prime (self vs. unrelated), Word type (CN, PN, BN), and Prime Case (AL, UC). Two mixed analyses of variance (ANOVA) were performed. The first analysis was a between group design 2 (AL and UC) x 3 (word Type) x 2 (Prime) with Prime Case the between group factor and Word Type and Prime the within-group factors. The second analysis was a 3 (word type) x 2(Prime) within-group design.

Experiment 1: Alternating and UPPER CASE primes

The experimental procedures consisted of two prime case conditions (AL, and UC), and three word types (PN, BN, and CN). The prime was presented in UC or AL for 60 ms and was followed by a blank screen for 50 ms and then the lower case target word was presented and remained on the screen until the participant responded. The priming manipulations were realized through the presentation of prime-target pairs that were counter-balanced across subjects so that half of the primes matched the target (e.g., HORSE-horse) and half did not match (MOTH-horse) and the words in the match condition for half of the subjects were in the unmatched condition for the other half. Thus, the experiment consists of three manipulations: Word type (CN, PN, BN), Prime (self prime versus unrelated prime), and Case (UC prime, AL prime). Both Word type and Prime were within-subject manipulations whereas Case was a between-subjects
manipulation in this mixed design. With the counter-balancing for the Prime manipulation, this resulted in 4 separate cells with 20 participants per cell.

Procedure

Participants were asked to respond to a computer program called Direct RT on a Compact Presario 9500. They were presented with real words (e.g., cat) or nonwords (e.g., cadex) in a Lexical Decision Task (LDT). They were asked to decide whether the string of letters is a real word or nonword as fast as possible using their respective computer keys. For example, if the word cat appeared then the student would respond by pressing the "real word" key, which is designated as the "?" key. They were given the following instructions to read: ["A letter string will appear in the middle of the display. You have to decode whether it is a real English word. If it is a real word press the ? key. If it is not, press the Z key. We will be looking at the time it takes you to make this decision so please go as quickly as possible. However, we cannot use your data if you make many errors so please try to be as accurate as possible. A word is real if it is spelled correctly. Sometimes you may see words that would sound like a real word (e.g., brane) but since it is not spelled correctly you should hit the Z key. Please hit the space bar after you have read this to begin the experiment"]). Once the instructions disappeared, the first prime was presented (60 ms), then the blank screen (50 ms) and then the first target. This sequence continued until the participant saw all 180 word and nonword trials. Upon completion of the LDT, the participants saw the words “thanks you’ve been great” and left the testing room.
CHAPTER 3

RESULTS

The RT means and standard deviations are presented in Table 1 for prime, word types (BN, CN, PN), and cases (AL and UC). The ANOVA yielded the following results:

There was no main effect for Case [F (1, 33)= .32], no two-way interactions between case and word type, case and priming, or word type and priming (F<1.8 in all cases).

<table>
<thead>
<tr>
<th>CASE</th>
<th>Data</th>
<th>BN</th>
<th>CN</th>
<th>PN</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL</td>
<td>Unprimed</td>
<td>944(470)</td>
<td>715(194)</td>
<td>895(446)</td>
<td>853(854)</td>
</tr>
<tr>
<td>UC</td>
<td>Unprimed</td>
<td>910(381)</td>
<td>787(313)</td>
<td>978(502)</td>
<td>854(368)</td>
</tr>
<tr>
<td>Unprimed Average of RT</td>
<td>920(408)</td>
<td>770(291)</td>
<td>924(467)</td>
<td>854(380)</td>
<td></td>
</tr>
<tr>
<td>AL</td>
<td>Primed</td>
<td>810(403)</td>
<td>683(283)</td>
<td>739(302)</td>
<td>735(331)</td>
</tr>
<tr>
<td>UC</td>
<td>Primed</td>
<td>799(394)</td>
<td>662(284)</td>
<td>922(586)</td>
<td>740(372)</td>
</tr>
<tr>
<td>Primed Average of RT</td>
<td>802(396)</td>
<td>669(283)</td>
<td>799(423)</td>
<td>738(357)</td>
<td></td>
</tr>
</tbody>
</table>

There was a main effect of priming [F (1, 33)= 23.65, p< .000001]: Primed target RTs was faster than unprimed targets. There was also a main effect for word type [F (2, 63)= 15.44, p< .000001]. Bonferonni Multiple Comparisons showed that CNs are recognized faster as words than BNs and PNs with no difference between PNs and BNs.

There was also a three-way interaction between case, word type, and prime [F (2, 49)= 3.02, p=.05] that is illustrated in Figure 1 in the form of a greater priming effect for the CN in the UC condition and greater priming for BN and PN in the AL condition with a substantially reduced priming effect in the UC condition for PN when compared to CN and BN. The speed of processing of CNs is reduced. Common nouns did not show an advantage for being preceded by a prime when that prime was presented in alternating case. Since CNs are known to have a stronger lexical representation (or more
connections) that resulted in speeded response times, a second experiment attempted to reduce that speed to determine whether these items became more like the PNs or BNs.

![Figure 1: Mean Priming Effects (unprimed – primed RTs) for BN, CN and PN as a function of prime case.]

Experiment 2: aLtErNaTiNg prime and target

Methodology

Procedure

Twenty-two students from the University of Windsor were recruited by sign-up/sign-in sheet located in the university’s Psychology department (see appendices F and G). The students were recruited on a voluntary basis and were eligible to receive 1 bonus course credit. The students were debriefed at the end of the experiment (see appendix E). The methodology is identical to the first experiment (see above) except that for this experiment both primes and targets were presented in aLtErNaTiNg case. The alternating case was always shown with the first letter in lower case.
RESULTS

The mean RTs and standard deviations for the priming effects for each word type are presented in Table 2. There was no word type by priming interaction \([F (2, 36)= 1.53, p= .23]\). The ANOVA yielded main effects for word type \([F (2, 36)= 21.45, p< 0.00001]\) and priming \([F (1, 18)= 11.41, p<0.00001]\). The results suggest that CNs are recognized faster than PNs and BNs but PNs and BNs did not differ. Bonferonni Multiple Comparisons revealed priming effects for CNs and PNs but not for BNs suggesting that with an increased number of participants the two-way interaction might have been significant.

Table 2
Mean RTs (Standard Deviation) for primed and unprimed brand names, common nouns and proper nouns in alternating case and priming effects for these items

<table>
<thead>
<tr>
<th>Word Type</th>
<th>Unprimed</th>
<th>Primed</th>
<th>AVG</th>
<th>Priming effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>BN</td>
<td>1066(469)</td>
<td>969(536)</td>
<td>1017(505)</td>
<td>97</td>
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<tr>
<td>CN</td>
<td>897(421)</td>
<td>728(373)</td>
<td>813(406)</td>
<td>169</td>
</tr>
<tr>
<td>PN</td>
<td>986(434)</td>
<td>856(465)</td>
<td>919(470)</td>
<td>130</td>
</tr>
</tbody>
</table>
CHAPTER 4
DISCUSSION

To date, most psycholinguistic and neuropsychological research has attempted to distinguish between grammatical classes (i.e., verbs versus nouns) or between noun classes (PN versus CN) through word naming research (Papagno & Capitani, 1998). These classes are said to be independent of one another (Gontijo et. al., 2002; Milders, 2000) and this implies that they should produce behavioral differences. The Gontijo et. al. (2002) study compared CN to BN and showed that these word types appeared to be processed differently. They speculated that BN were processed more like geographic names and people names (i.e., traditional PN) than like CN, but because PN was not included, they did not make a direct comparison.

The current study supports the speculation of Gontijo et. al. (2002) in that PN and BN do appear to produce similar patterns across the range of manipulations in this study. When contrasted with CN both BN and PN are processed slower. This main effect of word type favoring CN implies a more lexicalized representation for these items relative to the other word types despite similar levels of familiarity. Such differences in lexicalization may be due to increased strength or number of connections to semantic representations for the CN. This interpretation follows the logic of the Semenza and Zettin (1988) argument regarding distinctions between types and tokens in lexical representations.

The first analysis showed a three-way interaction between case, prime, and word type. At first glance, in the UC condition, BN were shown to be intermediate between PNs and CNs. The CNs produced the slowest RTs in the UC priming condition and BNs
are behaving similar to CNs: Longer RTs are typical since CNs are not normally seen in UC. However, some BNs may have been more of an effective prime compared to other BN that are not, with some ambiguity in presentations. Some BNs are in all UC and some just presented with the first letter in UC. However, most BNs are typically seen in all capital letters (e.g., NIKE, TELUS), but some are not (e.g., Google, Reebok). Therefore, the presentations of the words themselves could have hindered the RTs for BNs in this condition.

In the alternating condition, BNs and PNs are behaving similarly and priming in the CNs condition seemed to be relatively ineffective. The CNs did not show an advantage for being preceded by a prime when that prime was presented in alternating case. One possible reason why these primes fail to increase processing speed for the target is because the lexicalization of these items is such that recognition, measured in lexical decision, is very rapid under ordinary conditions (i.e., lower case as in the targets) and so would not benefit from priming if the briefly presented prime was recognized slowly.

Because the logic behind the explanation of the difference between CNs and the other word types rests on stronger lexical representations or more connections that result in speeded response times, a second experiment attempted to reduce that speed to determine whether these items became more like PNs or BNs. This experiment produced the same main effect and advantage for CNs, while PNs and BNs again performed similarly. This interaction considered with the main effect supports the notion that BNs are intermediate between CNs and PNs.
The data from the current study adds to the literature that distinguishes among word types on the basis of behavioral responses. The crucial result from this study is that PNs appear to result in processing rates that are similar to BNs, but priming effects are more like CNs even when the fluidity of CN recognition is compromised by orthographic complexity. The differences revealed in terms of processing speed and admission of priming effects must be due to differences in lexical representations or connections relating to each of the word types lexical differences. The Type/Token distinction (Semenza & Zettin, 1988) provides us with suggestions about the source of these differences.

A type, in this case a CN, has a less restricted range of semantic associates than equally familiar tokens according to (Semenza & Zettin, 1988). Therefore, CNs have more connections to other words than tokens (BN and PN) and as with orthographic neighborhood size (Andrews, 1997), semantic neighborhood size is a facilitator under normal lexical decision conditions (Buchanan et. al., 2001). The fluidity of processing may have compromised the ability of the experiment to reveal more subtle priming effects and this was countered by presenting the targets in alternating case in the second experiment. With this additional manipulation, the word types seem dissimilar with PNs and BNs appearing more closely related than CNs, PNs, or BNs.

If the processing differences are predicated upon different levels or strengths of representation than something other than number of connections must play a role in determining that strength because BNs should have more connections than PNs, given its more general or inclusive referent group. Different from both PNs and CNs, BNs do not designate one particular object (PN) per se, they do refer to, for example, one car.
company "Nissan" (BN), but Nissan has many types of cars (e.g., Sentra) and those cars have different engine types (e.g., V6) and color paint (e.g., forest green) or exemplars (CN). Thus, Sentra is one token of Nissan and engine type is one type of Nissan. Therefore, BNs are represented differently in the mental lexicon compared to PNs and CNs in terms of the number of accessible connections, but CNs should always come out on top given this hierarchy of connections. This was the case here, but BNs appeared to be centered between CNs and PNs. This notion was demonstrated by priming effects that showed BNs to be more similar in pattern to CNs than to PNs. These differences may be explained by including emotional content as a potential source of representation strength in addition to the number of connections explanation. Such a two-source model of contributions of connections to processing could accommodate similarities between BNs and CNs in terms of priming effects and BNs and PNs in terms of processing speed. This post hoc explanation would require support from future studies.

Gontijo et al. (2002) reported similarities and differences of BNs versus CNs during a LLDT and compared BNs to PNs on several levels: capitalization and emotional content. Regarding the latter, BNs are not similar to PNs as emotionally laden items. There is not evidence for processing for BNs in the right hemisphere compared to PNs but BNs nonetheless may be less lateralized than CNs over all: In those cases where a specific BN has emotional connotations because of personal attitudes then these types of BNs should appear to be processed in the right hemisphere, much like PNs, in normal readers. This possibility by no means suggests that any or all BNs are emotional items but the question does merit further investigation.
Impaired lexical access is also seen in cases of aphasia, anomia, and Pick's disease in word-retrieval dissociations. Noun dissociations lend a hand to investigate the view of type versus tokens when patients are presented with CNs and PNs during a naming task (McNeil, Cipolotti, & Warrington, 1994; Avila et. al., 2001; Blumenfeld, 2002). These impairments have been reported in all three cases, but with no consistent findings for any model. For example, BMW showed impairment for CNs and not for PNs. A reverse dissociation has also been reported in crossed aphasia (Lucchelli & De Renzi, 1992; Cipolotti, 2000). It seems that these noun types are independent of one another indicating different representations and processing abilities within their respected brain regions (Kohn & Goodglass, 1985; Hittmair-Delazer, et. al, 1994). One theory that could go hand-in-hand with the type versus tokens is the failure of inhibition theory (FIT), which places much emphasis on the fact that in cases of dissociation the patient has trouble accessing the right noun type due to those connections not inhibited for proper item retrieval. Therefore, in the case of BMW he had failure to inhibit competing representations for types compared to token responses. So his written production was compromised for CNs. However, not much is known about the neurological underpinnings of BNs and whether or not word impairment occurs similarly to CNs and PNs. Most of this kind of research is based on marketing and advertising studies.

The results of this study support the general notion that a distinction between BN and PN is psychologically meaningful and hint that the difference may be a function of lexical strength as determined by both semantic connections and emotional importance, but the results are not conclusive at this time. The generalization of the data can be...
questioned because the sample is rather small and because the priming manipulation in the first experiment failed to distinguish between the word types. A set of additional experiments may help to resolve the outstanding questions. One set of experiments could tap the number of connections explanation for word type differences by using semantic primes for each of the items. A second set of experiments could test the hypothesized explanation for emotional content via visual field manipulations that would capitalize on the differential emotional processing reported for right versus left hemisphere. If BNs words really are less emotional than PNs, they should show relatively longer RTs when presented to the right hemisphere as well as less priming when primes are presented to that hemisphere. A first step, though, would be to simply increase the power of the current experiment by conducting a follow-up study on this work with a larger sample of participants and more complete test of the type versus token continuum hypothesis in both normals and impaired readers.
REFERENCES


Van Lancker, D. and Ohnesorge, C. (2002). Personally familiar PN are relatively successfully processed in the human right hemisphere; or, the missing link. *Brain and Language, 80*, 121-129.


APPENDIX A
CONSENT TO PARTICIPATE IN RESEARCH

How Visually Presented BN are Represented in the Mental Lexicon

You are asked to participate in a research study conducted by Darren Schmidt under the supervision of Dr. Lori Buchanan and with the assistance of Courtney Heffeman at the University of Windsor. This research is sponsored by the Social Sciences and Humanities Research Council of Canada (SSHRC). Your participation will contribute to a Master’s Thesis for Darren Schmidt. If you have any questions or concerns about the research, please feel free to contact Darren Schmidt or Courtney Heffeman at (519) 253-3000 extension 2240 or Dr. Lori Buchanan at (519) 253-3000 extension 2246.

PURPOSE OF THE STUDY
To explore the concept of BN and how they are processed when shown in print

PROCEDURES
If you volunteer to participate in this study, you would be asked to do the following things: You will be asked to complete a familiarity test and then a lexical decision task that is deciding whether the presented word is a real word or nonword. During the familiarity test, you will be asked to indicate which word is most familiar to least familiar when the word is presented on the computer screen. During the lexical decision task, you will see the individual presentation of words or nonwords on a computer screen. A word or nonword will be presented and then you will be asked to determine if you saw a real word or nonword. You will indicate your decision by pressing one of the pre-designated keys that represent each alternative. You will be asked to perform this task as quickly as you can without making any mistakes. The tasks should take you approximately 30 minutes to complete.

POTENTIAL RISKS AND DISCOMFORTS
This study does not involve any anticipated risks or discomforts.

POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY
Your participation in this study will help us learn more about how people process information about words and nonwords and about the methods we can use to investigate linguistic processing in laboratory settings. In general, this information will help us learn more about language function. You will have the opportunity to see how psycholinguistic research is conducted.

PAYMENT FOR PARTICIPATION
For your participation in this study you will be eligible for one (1) course credit (bonus mark).

CONFIDENTIALITY
Any information that is obtained will remain confidential and will be disclosed only with your permission. In order to ensure confidentiality no personal information will be in any way connected with the data you provide.

PARTICIPATION AND WITHDRAWAL
You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may want to exercise the option of removing your data from this study. You may also refuse to answer any questions you do not want to answer and still remain in the study. The investigator may withdraw you from this research if circumstances arise which warrant doing so.

FEEDBACK OF THE RESULTS OF THIS STUDY TO THE SUBJECTS
The findings from this experiment will be made available to each participant via the Research Ethics Board website (http://athena.uwindsor.ca/reb).

SUBSEQUENT USE OF DATA
This data will/will not be used in subsequent studies.

Do you give consent for the subsequent use of the data from this study? □ Yes □ No
RIGHTS OF RESEARCH SUBJECTS

You may withdraw your consent at any time and discontinue participation without penalty. This study has been reviewed and received ethics clearance through the University of Windsor Research Ethics Board. If you have questions regarding your rights as a research subject, contact:

Research Ethics Coordinator
University of Windsor
Windsor, Ontario N9B 3P4

Telephone: 519-253-3000, ext. 3916
E-mail: lbunn@uwindsor.ca

SIGNATURE OF RESEARCH SUBJECT/LEGAL REPRESENTATIVE

I understand the information provided for the study how BN are visually represented in the lexical domain as described herein. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

Name of Subject

__________________________

Signature of Subject

__________________________

Date

SIGNATURE OF INVESTIGATOR

These are the terms under which I will conduct research.

__________________________

Signature of Investigator

__________________________

Date
APPENDIX B
LETTER OF INFORMATION

How Visually Presented BN are Represented in the Mental Lexicon

You are asked to participate in a research study conducted by Darren Schmidt under the supervision of Dr. Lori Buchanan and the assistance of Courtney Heffeman at the University of Windsor. This research is sponsored by the Social Sciences and Humanities Research Council of Canada (SSHRC). Your participation will contribute to a Master's Thesis for Darren Schmidt. If you have any questions or concerns about the research, please feel free to contact Darren Schmidt or Courtney Heffeman at (519) 253-3000 extension 2240 or Dr. Lori Buchanan at (519) 253-3000 extension 2246.

PURPOSE OF THE STUDY

To explore the concept of BN and their positioning in the mental lexicon.

PROCEDURES

If you volunteer to participate in this study, you would be asked to do the following things: You will be asked to complete a familiarity test and then a lexical decision task that is deciding whether the presented word is a real word or nonword. During the familiarity test, you will be asked to indicate which word is most familiar to least familiar when the word is presented on the computer screen. During the lexical decision task, you will see the individual presentation of words or nonwords on a computer screen. A word or nonword will be presented and then you will be asked to determine if you saw a real word or nonword. You will indicate your decision by pressing one of the pre-designated keys that represent each alternative. You will be asked to perform this task as quickly as you can without making any mistakes. The tasks should take you approximately 30 minutes to complete.

POTENTIAL RISKS AND DISCOMFORTS

This study does not involve any anticipated risks or discomforts.

POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY

Your participation in this study will help us learn more about how people process information about words and nonwords and about the methods we can use to investigate linguistic processing in laboratory settings. In general, this information will help us learn more about language function. You will have the opportunity to see how psycholinguistic research is conducted.

PAYMENT FOR PARTICIPATION

For your participation in this study you will be eligible for one (1) course credit (bonus mark).

CONFIDENTIALITY

Any information that is obtained will remain confidential and will be disclosed only with your permission. In order to ensure confidentiality no personal information will be in any way connected with the data you provide.

PARTICIPATION AND WITHDRAWAL

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may want to exercise the option of removing your data from this study. You may also refuse to answer any questions you do not want to answer and still remain in the study. The investigator may withdraw you from this research if circumstances arise which warrant doing so.

FEEDBACK OF THE RESULTS OF THIS STUDY TO THE SUBJECTS

The findings from this experiment will be made available to each participant via the Research Ethics Board website (http://athena.uwindsor.ca/reb).

SUBSEQUENT USE OF DATA

This data will / will not be used in subsequent studies.

Do you give consent for the subsequent use of the data from this study?  □ Yes  □ No

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RIGHTS OF RESEARCH SUBJECTS

You may withdraw your consent at any time and discontinue participation without penalty. This study has been reviewed and received ethics clearance through the University of Windsor Research Ethics Board. If you have questions regarding your rights as a research subject, contact:

Research Ethics Coordinator
University of Windsor
Windsor, Ontario N9B 3P4

Telephone: 519-253-3000, ext. 3916
E-mail: lbunn@uwindsor.ca

SIGNATURE OF INVESTIGATOR

These are the terms under which I will conduct research.

__________________________________________  _______________________
Signature of Investigator                         Date
### APPENDIX C

#### FAMILIARITY TEST

<table>
<thead>
<tr>
<th>Real Words</th>
<th>CN</th>
<th>BN</th>
<th>PN</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Real Words</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cat, dog, cow, rat, mouse, chair, desk, computer, radio, mail, hammer, paper, book, disk, cord, mouse, shirt, pants, shoes, glasses, socks, keys, watch, clown, snake, clock, wallet, cup, car, truck, table, coat, boot, tote, bag, band, goat, star, screen, fish, stapler, pig, knife, camera, phone, fan, cake, board, pen, outlet</td>
<td>google, apple, nike, reebok, coke, pepsi, telus, ford, xerox, crest, molson, labatt, dolen, fresca, godiva, nabisco, natural, colgate, ragu, kellog, slice, spam, triscuit, tostitos, velveeta, weider, whopper, sony, lipton, nescafe</td>
<td>darren, chris, annette, courtney, noah, billy, erin, fred, greg, george, heidi, jack, jeff, lisa, laura, wendel, mike, lisa, ned, natalie, lori, peter, becky, ryan, jake, sam, steve, stef, tammy, ted</td>
<td></td>
</tr>
<tr>
<td><strong>Nonwords</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>wat, yna, bot, shd, rever, dimey, raam, astojoid, crune, rast, grines, bor, pqim, funereantlly, wool, sanny, runds, gustu, bogod, spoofing, tiles, tapk, rogen, cowzi, stram, paskis, rebute, qents, gug, quiys</td>
<td>cadxes, acque, urab, fervit, hammad, jwing, finil, herm, urmea, warxs, stront, spronts, pohn, dixces, risquo, nautili, beggury, bhutes, tasap, dretty, stife, seft, napering, paintizg, xlassing, robier, sropper, bazu, actibg, ovsteds</td>
<td>margle, nirnin, dztars, iznended, hutr, vyfhs, svar, timm, joxt, puublo, wross, coqs, banu, lich, smetb, wineoars, rars, knok, puy, glcecer, torinro, trals, loren, swey, rint, gent, kinge, axow, prame, tro</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX F
COPY OF SIGN-UP SHEET

Research Participant Board Posting

Date Posted: July 2005

Name of Researcher: Darren Schmidt

Name of Supervisor: Dr. Lori Buchanan

Contact Researcher at Telephone Number: (519) 253-3000 ext 2240
*IMPORTANT* - Do NOT call or email unless you are unable to make your appointment and need to reschedule.

Email Address: schmida@uwindsor.ca

Brief Description of Study:
You will be asked to participate in a lexical decision task (LDT). This task involves the individual presentation of letter strings on the computer screen. You will be asked to decide whether these letter strings represent real words or nonwords. The experiment should take approximately 30 minutes to complete.

Number of Bonus Points:
All participants will be eligible to receive ONE (1) bonus point.

Location and Times of the Participation Sessions:

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<thead>
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<th>Room #</th>
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<th>Time</th>
<th>To Sign Up</th>
<th>Write Name</th>
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<tbody>
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APPENDIX G
COPY OF SIGN-IN SHEET

Priming study

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# APPENDIX H
## ERROR RATES

**Table 3**

*Error rates for case and word type*

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<tr>
<td>AVERAGE</td>
<td>.09</td>
<td>.22</td>
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</table>

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VITA AUCTORIS

NAME: Darren Schmidt

PLACE OF BIRTH: Belleville, New Jersey; now a permanent resident of Canada

YEAR OF BIRTH: 1976


Confederation High School, Val East, Ontario, Canada 1995-1996 (Ontario certified diploma)

Laurentian University, Sudbury, Ontario, Canada 1997-1999

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