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"Study on Brand Names by use of Lexical Recognition Tasks"

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- So long, and thanks for all the fish.-

(Douglas Adams, 1984)

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Abstract

En primet lexical decision task ble gjennomført for å teste ulike teorier om merkenavn. Noen lingvister og filosofer argumenterer, at de er en underklasse av egennavn, og at de er direkte refererende, mens andre foreslår at merkenavn og egennavn, akkurat som vanlige substantiv, refererer indirekte gjennom sitt semantisk innhold. Basert på disse divergerende teorier ble det formulert to alternativhypoteser AH1: "Primingeffekter er forskjellige for merkenavn og vanlige substantiv' og AH2: 'Reaksjonstidmønstre er forskjellige for merkenavn og vanlige substantiv'.

En reaksjonstid-målende umaskert primet lexical decision task med en uprimet versjon som baseline ble gjennomført, med merkenavn, vanlige substantiver og non-words som target-stimuli. Fem grupper av stimuli-par ble brukt: relaterte merker og relaterte ord ble primet med vanlige substantiver som var relatert til målet i form av hyperonymi, prime-stimulusen for urelaterte merker, urelaterte ord og non-words var urelaterte vanlige substantiv. SOA var 200ms.

Analysen av resultatene fra begge eksperiment-versjoner viste ingen signifikante primingeffekter for verken merkenavn eller vanlige substantiv. Dette kan være forårsaket av å bruke ren semantisk priming som en fremgangsmåte, som er kjent for å produsere svakere primingeffekter (se Lucas 2000, Perea & Rosa 2002), i stedet for assosierende priming. Signifikante hemmende priming effekter ble funnet for urelaterte merkenavn ($p < 0{,}01$) og urelaterte ord ($p < 0{,}001$), noe som kan forklares med expectancy-effekten. Imidlertid ble det ikke funnet noen signifikant forskjell for disse effektene på merkenavn og vanlige substantiv. Dermed har NH1 blitt avvist.

Det ble heller ikke funnet noe forskjell i reaksjonstid ved analysen av resultatene fra den unprimete versjonen av forsøket, med unntak av ord fra den relaterte ord- og relaterte merkevarer-klassen, der de relaterte merker hadde signifikant kortere reaksjonstid ($p < 0{,}01$). Disse funnene kan være basert på metodiske problemer, for eksempel ulike frekvenser for target-stimulusen. For ord i den urelaterte ord- og urelaterte merkevare-klassen ble det ikke funnet noen signifikant forskjell i reaksjonstidene, det samme gjelder for en helhetlig analysen som sammenlignet alle merkenavn og vanlige substantiv fra baselinen. AH2 ble derfor avvist.

Det ble konkludert med at de hemmende priming-effekter indikerer, at behandling av merkenavn krever aktivering av det semantiske nettverket. Dette impliserer at strenge direkte

refererende teorier, som sier at merkenavn ikke har semantisk innhold, ikke kan opprettholdes.

Introduction

In this study, I investigated priming effects on brand name recognition which I compared to priming effects on common nouns. This was done by conducting an unmasked primed lexical decision task with reaction time measuring. Also, reaction times were compared for brand names and common nouns. A lot of research has been done on priming effects on nouns, but hardly any on brand names. This seems surprising, as brand names have some rather interesting properties, and their classification is quite disputable. Obviously, they are different from personal or geographical names. While a sentence like *I saw a Pepsi in the fridge* sounds perfectly fine, a sentence like ?*I saw a Peter in the subway* sounds odd. But they still share some properties with these kinds of names, that makes them different from common nouns: *the search engine Google* works, ?*the book collection library* – not so much. Then again, is there a homogenous group that fits the label brand names? Or are there indeed some brand names that act like common nouns, while others act like proper names?

In the first chapter of this work, I will examine the semantic and lexical nature of common nouns and proper names and compare two main theories on the nature of proper names, the direct reference theory and the indirect or intermediate reference theory. Based on that, I will attempt to explain, why some brand names are so hard to put a label on, and what the different theories would predict for the outcome of the experiment.

Chapter 2 describes the methods used in this experiment, namely reaction time measuring and semantic priming and the motivation to use these methods as well as the theoretic assumptions that the experiment is based on. Furthermore, the stimulus and the technical setup will be presented.

The third chapter will deal with the statistical analysis of the results, based on the two null-hypotheses ‘Priming effect is the same for brand names and common nouns’ and ‘Reaction time patterns are the same for brand names and common nouns’ and the alternative hypotheses ‘Priming effect is different for brand names and common nouns’ and ‘Reaction time patterns are different for brand names and common nouns’. It further describes the statistical methods used to analyze the data gained in the experiment and presents the results.

Chapter 4 gives an interpretation of the results in relation to the characterization of brand names and nouns in semantics as described in the first chapter.

The fifth and last chapter gives a summary of the article and addresses questions that still need to be answered as well as new questions that were raised during the work on this thesis. Further, it points out possible sources of error during the study and gives suggestions for future research.

1 – Semantic background

The difference between common nouns and names has aroused the curiosity of philosophers and linguists for a long time. One of the most obvious differences is the fact, that proper names are inherently definite, that means that they usually[1] don't need definite articles, as their semantic function involves a presupposition of uniqueness and existence and they have a fixed referent, all of which has to be established by use of determiners for common nouns (Van Langendonck 2007:154).

When Gottlob Frege (1892) discussed the distinction between sense ("Sinn") and reference or denotation ("Bedeutung") of a word, he mentions proper names, stating that they do have meaning, even though the content of the meaning might depend on the speaker's knowledge of or attitude towards the person referred to[2]. Although Frege generally calls all nouns "Eigennamen", 'proper names' and attempts to treat proper names and common nouns similar, he does acknowledge that 'actual' proper names and common nouns differ in the latter having an objective meaning, while the meaning of proper names tends to be somewhat subjective, reflecting the individual's attitude towards the person or entity referred to by the name. The reference is then established through the sense of the name. Later philosophers, like Kripke (1980) argued, that proper names don't are referential through sense, further claiming that they don't attribute to the propositional content apart from determining the referent, but instead are directly referential.

Both positions are based on the assumption that the phonological or orthpgraphical representation of a word, or broader spoken a *sign*, activates a mental concept, also called *meaning*, *sense*, *connotation* or *intension*, which then refers to an object, called referent, denotation or extension, with the relation between the sign and the object being arbitrary (Cunningham 2006). The use of these terms often varies and they are often used in conflicting ways. In this study, I will use the term *meaning* to broadly describe "whatever comes to mind, when someone says the word" (Traxler 2012:83), while *sense* refers a bit more specifically to the conceptual properties assigned to a word, "represented by a set of nodes and links between

1 geographic names are special here, since mountains and rivers usually require the definite article

2 One should keep in mind that Freges definition of meaning differs a lot from nowadays definition of lexical meaning (Van Langendonck 2007).

them" (ibid.). The word *referent* then describes the object denoted by the word, with *reference* being the act of denoting an object, as depicted in fig.1.

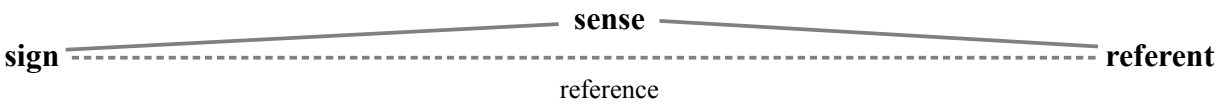


Figure 1: Relation between sign, sense and referent

Today, in addition to the lexical meaning, other properties are being used to distinguish proper names from common nouns, such as grammatical features or pragmatic properties.

In the following sub-chapters, I will present some definitions for common nouns and proper names, based on semantics and logic.

1.1 – Common Nouns

Oxford dictionary defines a noun as

> "[a] word (other than a pronoun) used to identify any of a class of people, places, or things (common noun), or to name a particular one of these (proper noun)".
>
> (Oxford Dictionary Online 2016a)

Both common nouns and names are thus considered nouns. Indeed, especially in language philosophy, both are often referred to as names (Frege 1892, Kripke 1980). Without denying that categorization, I use the terms *common noun* and *proper name* in this paper, to make the distinction more clear. This counts also for indirect citations from other works, where I will adapt the terminology to the one I use in this work.

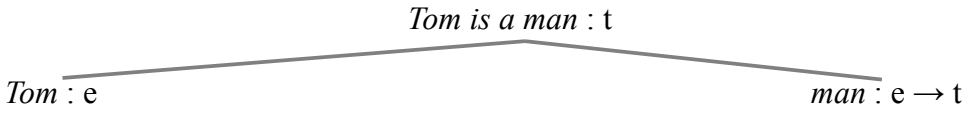
According to Cann et al. (2009:49), common nouns, just like verbs and adjectives, are classified as predicates in predicate logic. Nouns are single-place-predicates, that means they take one argument and combine with it to form a propositional formula. Thus a sentence like

> *1) Tom is a man.*

would be translated into predicate logic formula as *Man(Tom)*, or *M(a)*. Note that the name *Tom* is treated as an individual constant.

In type logic, the fact that common nouns act as predicates is reflected in them being of the type $e \rightarrow t$, where *e* referes to an entity and *t* refers to a truth-value (cf. Cann et al. 2009: 85) So what a noun in type logic basically does, is to take an entity and produce a truth value. If there is an entity, then a truth value of the type 1/true or 0/false will be produced, 1 if the

entity complies to the sense of the noun and 0 if it doesn't. For the sentence in 1), with *Tom* being of the type e, and *man* being of the type e → t, that can be illustrated like this:



Thus, a common noun is not directly referential, it is only referential by its sense. When using a common noun, one refers to a set of concepts, its sense, which defines a class of entities.
In other words, the signifier (in oral speech that would be the phonological representation) of a common noun activates the nodes of corresponding concepts in the recipient's brain, representing the sense, who then matches the received information of meaning to the context, trying to find an entity that is a part of the defined class.
Because of the intermediate reference through sense, it is possibly to convey additional meaning that goes beyond the sheer denotation of the referent. While every of the following words might be used to refer to the same woman in the same situation, the use of each specific common noun alternates the propositional content of the utterance, while at the same time revealing information about the mindset of the speaker and his attitude towards the referent: *female* vs. *woman* vs. *bimbo* vs. *bitch* and so on.

1.2 – Proper Names

As seen in the dictionary entry for *noun* (Oxford Dictionary Online 2016a), proper names are thought of referring to one particular entity, unlike common nouns, who refer to classes of entities. Beyond the referential difference, there are some grammatical features, that distinguish proper names from common nouns. Van Langendonck (2007:182) lists some of them:
They can systematically appear in close appositional structures, such as *Hurricane Edna*, *the poet Burns*, *Fido the dog* and so on. They "do not take restrictive modifiers or quantifiers, cannot function as predicate nominals and are the weakest anaphoric elements". They are "inherently definite", and most proper nouns are "singular, countable, nonrecursive and show third person on the lexical level" (Van Langendonck 2007:182).
While there is little dispute about the fact that common nouns have sense, both linguists and philosophers heavily disagree on the nature of proper names. Roughly said, there are basically two opposite views on the question of whether names have meaning or not. The first view, the

mediated or indirect reference theory, whose roots are dating back to Frege (1892), states, that proper names have sense which contributes to the propositional content of a sentence and that the mechanism of reference is the same as for common nouns, intermediated through the sense (cf. Sullivan 2006). The degree of sense indirect reference theorist assume in a proper name differs. Frege and Russell (1905) state that a proper name can be substituted with a definite description, such as "the first African-american man in history who became president of the United States" for Barack Obama. The sense of the name would thus be the same as the meaning of the definite descriptions referring to the same referent. Others argue that the sense of a proper name is more limited, containing "only the nominal property of being the name of its bearer(s)" (Katz 2001:139). In 1.2.1 I will present different variants of the indirect reference theory.

The other theory, the direct reference theory, going back to John Stuart Mill (1843), states the opposite: A proper name refers directly to the referent, much like indexical expressions such as *I* or *yesterday* (cf. Sullivan 2006). For proper names, this reference can for example be based on convention, or a chain of reference, where one speaker used a proper name to refer to an entity, and others followed this usage. Even though some proponents of the direct reference theory don't generally reject the idea of proper names having meaning, the meaning is not considered determing the referenc (Van Langendonck, 2007) and does not affect the propositional content (Sullivan 2006).

In type logic, proper names have the type *e*, which reflects the predicate logic's classification of proper names as individual constants. They don't have predicate status and don't contribute any meaning to the proposition apart from denoting the referent (Cann et al. 2009).

1.2.1 Indirect Reference Theory

As we have seen earlier, Frege (1892) generally referred to nouns, thus both common nouns and proper names as "Eigennamen", literally 'proper names'. He did so, because he was convinced that proper names (in the modern sense) refer the same way common nouns do, by sense. That entails, that the propositional content of an utterance can be varied by using a different proper name to refer to the same referent. That would not be possible, if the only contribution of the proper name was the referent. One of the more famous examples for this argumentation comes again from Frege (1892:32, own translation), who said that the sentences "Hesperus is a [celestial] body, illuminated by the sun" and "Phosphorus is a [celestial] body, illuminated by the sun", even though both having the planet Venus as

referent, have a different meaning, and a person could easily think that one of the sentences is true, while assuming the other one is wrong, for example thinking of Hesperus as a star, while falsely believing that Phosphorus is a planet. At the same time, a sentence like “Hesperus is Phosphorus” provides new information, while a sentence like “Venus is Venus” would be semantically tautological.

In response to criticism from the direct reference theory, which showed that definite descriptions are insufficient when it comes to referring to the bearers of proper names in possible-world-scenarios (see 1.2.2), newer accounts on indirect reference use different definition of sense, such as Katz (2001:139), who says that the sense of a proper name N is “the thing which is a bearer of ‘N’”. A similar view was proposed by Searle (1958:173), who said that proper names can have sense “in a way”, if sense is understood as being “logically connected with characteristics of the object to which they refer”.

Chalmers (2004) on the other hand replaced the Fregean definition of sense with the concept of *intension*, which was defined by Carnap based on Fregean sense as followed:

> “That a predicate 'Q' in a language L has the property F as its intension for [Speaker] X, means that among the dispositions of X constituting the language L there is the disposition of ascribing the predicate 'Q' to any object Y if and only if Y has the property F.”
>
> Carnap (1955:35).

This definition is a lot more specific than Frege’s definition of sense and was later expanded to the definiton “an intension is a function from possibilities to extensions” (cf. Chalmers 2004:156) which enables Chalmers to argument for intermediate reference by means of two-dimensional semantics, rebuffing possible-worlds-argument used by proponents of direct reference theory. According to him, in two-dimensional semantics, every expression has two intensions, called *1-intension* for a first-dimensional intension and *2-intension* for a second-dimensional intension. The possibilities evaluated in the first dimension are the ones that a speaker in his world would see as possible based on the nature of his world and his perspective, while the second-dimensional possibilities are meant to be possible worlds, that is worlds, that can differ in any distinctive way from the speaker’s world. The 1-intension is the sense of the expression in the speakers world and perspective, whereas the 2-intension is the referent of the 1-intension in the speakers world and extension (cf. Chalmers 2004:160)

When applied to the Venus-example, 'Hesperus is Phosphorus', the 1-intension of these two could be described as 'the evening star' and 'the morning star'. If the same statement was uttered in other worlds, one of them could be a satellite and one of them could be Mars, in which case the statement was wrong. But in the actual world, both refer to Venus, which makes the statement correct. The 2-intension of this statement is thus 'Venus'. If 'Venus' is 'Venus' in every possible world, then the statement would be true in all possible worlds. As 'Venus' only property consists of being 'Venus', this statement thus is true in all possible worlds (cf. Chalmers 2004:160-161).

As we have seen, the indirect reference theory states, that proper names have at least a rudimentary semantic content, thus semantic concepts which are a part of the semantic network, and would thus be subject to spread activation processes. If the indirect reference theory is true and if brand names behave like proper names, then brand names should show semantic priming effects, the same way as common nouns do. A lack of these effects for brand names but not for common nouns would be hard to explain by means of indirect reference theory, but of course that doesn't necessarily mean, that semantic priming effects on brand names would prove this theory right. As we will see in 1.2.3, brand names might not even necessarily be proper names. Instead, a part of them might be common nouns.

1.2.2 Direct Reference Theory

The direct reference theory is closely associated with John Stuart Mill. In his book "A system of logic (1843: 22) he wrote: "A proper name is but an unmeaning mark which we connect in our minds with the idea of the object", further stating, that proper names denote the referent directly, without intermediate sense. Katz (2001) summarizes his view on direct reference as follows:

> "Proper names are not connotative. They denote the individuals who are called by them; but they do not indicate or imply any attributes as belonging to those individuals"
>
> (Katz 2001:137)

Later, this view was challenged by Frege and Russel, who argued that different proper names referring to the same entity could best be explained with the names having sense. In 1972, Saul Kripke revisited Mills theory, stating that proper names are rigid designators (Kripke 1972:9). On of his main arguments against indirect reference of proper names is based on possible-world scenarios. As Frege (1892) claimed, a proper name could be substituted by a

definite description based on the sense of the name. For example, Barack Obama could be described as 'the first African-american president in the history of the United States' and 'successor to George W. Bush'. If one now would think of a world, where Barack Obama had lost the election in 2008, neither of these statements were true. At the same time, one could think of a world where historians found out, that one of the former presidents had indeed African-american roots, and so on. That way, for every definite description referring to Barack Obama in our actual world, one could find a possible world where none of them refers to Barack Obama. Still, as Kripke (1972) claims, the proper name 'Barack Obama' would refer to Barack Obama, whether he's president or not.

To avoid such problems inherent to definite descriptions, Kripke (1972) suggests a model he calls the *chain of communication* or *causal chain*, to explain how reference is established for proper names:

> "An initial baptism takes place. Here the object may be named by ostension, or the reference of the name may be fixed by a description. When the name is 'passed form link to link', the receiver of the name must […] intend when he learns it to use it with the same reference as the man from whom he learned it."
>
> (Kripke 1972:96)

The last part is important, since it states that one can use a name for a different reference, if one intends to do so. The causal chain would then be interrupted and a new chain would begin. Likewise, to different chains of communication could refer to the same entity, as with Hesperus and Phosphorus, both referring to Venus via different chains.

One of the fundamentals of direct reference theory is the concept of rigid designation, which states that some expressions, among which are proper names, designate the same referent in every possible world (Kripke 1972:49). In terms of the earlier example: It is possible to think of Barack Obama not being president, but it is not possible of thinking of Barack Obama as not being 'Barack Obama'. Kripke and Putnam (1975) suggested, that this even might count for pronouns and certain common nouns like 'water', so called *natural kinds*. Accordingly, what we know as water and may define as 'watery stuff', is referred to by a clausal chain and therefore, if there was a possible world where there was some watery stuff that would meet all descriptions we have for water, but was in fact chemically different, it could not be referred to as water (Putnam 1975).

Van Langendonck (2007:36) rejects this expanded use of direct reference and argues that only proper names directly refer rigidly, whereas natural kinds are rigid due to the rigidity of their sense. He makes a distinction between the lexical item of a proper name, which he calls a *proper lemma* and its actual use as a proper name. Further, he argues that proper names have sense in the form of associative and categorical meaning[3], which in primary use doesn't determine the referent or contribute to the propositional content of an utterance. But they can also be used as common nouns, in which case the categorical and associative meaning determines the reference and contributes to the propositional content (Van Langendonck 2007:11). Thus, not every use of a proprial lemma is considered a proper name. As we will see in 1.2.3, this approach will be interesting in the case of brand names, which often are used as common nouns.

Evidence for direct reference theory comes from neurolinguistic research, such as Semenza & Zettin (1989), who reported the case of a brain-injured patient who suffered of a rare type of aphasia disturbance, that consisted in the inability of retrieving proper names, whereas he showed no significant trouble with retrieval or comprehension of common nouns and comprehension of proper names seemed intact as well. In Semenza & Zettin (1988), they further showed that semantic cues didn't help the patient retrieving names, which leads them to the assumption, that proper names are directly referential. Also, they state that the mental lexicon might be organized in categories, where names would have their own category.

These findings were further supported by a study by Bayer (1991), which was translated and summarized by Van Langendock (2007:110-12): In this study, Bayer reports the case of a patient suffering from 'deep dyslexia', who can not process words via grapheme-phoneme transmission, but instead interprets words and morphemes holistically, skipping the phonological resolution and instead directly accessing her semantic lexicon. When it came to common nouns, this patient frequently exhibited paralexia, where, when asked to read a word, she would name a semantically related word instead. However, she was basically unable to read proper names. Van Langendonck attributed this to the weak semantic content in proper names.

As we have seen, more recent proponents of the direct reference theory don't necessarily deny the existence of some sort of sense in proper nouns, with some, like Van Langendonck,

3 The categorical meaning of the name *John* for example would include the categorical meaning 'man'.

admitting that proper names have associative and categorical meaning. One thing all direct referentialists can agree on, is that proper names don't contribute any propositional content to the expression they are used in apart from denoting their referent. Further, the semantic sense of proper names except from categorical or associative meaning is regarded non-existent or very weak. In terms of my study, one could conclude that brand names, granted they are proper names, should be expected to show weaker or no priming effects, if the strict direct reference theory is true, while a less stricter version of the theory, such as proposed by Van Langendonck, could explain semantic priming effects due to the categorical meaning.

1.2.3 Are Brand Names Proper Names?

Even though brand names are usually considered as a subcategory of proper names, they exhibit some deviating behavior compared to other common names. In particular, they appear much more often with a definite article, as in *Could you give me the pepsi?*. This was also observed by Semenza & Zettin (1988), who excluded brand names such as Coca-Cola from their study, "since there is no way of being sure how a subject would represent them in his/her semantic system", arguing that, even though they are proper names, they were "somewhat ambiguous" (Semenza & Zettin 1988:714). Indeed, Gonjito et al. (2002) suggest, that brand names should be assigned a special neuropsychological status, as they were, just like proper names, significantly less lateralized than common nouns. Nonetheless, in their experiment, a lateral lexical decision task[4], they found that brand names behave much like common nouns in exhibiting significant length effect, i.e. increasingly higher reaction times the more characters a word has, only in the left visual field.

However, some of the special behavior of brand names might stem from the fact, that the category 'brand names' might be misleading. Instead, one might look at brand names as a heterogeneous group consisting of common nouns and proper names. If, like in Gonjto et al. (2002), these different nouns are treated as one group, the results might be misleading. Darren Schmidt (2011) conducted a lexical decision task, testing brand names, proper names and common nouns. He divided brand names into two groups, ambiguous brand names and unambiguous brand names. Ambiguous brand names are brand names, that are used like common nouns, not showing the typical grammatical features of proper names (see chapter 1.2), whereas non-ambiguous brand names behave like prototypical proper names. In terms of

4 a lexical decision task, where the participant's head is fixated and words are presented either on the left side or the right side of the visual field

reaction times, ambiguous brand names were quite similar to common nouns and both produced lower reaction times than non-ambiguous brand names and proper names. However, he too concludes that brand names might have a special status.

I would instead argue, that some brand names, the one Schmidt (2011) called ambiguous, are common nouns, whereas others are proper names. It is not unusual, that proper names over the course of time change their lexical status and become common nouns. A famous example is the Latin name *Caesar*, that later was used as a byname by the roman emperor and later became the common noun *Kaiser* (meaning 'emperor') in German (see Kluge & Seebold 2001:460). In American jurisprudence, the case of a brand name becoming a common noun is subject to legal disputes, as a brand can be deleted from the federal trademark register as soon as it becomes a status as generic common noun not only for the branded product but also for similar products from other brands (see Folsom & Teply 1980) and strategies have been developed to avoid brand names becoming generic, a process referred to as "genericide" (Taylor & Walsh 2002). One of the famous examples for a brand name becoming a common noun is *cola*, which the Coca-Cola company unsuccefully tried to defend as their trademark, and which subsequently shifted from using *Cola* to *Coke* (see ibid.). As Schmidt (2011) has shown, brand names which appear as common nouns show similar reaction times as prototypical common nouns in lexical decision tasks, whereas it is not quite clear, whether proper names are generally processed slower than common nouns (Gontijo et al. 2002, Schmidt 2011) or at the same speed (Peressotti et al. 2003).

Whether one is willing to follow my assumption, that the label 'brand names' actually refers to a group consisting of proper names and common nouns or not: When it comes to semantic meaning of brand names, it is very like that they have at least some associative and categorical meaning, such as Van Langendonck (2011) assumes it for proper names, or even semantic sense as we find it in common nouns. A study by Crutch & Warrington (2004) based on a series of experiment with a patient suffering from semantic access dysphasia showed that, when asked to assign a matching picture from a selection of four pictures to a brand name or proper name, the patient had problems assigning brand names to the correct picture of the brand product when the other pictures showed products from the same product category. A similar effect was observed for person names, where the patient scored worse in assigning the right picture to a person name, when the other pictures presented showed

persons who had the same profession as the person in question. This can be interpreted as evidence that proper names are organized by associative or categorical meaning.

1.3 Conclusions for the experiment

Over the past decades, it seems as though the main difference between the direct reference theory and the intermediate or indirect reference theory has narrowed down to the question, whether or not names contribute to the propositional content of an expression apart from denoting their referent (cf. Sullivan 2006), while some of the proponents of the two different theories would agree on proper names having some meaning (e.g. Van Langendonck 2007 and Katz 2001), even though it is more rudimentary compared to proper nouns. As for the question, if the meaning of the word or meaning associated to the referent contributes to the propositional content of an expression, my experiment will not bring any answers, as this seems to be more of a philosophical question. But when it comes to the sense of brand names, it might do so, at least when it comes to the stricter direct reference-account, that proper names, including brand names, have no or very limited semantic content. If that was true, then brand names in this experiment should not show priming effects, or at least much weaker priming effects than common nouns. It is that stricter, older position of direct reference theory that is often argued for in psycho- and neurolinguistic studies (eg. Semenze & Zettin 1988, 1989, Bayer 1991, Gontijo et al. 2002).

Referring the question of reaction times for common nouns and brand names, we might get some interesting results from the unprimed version of the experiment. It is a known phenomenon that words with little semantic richness exhibit higher reaction times than semantically rich words (see Pexman et al. 2003, Robert & Duarte 2016). If thus the brand names in this experiment would show significantly higher reaction times than the common nouns, this would support the views, that proper names have no or only rudimentary semantic content.

Regarding the nature of the words summarized under the label ‘brand names’, the experiment might not bring any more clarity, since I chose to use both brand names that act like prototypical proper names and brand names, that act more like common nouns, in convention with the predominant view that brand names are a homogenous group. To find significant

differences between different types of brand names, one would have to conduct an experiment that focuses exclusively on brand names, to collect enough data for solid and legit statistical analysis.

2 – Methods

This chapter describes the theoretic framework and motivation of the experiment as well the technical implementation and the stimulus used.
The general idea with the experiment was to measure reaction times on primed and unprimed brand names and common nouns, in order to see if priming effects and/or reaction times differ between those two categories. In the first sub-chapter, 2.1, I will account for the use a lexical decision task with reaction time-measurement as the tool of choice and why priming effects were investigated. Also, the research hypotheses will be presented and motivated.
The second sub-chapter, 2.2, describes the selection of the stimulus, including a description of the non-words
Sub-chapter 2.3 gives an overview of the participants in terms of age, gender and social background.

2.1 – Theoretic Framework of the Experiment

The design of the experiment can be summarized as a reaction time-measuring unmasked primed lexical decision task. In 2.1.1, I will state and explain the research hypotheses. Sub-chapter 2.1.2 gives a definition of lexical decision tasks and summarizes what assumptions they are based on and what reaction times can tell us about the mental processes involved in these kind of tasks. In 2.1.3 I will have a closer look at the nature of semantic priming and the history of research on that issue.

2.1.1 Research Hypothesis

As pointed out in chapter 1, there are good reasons to believe that there might be a difference in priming effects on brand names and proper nouns due to different lexical features. Also, it is not quite clear whether reaction times for brand names are generally higher or lower than for proper nouns, whereas differences in reaction times between these two categories could tell as a lot about the question, whether brand names have semantic content.
This leads to the following two null-hypotheses:

NH1: ‘Priming effect is the same for brand names and common nouns’

NH2: ‘Reaction time patterns are the same for brand names and common nouns’

And the corresponding alternative hypotheses:

AH1: ‘Priming effect is different for brand names and common nouns’

AH2: ‘Reaction time patterns are different for brand names and common nouns’.

To test the first null hypothesis, date from both the primed and the unprimed version will be analyzed and compared. To test the second null hypothesis, data from the unprimed version will be analyzed.

2.1.2 Reaction Times and Lexical Decision Tasks

Lexical decision tasks in connection with reaction time measuring have been one of the most common tools in psycholinguistic research. Some of the first one to conduct priming experiments involving word recognition with the reaction time being measured were Thomas K. Landauer and Jonathan L. Freedman in 1968 (see Landauer & Freedman 1968), based on earlier experiments with a word recognition layout (e.g. Solomon & Howes 1951). From back then, the basic setup has not changed a lot. A string of letters is shown to a participant, who then has to decide whether or not that string is a word, by pressing one of two buttons, one for ‘yes’ and one for ‘no’. The reaction time, that is the time passing from the onset of the stimulus until a reaction has been recorded, is then recorded for each of the letter strings. When, as in the case of my study, a prime stimulus is used before the target stimulus, the reaction time is measured from the onset of the target stimulus. At the same time, the correctness of the answer will be recorded. A high percentage of wrong answers for a particular word for example would indicate an average low familiarity with that word, whereas a high error rate with a non-word can indicate that the participants were tricked by the non-word’s phonotactical well-formedness (see Berent et al. 2001).

The general idea behind measuring the reaction time in lexical decision tasks, is that the more complex the mental process behind word recognition is, the higher the reaction time will be (Garman 1990, Traxler 2012). This counts even for non-words: It takes longer to reject phonotactically legit non-words than to accept real words. This can be explained with the lexical system unsuccessfully trying to find the corresponding phonological representation, which is “exhaustive and fruitless” (Garman 1990:268).

2.1.3 – Priming

A simple definition of priming is provided by Traxler (2012, p. 84):

> *"Priming occurs when presenting one stimulus at time 1 helps people respond to another stimulus at time 2".*

Nowadays, priming is a well-known phenomenon within linguistics and psychology and a lot of research has been done in that area. Probably one of the earliest examples of lexical decision tasks investigating priming effects by means of reaction times was conducted by David E. Meyer and Roger W. Schvaneveldt in 1971. They discovered that subjects needed significantly less time to identify a pair of strings as real words, when those two words were associatively or semantically related, such as "BREAD", "BUTTER" or "NURSE", "DOCTOR" (Meyer & Schvaneveldt 1971). Even though the two strings were presented at the same time, the observed effects fall under Traxler's definition, since the subjects, as Meyer and Schvaneveldt pointed out, obviously read the two words one after another. Note that Meyer and Schvaneveldt didn't distinct between semantic priming and associated priming, with some pairs, like "BREAD" and "BUTTER", being mostly associatively connected[5], while pairs such as "DOCTOR" and "NURSE" were also semantically related. While Meyer and Schvaneveldt were among the first ones to conduct experiments on priming, they were far from being the first ones to describe general priming effects. Bargh (2014) notices that Karl Lashley (1951) described carryover effects already as early as 1951.

The difference between semantic priming and associative priming lies in the connection between the concepts. When two concepts are associatively related, they often co-occur, that is they are often used in the same context, such as "police" and "jail". They don't necessarily share common properties. Semantically related words on the other hand share common features, for example "horse" and "pig", who are both mammals, both domesticated and so on (cf. Traxler 2012). However, as the examples from Meyer and Schaneveldt's (1971) study show, words are often related in both ways and it isn't always easy to tell, whether a priming effect was caused by associative or semantic relatedness.

It is important to note, that there is some evidence leading to the conclusion that priming by association and semantic priming should be treated as two different effects (Perea & Rosa 2002). The stimulus used in this experiment was mainly semantically related, as semantic relationship in terms of hyperonomy is, in the matter of brand names, methodologically

5 Of course one can argue, that there is some semantic relationship, too. Bread and butter are both comestible goods, but certainly the associative connection is much stronger here.

cleaner to determine than associative priming. As one can see in appendix 1, frequencies for brand names tend to be rather low, thus a corpus-based selection of co-occuring nouns for these brand names would have been based on too little numbers to produce reliable results.

Semantic priming effects can be explained with the Semantic network theory, which says that "a word's meaning is represented by a set of *nodes* and the *links* between them" (Traxler 2012:83). This network of links between these nodes facilitates *spreading activation*: When activating the node representing one word, activation of other nodes who are connected to that node occurs. The more common properties a concept shares with the originally activated concept, the stronger the co-activation will be (see Collins & Loftus 1975). The so activated concepts can again activate other concepts who share common properties with them, but not necessarily with the originally activated concept (Traxler 2012:85). This way, even words that aren't directly semantically related can cause priming effects on words through an intermediate concept that shares properties with both the prime and the target word's concepts, such as "MANE" and "TIGER", mediated through "LION" (McNamara & Altarriba 1988). However, "the amount of activation that arrives at a node is a decreasing function of the number of nodes the activation has traversed" (Ratcliff & McKoon 1981), that means the priming effect through mediate activation is weaker than through direct activation and the more nodes there are in between, the weaker the effect, until it finally fades out. Spreading activation is an automatic and subconscious process, that happens very fast and can not be controlled (cf. Traxler 2012:84).

In the execution of priming experiments, one can differ between masked priming and unmasked priming. While in unmasked priming, the prime stimulus is immediately followed by the target stimulus, in masked priming a brief exposure to the prime stimulus is directly followed by a graphic pattern mask with the same dimensions as the prime stimulus, which then itself is followed by the target stimulus. Generally, in addition to the pattern mask impeding the conscious perception of the prime stimulus, the time interval in which the prime stimulus is presented, tends to be shorter in masked priming setups. As a result, the subjects in the experiment are usually not able to consciously read the prime word or even notice there being a prime word at all (cf. Garman 1990). According to Garman (1990:294), the "semantic priming effect is observed even where the subject cannot report the existence or identity of the first, masked, word". Masked priming experiments thus gives further evidence, that priming is an automatic and subliminal process, and can be used to avoid expectancy, i.e. the paticipant

adapting an intentional strategy to conclude on the target stimulus by analyzing assumed patterns in the prime stimulus (see McNamara 2005).

In both masked and unmasked experiments, the priming effect increases to a certain degree with higher stimulus onset asynchrony (SOA), which is the time interval between the onset of the prime stimulus and the onset of the target stimulus. However, long SOAs of more than 1000ms can lead to higher reaction times and eventually a reduced priming effect (De Groot et al. 1986, Vorberg et al. 2003). Having in mind that the difference in priming effects on brand names and common nouns might to be rather small and hard to detect, I used an SOA of 200ms in this experiment, which increases the priming effect compared to the use of SOAs of 50 or 100ms.

2.2 – About the Stimulus

In this study, I used three types of target stimuli: 48 Non-words, 48 brand names and 24 common nouns. All words used were Norwegian, the brands were partially Norwegian, partially international, but all of them were used in Norway and could be found in the Norwegian Newspaper Corpus Bokmål (2016). The detailed list of the stimuli, along with their frequencies, is documented in Appendix 1. In the primed version of the experiment, these were paired with common nouns as prime stimulus.

Prime (only in primed version)	Target	Class
brus	PEPSI	related brand a
brus	COCA-COLA	related brand b
brus	SOLO	related brand c
brus	COLA	related word
sesong	GOOGLE	unrelated brand
eple	SOFA	unrelated word
kasse	TRÅRNE	non-word

Table 1: Examples for the different stimulus classes

The experiment consisted of three blocks as described in chapter 2.4. Within each block, 5 different classes of items were presented: 12 related brands, 12 related words, 12 unrelated brands, 12 unrelated words and 48 non-words. Both in the primed and in the unprimed version of the experiment, the non-words and the common nouns were the same in all the three blocks, as well as a part of the brand names (those tagged as ‘unrelated brand’ in the stimuli

list in appendix 1 and in table 1). For these items, only the reaction times from the first block were used. Only the brand names tagged as 'related brand' varied for each block, with Block A using the brands marked as 'related brand a', Block B using 'related brand b' and Block C using "related brand c". The block order for each participant can be seen in App. 1.

In the primed version, the following pairs of prime and target stimuli were used:

'related word' and 'related brand'

Related pairs consisted of a common noun as prime stimulus and a brand name or a common noun as target stimulus. Pairs with a common noun in the target position were tagged as 'related word' and pairs with a brand name in the target position were tagged as 'related brand'. The targets were chosen such that there was a common noun describing a product or service and three names of brands operating in that field of business, for example *COLA*, *PEPSI*, *COCA-COLA*, *SOLO*. The corresponding prime word was a common noun acting as a hyperonym to the targets, i.e. as a superordinate category or concept, including other categories or concepts (Cruse 2006), as depicted in fig.2. In this example, the prime stimulus would be *BRUS* (="soft drink"). The brand names used were partially prototypical proper names (eg. *Telenor*), whereas others are less prototypical (e.g. *Pepsi*), reminding more of common nouns than of proper names (see chap. 1.2.3).

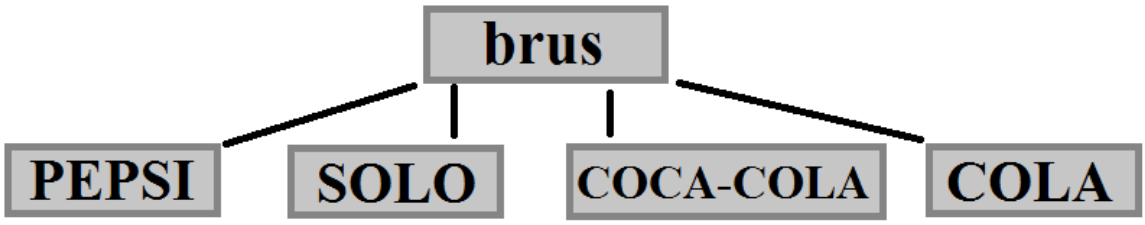


Figure 2: Relation between the targets and the primes in related pairs

'Unrelated' pair

Unrelated pairs consisted of a common noun as prime stimulus and an unrelated brand name or common noun as target, such as *område* and *SAMSUNG* or *gate* and *BOKS*. The pairs with a common noun as target were tagged as 'unrelated word' and the ones with a brand name in the target position were tagged as 'unrelated brand'.

Non-word pairs

Non-word pairs consisted of a common noun as prime stimulus and a non-word as target, such as *kasse and TRÅRNE*.

The non-words were designed to be phonotactically well-formed in Norwegian, since ill-formed non-words are more likely to be excluded as potential words and therefore rejected more quickly (Berent et al. 2001). Most non-words were created using Wuggy (Keuleers & Brysbaert 2010), a multi-lingual non-word generator with which the letters of the 200 most frequent common nouns found in the Norwegian Newspaper Corpus (2016) were rearranged in a phonotactically well-formed way.

In the unprimed version, who served as baseline to test priming effects, the same list of stimuli was used, limited on the target stimuli, as no prime stimulus was used. The target words were tagged with the same tags as the corresponding words from the primed version, to simplify analysis. Note that the names for the different stimuli-classes are just labels. When talking about 'related words' in the unprimed version of the experiment, this serves only the purpose of pointing out, that the nouns subsumed under this label are the same as the ones who were used as target stimulus in related word-pairs in the primed version of the experiment. The same goes for 'related brands'. 'Unrelated words' are common nouns and 'unrelated brands' are brands, which in the primed version have been used in pairs with unrelated common nouns as prime stimulus. I chose to use the word 'word' in the labels, because it is shorter than the term 'common noun', and since both proper names and common nouns are usually seen as nouns, the word 'word' isn't more ambiguous than the word 'noun' might have been in that context.

2.3 – Participants

The 36 participants[6] were mainly students who were recruited from a student pub in the Faculty of Humanities at the University of Bergen. They participated voluntarily and without compensation. The participant's age ranged from 19 to 30 years, with an average age of 23,92 years, a median of 24 and a mode of 22. Out of 36 participants, 13 (36,1%) were female and 23 were male. All participants were native speakers of Norwegian. Half of the participants

6 The results from one participant, subject-number 007, could not be used due to a technical problem. Therefore, the number 007 is missing in the participant list.

took part in the primed version of the experiment, while the other half took part in the unprimed version.

For a detailed list of the participants, see App. 2.

2.4 – Technical Setup and Procedure of the Experiment

The experiment was conducted in a sound-insulated room, using the experiment software Cedrus SuperLab and a Cedrus RB-530 response pad with 5 buttons, one of them red and one of them green (see fig. 3). SuperLab was running on a MacOS system, connected via HDMI-port to a 24” display with 4ms response time.

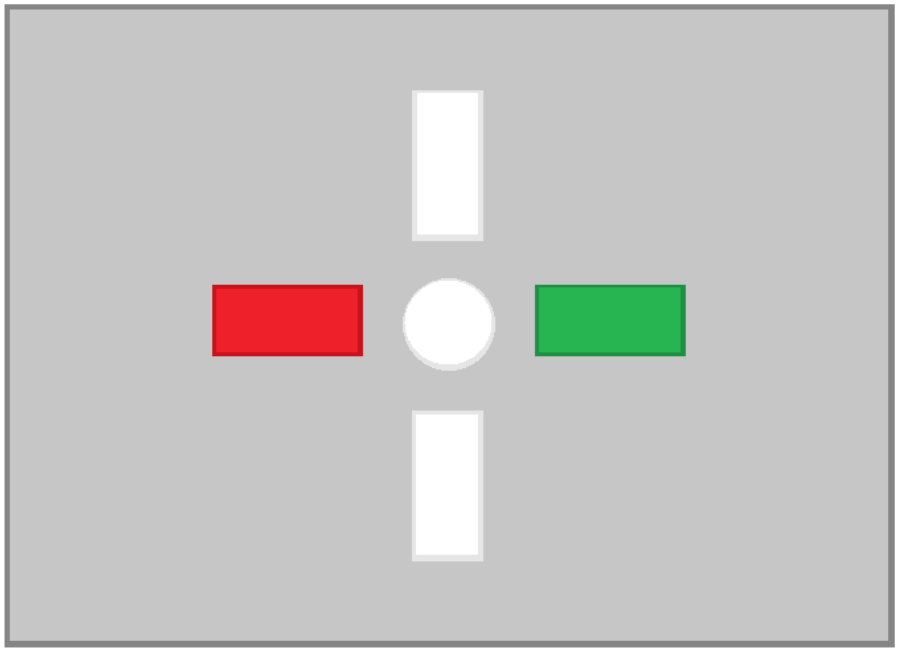


Figure 3: Drawing of the Response Box Design used in the Experiment

Prospect participants were interviewed on their proficiency in Norwegian to ensure that all participants were literate and spoke Norwegian on a native level. They were advised of the fact that, during the course of the experiment, they would be exposed to a flickering screen, to prevent triggering of photosensitive epilepsy. When found eligible for participation, the participants' age and gender was registered (see Appendix 2). The participants were assigned a participant number, to ensure anonymity. Then an oral summary of the instructions for the experiment (see Appendix 3) was given, with emphasis on the fact that the participation is strictly voluntarily and that the participants are free to leave the experiment at any given time. In addition, participants in the primed version of the experiment were instructed to react only on the target words written in capitals, not to the prime words written in small letters. At the

beginning of each block, the before mentioned instructions in Norwegian language were displayed on the screen and the participants were asked to start the experiment by pressing any button as soon as they had read and understood the instructions.

The stimulus was presented in three blocks as described in 2.2. Each block started with 6 warm-up events, where the response was not recorded. Each of the block had a pause after 49 events, with the pause screen reading “Please take a break. Press any key when you are ready to continue”. The participants were orally instructed to take this pause as long as they wanted and could proceed with the rest of the block by pressing any button on the response pad. After each block, a message appeared, asking the participants to inform the experimenter in order to start the next block of the experiment. The blocks were manually randomized, the block order for each participant is documented in Appendix 2. The next block then was started manually by the experimenter. This procedure stems from the original plan of conducting the study in a way that each participant would only be presented one of the three blocks. This plan was later abandoned due to the much higher number of participants required for that approach. While it would have been technically easy to present the three blocks fully automatically to the participant, the manual solution was kept for several reasons. Trial runs of the experimental setup had shown that participants tended to take rather short breaks, often around 4-5 seconds. The manual solution led to the participants getting a longer (forced) break after each of the blocks, to prevent fatigue or eye irritation from staring at the screen and at the same time gave the experimenter the opportunity to ask them if they experienced any irregularities[7]. Since only the items from the related brand names-class differed between the three blocks, with the related nouns, the unrelated nouns, the unrelated brand names and the non-words being the same, one could expect a learning effect on the other items. Therefore, only the reaction times for the related brand names-pairs were used from the respective second and third block.

The stimulus, the instructions etc. were presented in black letters centered on an eggshell-white (color code in RGB: R235 G235 B208) background. The color was chosen, as it had shown that it was perceived more comfortable than black letters on an all-white background.

Every event started with a fixation point +, visible for 1000ms, which in the unprimed version of the experiment was followed directly by the target stimulus written in capital letters[8],

7 During one trial test run, an error message popped up and disrupted the experiment for some seconds. If this had happened during the course of an actual experiment, it would have been a reason to stop the experiment and spare the participant the effort of going through the remaining blocks, since the recorded data couldn't have been used anyway.

8 Capital letters were chosen to avoid orthographic cues, see Peressoti et al. (2003)

displayed until either the green or the red button had been pushed. If after 3000ms no feedback had been recorded, the event was recorded as a non-response and the next event started. The primed version differed in the fixation point being followed by a prime stimulus, displayed for 200ms, then followed by the target stimulus.
Thus, the events in the two versions of the experiment looked like this:

Unprimed version:
+ (1000ms) → TARGET (max. 3000ms or until response)

Primed version:
+ (1000ms) → prime (200ms) → TARGET (max. 3000ms or until response)

3 – Results and Analysis

The following chapter describes the statistical analysis of the results of the two versions of the experiment, i.e. the primed version and the unprimed version. The experiment resulted in 4320 data sets, 2160 for each version. See App. 4 for detailed plots of the reaction times by stimulus type for each participant. All data sets with wrong answers and non-responses were excluded from the analysis, resulting in 2037 remaining data sets for the primed version and 2009 data sets for the unprimed version. For each version, a separate outlier analysis was done, removing every data set whose reaction time ranged below 150ms and above 2000ms.
In the primed version, 20 outliers, i.e. 0,982% were removed, in the unprimed version, 10 outliers, i.e. 0,498% were removed. Mean for related brands[9] was 713.41ms in the primed version and 723.83ms in the unprimed version and mean for related words was 755.68ms in the primed version and 762.36ms in the unprimed version.

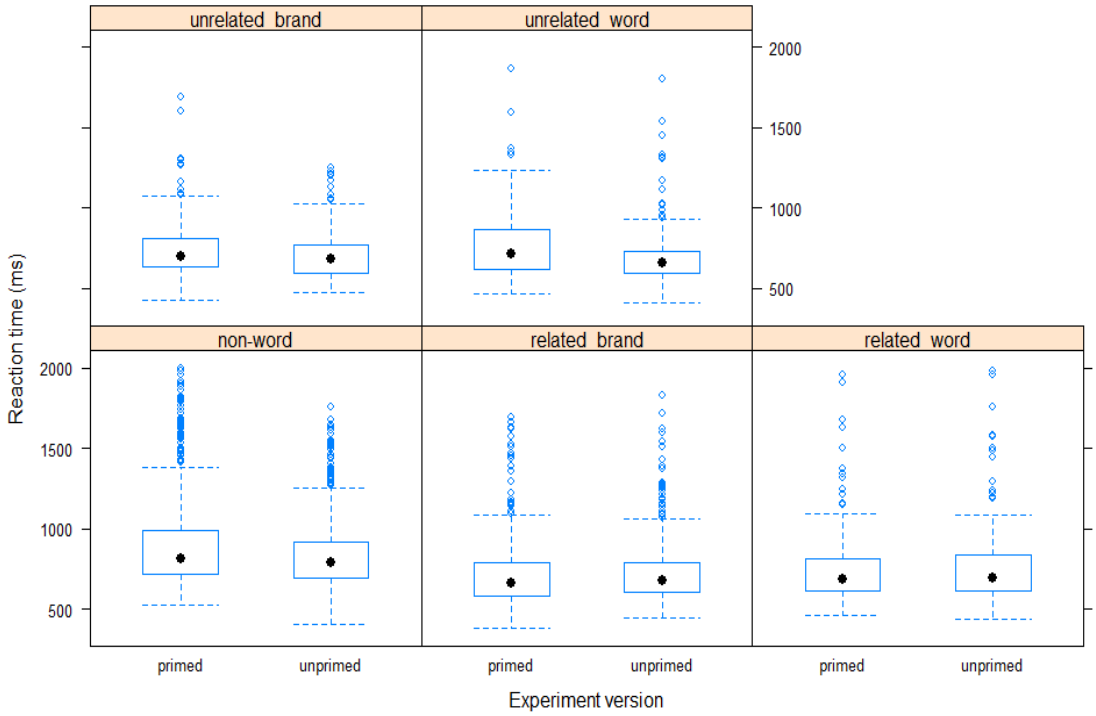


Figure 4: Reaction time per stimulus type for each experiment version

9 Remember that *related brands*, *related words*, *unrelated brands* and *unrelated words* are labels for a group of target words (see chapter 2), that were used both in the primed and in the unprimed version. The labels are based on the fact, that these words were either primed with a related or an unrelated word in the primed version of the experiment.

3.1 Null Hypothesis 1 and Alternative Hypothesis 1

In order to test the null-hypothesis NH1 ‘Priming effect is the same for brand names and common nouns’ and the alternative hypothesis AH1 ‘Priming effect is different for brand names and common nouns’, it had to be established if there were indeed any priming effects for brands and nouns, as the existence of priming effects for at least one of the latter is a presupposition to the alternative hypothesis. To do this, both a Welch two sample t-test and a linear mixed effects analysis with ANOVA model analysis was performed (see Winter 2013) both for related brands and related words separately, comparing the data from primed version with the data from the unprimed version as baseline. Prior to every test in this and the following analysis, aShapiro-Wilk normality tests for the dataframes were conducted.

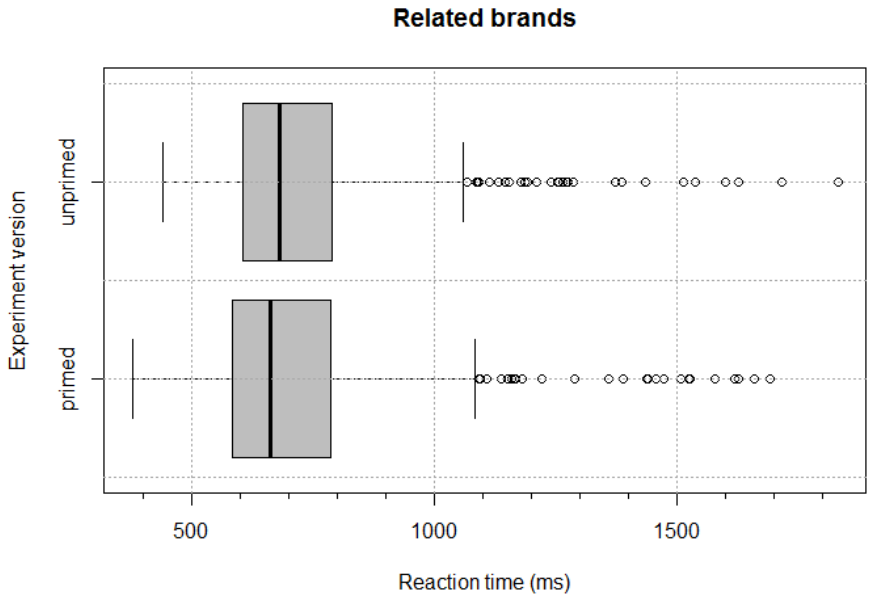


Figure 5: Reaction times for related brands by experiment version

The two sample t-test for related brands, modeling mean reaction time by experiment version (see fig. 5), i.e. primed or unprimed[10], showed no significant priming effect, with p = 0.3702. To confirm this, a linear mixed effect model test was conducted. The data was analyzed with the formula *rt ~ trial + (1 | participant) + (1 | target)*, where *rt* stands for the dependent measure reaction time and the fixed effect *trial* stands for the experiment version. Different intercepts for participant and target, i.e. item, were used. In the null-model, the fixed effect

10 A two sample t-test comparing reaction times for related brands and unrelated brands in the primed version showed significant effects for the stimulus group, with p = 0.00909. However, this is most likely caused by inhibitory effects of the unrelated prime words for unrelated brands (see McNamara 2005).

"trial" was removed. ANOVA showed no significance for an effect of trial type, with p = 0.6678 and $\chi^2 = 0.1842$, thus no significance for priming effects for brand names.

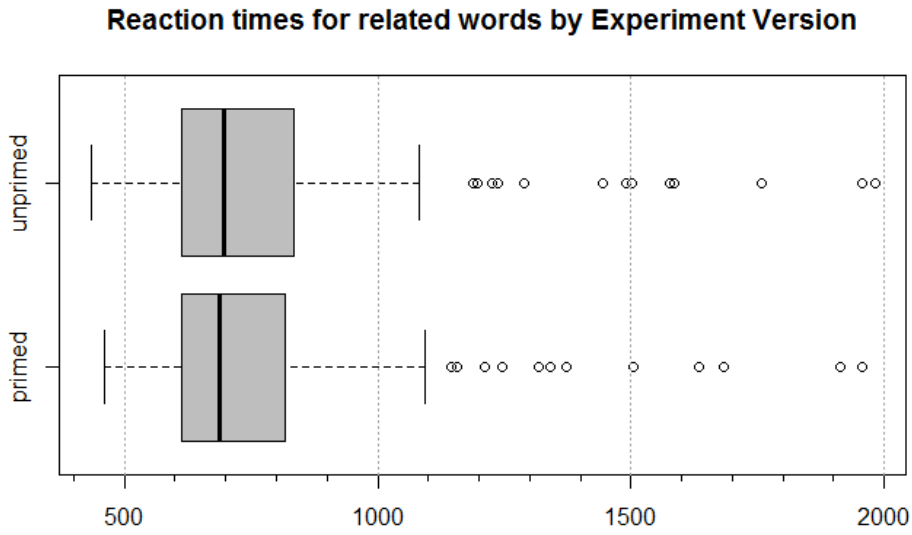


Figure 6: Reaction times for related words by experiment version

The models for related words were build up the same way (see fig. 6). The two sample t-test showed no significance for priming effects, with p = 0.7737. ANOVA for the linear mixed effect models showed no significance for priming effects on related words either, with p = 0.8662 and $\chi^2 = 0.0284$.

Thus, no priming effects on neither brand nor common nouns were observed.

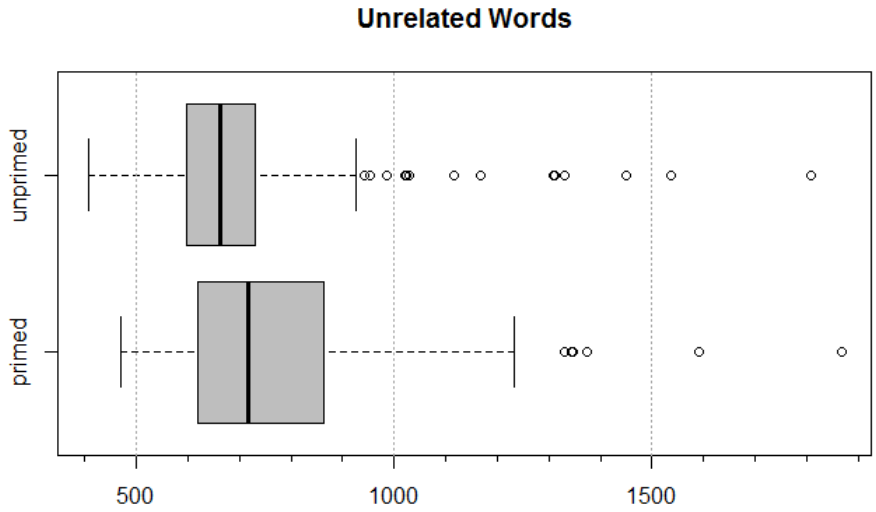


Figure 7: Reaction times for unrelated words by experiment version

As an additional test, unrelated words were tested for inhibitory priming effects with a two sample t-test on reaction time by trial type, i.e. primed/unprimed (see. fig. 7). The mean for unrelated words in the primed version was 767.02ms, against 698.61ms in the unprimed version. As expected from the mean, the t-test showed high significance with t = 3.4336, df = 405.3 and p = 0.0006571.

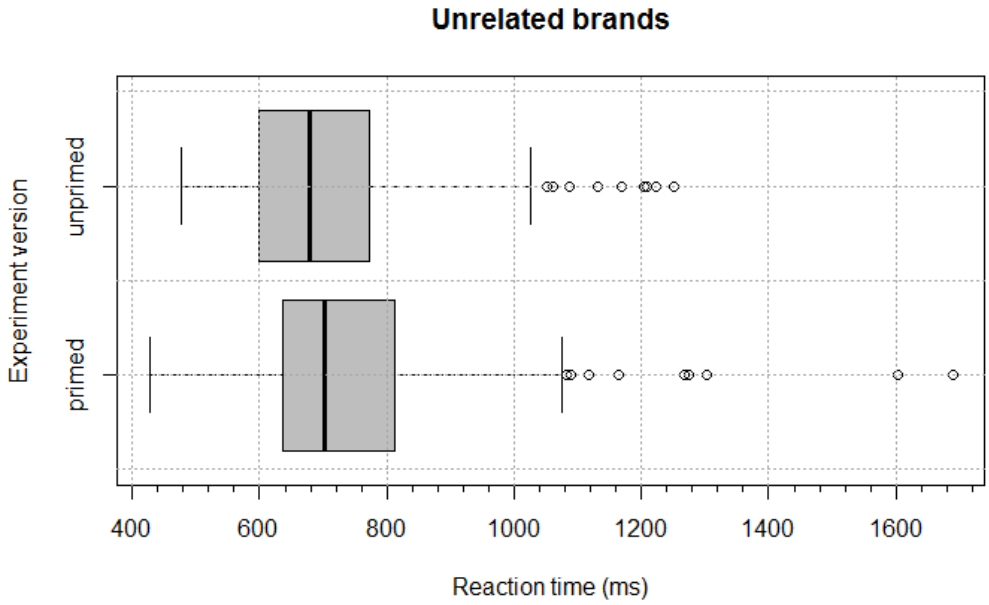


Figure 8: Reaction times for unrelated brands by experiment version

The same test was applied on unrelated brands (see fig. 8), showing high significance for inhibition effects, with t = 2.5904, df = 393.14 and p = 0.009944. Mean for the primed version was 753.90ms and for the unprimed version, the mean was 710.19ms. Thus, a linear mixed effects models test was conducted to see if the stimulus type, i.e. brand name or common noun, had any effect on the size of the inhibitory effect, testing the model *rt ~ stimulus + trial +(1|participant)* against the null-model *rt ~ trial +(1|participant)*. ANOVA showed no significant effect of stimulus on inhibition effects, with χ^2= 0.0014 and p = 0.9699.

No priming effects were found for both brand names and common nouns. Inhibitory priming effects in terms of longer reaction times were found for unrelated brands and unrelated words. However, no significant difference in inhibitory priming effects based on stimulus type was found, inhibition effects on brand names did not differ significantly from inhibition effects on

common nouns. That means, the null hypothesis NH1 is confirmed and the alternative hypothesis AH1 was rejected: Priming effect is the same for brand names and common nouns.

3.1.1 Priming effects for individual brand names

If one takes a look at the plot in fig. 9, p.37, it might seem as if some brand names could show priming effects, e.g. *Grandiosa*, or *BigOne*, while others, such as *Primark* or *Kjeldsberg* seemed to show a reversed effect. However, almost no priming effects for the individual brand names could be detected.

All related brands were individually tested with a two samlpe t-test for rt ~ trial, i.e. reaction time by primed/unprimed. Only *Koss* showed significant priming effects, with $p = 0.03483$. Other brands who had almost significant effects were *Chess*, with $p = 0.058$ and *Grandiosa*, with $p = 0.059$.

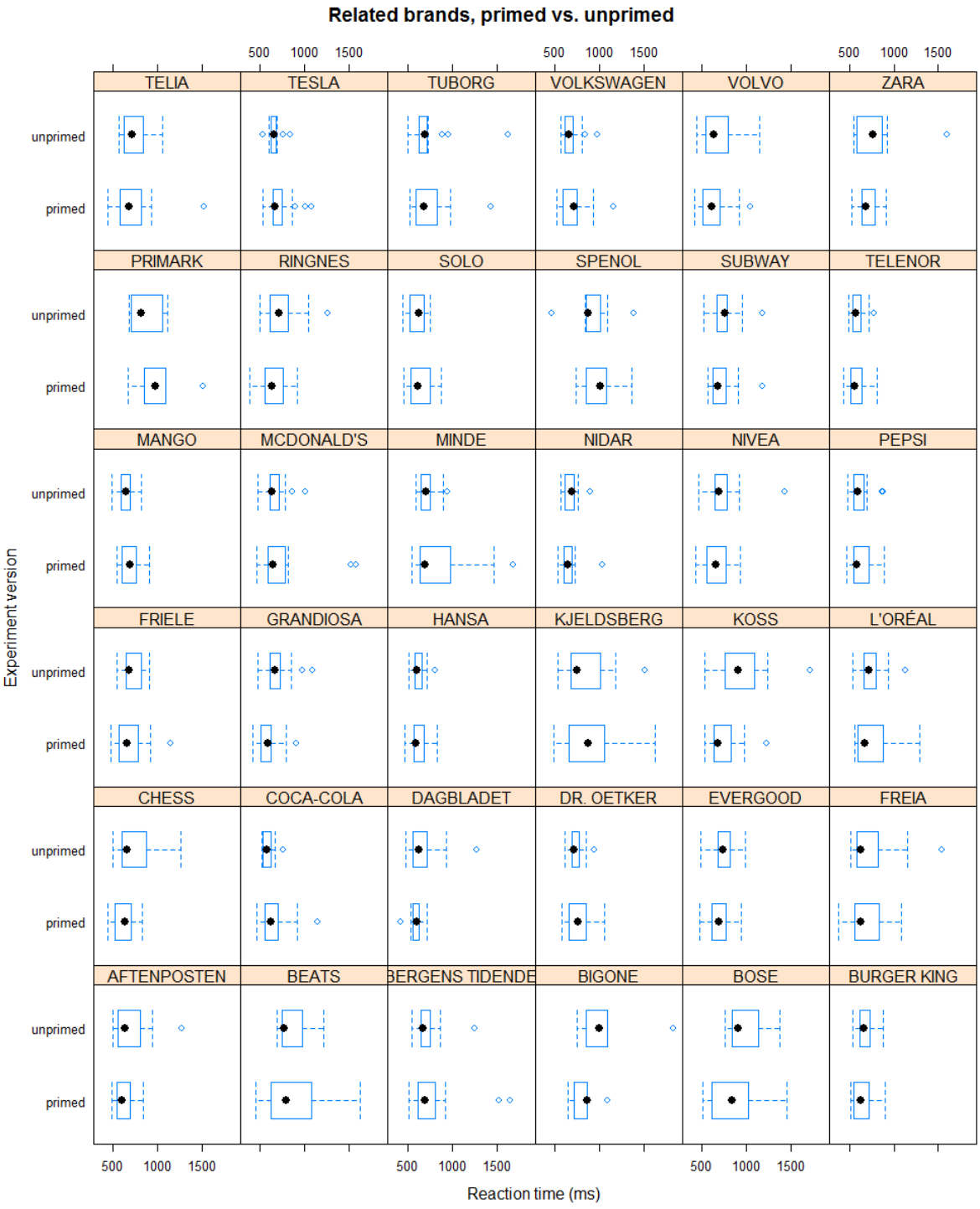


Figure 9: Reaction times per item by experiment version for related brand names

3.2 Null-hypothesis 2 and Alternative Hypothesis 2

To test the null-hypothesis NH2 ‘Reaction time patterns are the same for brand names and common nouns’ and the alternative hypothesis AH2 ‘Reaction time patterns are different for brand names and common nouns’, data from the unprimed version of the experiment was used. All brands, i.e. both the ones tagged as related brand and the one tagged as unrelated brand, were subsumed under the tag *brand*, whereas related words and unrelated words were subsumed under the tag *word* and both were merged into one single data frame. Mean reaction time for combined brand names was at 720.24ms and mean reaction time for combined common nound was at 730.95ms (see fig. 10).

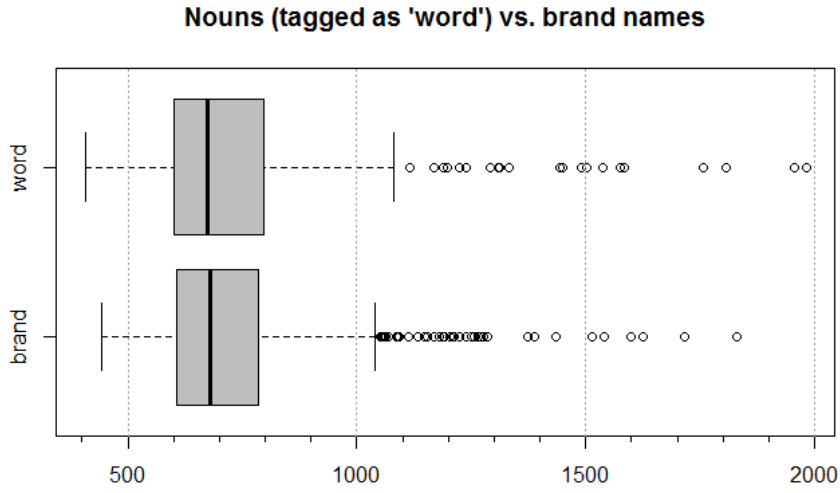


Figure 10: Reaction times for brand names and nouns in the unprimed version

The linear mixed effects model had the formula *rt ~ stimulus + (1 | participant)*, with the fixed effect *stimulus* standing for the stimulus type, brand or common noun.

The null-model had the same formula, except for *stimulus* being removed. ANOVA analysis of the two models showed no effect for the stimulus type on the reaction time, with $p = 0.3082$ and $\chi^2 = 1.0383$.

However, a two sample t-test comparing reaction times for related words and related brands in the unprimed version (see. fig. 11) showed significance for the stimulus type, with $t = -2.0692$, $df = 304.35$ and $p = 0.03937$, with the mean for related brands at 723.83ms and for related words at 762.36ms. To confirm this finding, a linear mixed effects model was built, with the formula *rt ~ stimulus + (1 | participant)* and the null-model *rt ~ (1 | participant)*.

ANOVA showed high significance for the effect of stimulus type on the reaction time, with $\chi^2 = 6.8389$ and $p = 0.00892$.

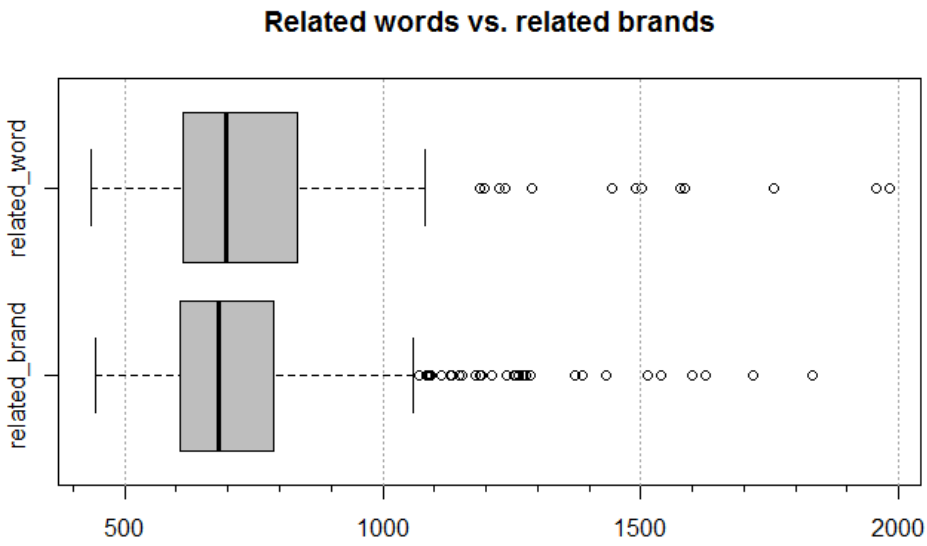


Figure 11: Reaction times for related words and related brand names in the unprimed version

A two sample t-test comparing reaction times for unrelated words and unrelated brands in the unprimed version on the other hand show no significance, with $p = 0.5036$.

That means that the alternative hypothesis AH2 was rejected due to lack of unambiguous evidence. However, the null-hypothesis NH2 can not be confirmed without any doubts. The findings are ambiguous and it can't be ruled out with absolute certainty that reaction time patterns might differ for brand names and common nouns.

3.3 Summary of the significant findings

The analysis of the experiment data indicates no priming effects for both related brands and related words as a whole. In individual analysis, no significant priming effects were found for most brand names except for one. Highly significant inhibitory effects were found for unrelated brands ($p < 0.01$) and unrelated words ($p < 0.001$) with a two sample t-test, but no significant difference in priming effect for unrelated brands and unrelated words was found through a linear mix effects model analysis with ANOVA.

Null-hypothesis NH1 is confirmed: Priming effect is the same for brand names and common nouns.

For the question of reaction times, the analysis of the unprimed experiment version gave no clear result. For parts of the stimulus, related brands and related words, significantly shorter reaction times for brand names than for common nouns were found ($p < 0.01$ in linear mixed effects ANOVA and $p < 0.05$ in a two samlpe t-test). However, no significance was found for the total group of brand names versus common nouns, as well as no significance for the groups unrelated brands versus unrelated words. Thus, alternative hypothesis AH2 could not be confirmed.

4 – Discussion

This chapter deals with the interpretation of the findings in the analysis. I will discuss how these findings can be explained by existing theories and where these findings provide new information.

Subchapter 4.1 will deal with the findings connected to null-hypothesis NH1 and alternative hypothesis AH1, which addressed the question whether or not brand names and proper nouns are affected by priming effects the same way and to which the answer was, that there are no significant effects on priming size. Also, I will take a look at the inhibitory priming effects that were found for unrelated brand names and unrelated proper names and present an explanation for them.

Subchapter 4.2 will discuss the issue of reaction times for brand names compared with those for common nouns, as expressed in the null-hypothesis NH2 and the alternative hypothesis AH2. A group of brand names had significantly lower reaction times than a group of common nouns, while for brand names and common nouns as a whole, no such effect could be observed.

4.1 Priming effects on brand names and common nouns

As seen in chapter 3, there were no significant priming effects detectable during the analysis, neither for related brands nor for related words. Several studies indicated that semantic priming effects tend to be weaker and less reliable than associative priming effects (Lucas 2000, Perea & Rosa 2002) and that pairs which are purely semantically related evoke a neural response similar to the one evoked by unrelated pairs (cf. Traxler 2012: 86, see also Rhodes & Donaldson 2008). The lack of priming effects for related brands and related words might thus be a result of the focus on semantic relatedness instead of associative relatedness in this study.

However, there were some interesting findings regarding inhibition effects: Reaction times for unrelated words and unrelated brands were significantly higher in the primed version than in the unprimed version, with $p < 0.001$ for unrelated words and $p < 0.01$ for unrelated brands. This complies with findings in other studies, who showed that unrelated prime stimulus leads to higher reaction times on the target stimulus (Lorch 1986, Eglin 1987, Neely et al. 1989, Nakamura et al. 2006).

This can be explained in term of expectancy, which is based on a strategic attempt of the participant to predict the target word with the help of the prime word, thus activating potential categories and leading to a longer reaction time, when the target is unrelated and activation has to be re-adjusted (see McNamara 2005:55-56). Nakamura et al. (2006) argued that inhibitory effects of unrelated prime-target pairs in lexical decision tasks where higher for children than for adults, because children have to rely more on expectancy than adults, since the links between nodes in their semantic network are less developed. The fact that brand names respond to inhibitory effects the same way as common nouns do, suggests that the recognition and processing of brand names is done in a similar way as it is done for common nouns, involving activation of the semantic information. As such, it seems improbable that the participants reacted on brand names solely based on the word-form.

If one applies this finding to the question of whether or not brand names are directly referential, granted one assumes that brand names indeed are proper names, one might doubt the proposition of some direct referentialists that proper names don't have semantic concepts. Inhibitory effects occur because the activation of the relevant semantic information is delayed due to prior activation of other potential categories. If brand names had no semantic property, no activation of semantic information would be required and thus there wouldn't be anything that could be delayed. For the newer approaches to direct reference theory on the other hand (e.g. Van Langendonck 2007), expectancy-based inhibitory effects would not pose a problem, since categorical meaning is assumed for proper names, which would make them vulnerable for inhibitory effects as described above.

4.2 Reaction times for brand names and common nouns

The findings for reaction times were ambiguous and thus the alternative theory AH1 "Reaction time patterns are different for brand names and common nouns" could not be confirmed. In overall analysis, no significant differences in reaction times could be found for brand names and common nouns. However, for some groups of stimulus, related brand and related words, significant differences in reaction times were found, with $p < 0.05$. This might be caused by different frequency of the target words, which is known to effect reaction times (Solomon & Howes 1951, McGinnies et al. 1952, Balota & Chumley 1985, Traxler 2012). As mentioned earlier in chapter 2, it is rather difficult to analyze frequency for brand names by using written corpora like the Norwegian Newspaper Corpus. Looking at the data in appendix

1, it becomes obvious that the corpus is biased in terms of high frequencies for same brand names, whereas other brand names are obviously underrepresented, with a brand like *Telenor* having more than 20 times as many hits than *Coca-Cola.*

As Schmidt (2011) had shown, brand names that are used like common nouns show similar reaction times as common nouns, whereas in his study, brand names that are more prototypical showed slower reaction times. The latter finding supports the results of Gontijo et al. (2002), who saw similar effects, whereas Peressotti et al. (2003) didn't find any significant differences in reaction times for proper names. I would argue that the findings of my study point more towards similar reaction times for brand names, in support of Peressotti et al. (2003). The brand names in the related brands-class contained both prototypical proper names as well as less prototypical proper names, whereas the unrelated brand-class contained only prototypical proper names, who fit the description of proper names given by Van Langendonck (2007), which I presented in chapter 1:

They can systematically appear in close appositional structures, as in "The search engine Google". They "do not take restrictive modifiers or quantifiers, cannot function as predicate nominals and are the weakest anaphoric elements". They are "inherently definite", and "singular, countable, nonrecursive and show third person on the lexical level" (Van Langendonck 2007:182).

A comparison of the reaction times for these prototypical brand with those of the common nouns in unrelated words showed no significant difference in reaction times. Even though the results of the analysis for related brands and related words raises some doubt, the overall conclusion is that there is no difference in reaction times for brand names and common nouns. Referring to the semantic richness-theory, stating that words with little semantic richness produce higher reaction times (see Pexman et al. 2003, Robert & Duarte 2016), this indicates that the brand names used in this experiment have as much semantic content as the common nouns they were compared with.

5 – Summary and outlook

As pointed out in chapter 1, there are different theories about the nature of brand names. Some linguists and philosophers state, that they are a subclass of proper names and that they are directly referential, whereas others state that proper names, just like common nouns, are referring indirectly through their semantic content. Based on these diverging theories, the two research hypotheses AH1: 'Priming effect is different for brand names and common nouns' and AH2: 'Reaction time patterns are different for brand names and common nouns' were formulated.

An unmasked reaction time-measuring primed lexical decision task, with an unprimed version as baseline, was conducted, with brand names, common nouns and non-words as target stimuli. Five groups of stimuli pairs were formed: related brands and related words were primed with common nouns that were related to the target in terms of hyperonymy, the prime stimulus for unrelated brands, unrelated words and non-words were unrelated common nouns. SOA was 200ms.

The analysis of the data from both experiment versions showed no priming effects for neither brand names nor common nouns. This might be caused by the approach to use pure semantic priming instead of associative priming, which is known to produce weaker priming effects (see Lucas 2000, Perea & Rosa 2002). Inhibitory priming effects were found for unrelated brands ($p < 0.01$) and unrelated words ($p < 0.001$), which might be explained with expectancy. However, no significant difference for these effects on brand names and common nouns was found. Thus, AH1 has been rejected.

Also, no difference in reaction times was found when analyzing the results from the unprimed version of the experiment, except for words from the related word- and the related brand-class, where the related brands had significantly shorter reaction times ($p < 0.01$). These findings might be based on methodological problems, such as different frequencies for the target stimulus. For words in the unrelated word- and unrelated brand-class, no significant difference in reaction times were found, the same applies to an overall analysis comparing all brand names and common nouns from this experiment. AH2 was therefore rejected.

5.1 Possible sources of error and suggestions for further research

As pointed out in chapter 4.2, the reaction times for related brands were significantly shorter than those for related words. This could be caused by different frequencies of the stimulus. Corpora of written language are not the optimal instrument to evaluate the actual frequency or familiarity of brands. In future experiments, a familiarity rating prior to the actual experiment (e.g. Schmidt 2011) would be a better way to balance the stimulus. Also, to test the theory that brand names is a class consisting of proper names and common nouns, one should test prototypical proper brand names and common noun-like brand names separately.

The inhibitory priming effect on unrelated words and unrelated brands showed that the use of unrelated pairs as baseline might result in false-positive prime effects for related pairs, if only compared with unrelated words (see Lorch et al. 1986).

It might be interesting to conduct a similar experiment with associative priming, since associative priming shows more consistent and stronger priming effects than pure semantic priming (Perea & Rosa 2002). As no priming effects were found in this experiment, it was not possible to clarify if brand names react differently on priming effects than common nouns. Since it is not very reliable to use corpora of written language for the analysis of co-occurence for brand names, a pre-study could be used to generate associative prime stimulus, e.g. by letting participants name the first word that comes into their mind when seeing a brand name target. These kinds of free association tasks are thought to activate the concept with the strongest associative link to the target word (see Gross 1966).

Appendix

App.1: Stimulus

Frequency taken from the Norwegian Newspaper Corpus Bokmål (size: 1,517,106,226 tokens) between 25/11 2015 and 11/07 2016, search string used: *"word" %c* for nouns and brand names consisting of one word, *"bergens" %c "tidende" %c* for consisting of two words. *%c* prevents case-sensitive search.

Prime	**Frequency Prime**		**Target**	**Frequency Target**	**Class**
hudpleie	316		NIVEA	172	related_brand_a
hudpleie	316		L'ORÉAL	179	related_brand_b
hudpleie	316		SPENOL	53	related_brand_c
bil	270402		VOLVO	22423	related_brand_a
bil	270402		VOLKSWAGEN	14407	related_brand_b
bil	270402		TESLA	4579	related_brand_c
avis	84642		AFTENPOSTEN	266141	related_brand_a
avis	84642		BERGENS TIDENDE	55339	related_brand_b
avis	84642		DAGBLADET	440745	related_brand_c
kaffe	26057		FRIELE	4674	related_brand_a
kaffe	26057		EVERGOOD	51	related_brand_b
kaffe	26057		KJELDSBERG	976	related_brand_c
hurtigmat	641		MCDONALD'S	3954	related_brand_a
hurtigmat	641		BURGER KING	1550	related_brand_b
hurtigmat	641		SUBWAY	211	related_brand_c
mobilnett	2597		TELIA	7825	related_brand_a
mobilnett	2597		TELENOR	94227	related_brand_b
mobilnett	2597		CHESS	5220	related_brand_c
brus	8377		PEPSI	1960	related_brand_a
brus	8377		COCA-COLA	4034	related_brand_b
brus	8377		SOLO	4781	related_brand_c
godteri	4663		FREIA	1265	related_brand_a
godteri	4663		NIDAR	2147	related_brand_b
godteri	4663		MINDE	2897	related_brand_c
klær	48794		MANGO	1477	related_brand_a

Prime	Frequency Prime		Target	Frequency Target	Class
klær	48794		ZARA	1170	related_brand_b
klær	48794		PRIMARK	71	related_brand_c
hodetelefon	140		BOSE	385	related_brand_a
hodetelefon	140		KOSS	5344	related_brand_b
hodetelefon	140		BEATS	1701	related_brand_c
øl	47712		TUBORG	355	related_brand_a
øl	47712		HANSA	3557	related_brand_b
øl	47712		RINGNES	8086	related_brand_c
pizza	12013		GRANDIOSA	1509	related_brand_a
pizza	12013		DR. OETKER	145	related_brand_b
pizza	12013		BIGONE	50	related_brand_c
hudpleie	316		ANSIKTSKREM	65	related_word
bil	270402		STASJONSVOGN	7831	related_word
avis	84642		TABLOID	3590	related_word
kaffe	26057		ESPRESSO	1315	related_word
hurtigmat	641		HAMBURGER	3718	related_word
mobilnett	2597		TELESELSKAP	660	related_word
brus	7918		COLA	5325	related_word
godteri	4305		SJOKOLADE	12631	related_word
klær	45377		GENSER	3604	related_word
hodetelefon	128		HEADSET	411	related_word
øl	44640		PILS	4070	related_word
pizza	10840		MARGHERITA	272	related_word
liv	305081		LEVIS	241	unrelated_brand
uke	376625		ADIDAS	2376	unrelated_brand
regjering	120055		NORRØNA	732	unrelated_brand
område	80545		SAMSUNG	12013	unrelated_brand
menneske	40161		SONY	23919	unrelated_brand
penger	410342		NUGATTI	314	unrelated_brand
sesong	176328		GOOGLE	24923	unrelated_brand
side	261785		NRK	255688	unrelated_brand
tillegg	497469		SIEMENS	5929	unrelated_brand
bil	270402		COLGATE	382	unrelated_brand
bombe	40677		NARVESEN	4859	unrelated_brand

Prime	**Frequency Prime**		**Target**	**Frequency Target**	**Class**
spørsmål	256815		TINE	3207	unrelated_brand
eple	3674		SOFA	4642	unrelated_word
kino	40823		TÅKE	8094	unrelated_word
båt	62403		SNUS	10353	unrelated_word
rotte	1397		HYLLE	15020	unrelated_word
gate	60065		BOKS	15990	unrelated_word
ferie	59713		VITS	11979	unrelated_word
person	180116		STRØM	67024	unrelated_word
bok	91183		HUS	184583	unrelated_word
klubb	100753		FART	45196	unrelated_word
sak	156923		LOMME	4123	unrelated_word
plass	497985		FJES	4644	unrelated_word
spiller	395664		TALE	72344	unrelated_word
mus			TRALF		non-word
kjele			SMERP		non-word
papp			ØLKER		non-word
geit			ENVRIK		non-word
kasse			TRÅRNE		non-word
jakke			KLUPP		non-word
prikk			SNOFF		non-word
eksamen			ÆRBROL		non-word
kaos			VROLT		non-word
saks			ARKEL		non-word
luft			FORG		non-word
kirke			SERNON		non-word
nese			MAFE		non-word
mobil			FROLLER		non-word
billlett			SPOME		non-word
omvei			KNOSELL		non-word
ballong			PLINSE		non-word
sykkel			REGONG		non-word
bukse			SIBUT		non-word
krem			BUP		non-word
hytte			MIRKE		non-word

Prime	**Frequency Prime**		**Target**	**Frequency Target**	**Class**
grunn			STREMIL		non-word
år			MERF		non-word
dag			PRIFF		non-word
tid			KVIRK		non-word
kamp			PARFER		non-word
norge			FLOLLER		non-word
land			BLALLE		non-word
mann			OGEBATT		non-word
foto			ØNUNDE		non-word
folk			ÆNSUDE		non-word
sak			LANVOSKE		non-word
gang			PERNE		non-word
politi			KROFLEM		non-word
krone			SELMING		non-word
del			KIGUNN		non-word
mål			NILLEON		non-word
prosent			VILNEM		non-word
kommune			JUNKARD		non-word
million			SPURFE		non-word
barn			BREGTAG		non-word
lag			FLIDALL		non-word
kvinne			SLONDEG		non-word
arbeid			LØYTVAG		non-word
vei			KNARM		non-word
Sogn			RILNOK		non-word
torsdag			TÅRPE		non-word
parti			SARKJE		non-word
Warm-up					
møbler			IKEA		
ski			STOL		
drøm			BOEING		
sete			PANIGL		
ulv			GLOND		
vann			NEPSIK		

App.2: Participants

Participant Number	Gender	Year of Birth	Age	Version	Block Order
001	f	1994	21	Primed	ABC
002	m	1988	28	Primed	ABC
003	f	1988	28	Primed	BCA
004	m	1986	30	Primed	BCA
005	m	1987	28	Primed	CBA
006	m	1990	26	Primed	CBA
008	m	1995	21	Primed	ACB
009	f	1988	28	Primed	BAC
010	m	1997	19	Primed	BAC
011	f	1993	22	Primed	CAB
012	f	1992	24	Primed	CAB
013	m	1995	21	Primed	ABC
014	m	1989	27	Primed	BCA
015	m	1994	22	Primed	CBA
016	m	1992	24	Primed	ACB
017	f	1994	22	Primed	BAC
018	f	1993	22	Primed	CAB
019	f	1993	22	Primed	ACB
020	m	1991	25	Unprimed	ABC
021	m	1992	24	Unprimed	ABC
022	m	1993	23	Unprimed	ABC
023	f	1991	25	Unprimed	BCA
024	f	1994	22	Unprimed	BCA
025	m	1992	24	Unprimed	BCA
026	m	1989	27	Unprimed	CBA
027	m	1992	23	Unprimed	CBA
028	f	1992	24	Unprimed	CBA
029	m	1992	24	Unprimed	ACB

Participant Number	Gender	Year of Birth	Age	Version	Block Order
030	m	1991	25	Unprimed	ACB
031	f	1993	23	Unprimed	ACB
032	m	1996	19	Unprimed	BAC
033	m	1994	22	Unprimed	BAC
034	m	1992	23	Unprimed	BAC
035	m	1994	22	Unprimed	CAB
036	m	1990	26	Unprimed	CAB
037	f	1991	25	Unprimed	CAB

Appendix 3: Instructions

Original Version (in Norwegian):

All deltagelse er frivillig og du kan forlate rommet når som helst.
Testene er anonyme, og det vil ikke bli lagret data knyttet til din identitet.
Du får se et fikseringspunkt på skjermen. Se på punktet.
Et ord i STORE BOKSTAVER kommer opp på skjermen.
Din oppgave er å avgjøre om ordene i STORE BOKSTAVER er ekte ord/merkenavn.
Hvis du kjenner et ord eller et merkenavn, trykk på den grønne knappen.
Hvis du ikke kjenner ordet eller merkenavnet, trykk på den røde knappen.
Prøv å avgjøre så fort du klarer.
Hold hendene klare på tastene.

Trykk på en knapp for å begynne testen.

Lykke til!

Translation:

All participation is voluntarily and you can leave the room at any time.
The tests are anonymous and not data connected to your identity will be stored.
You will see a fixation mark on the screen. Please look at the mark.
A word in CAPITAL letters will appear on the screen.
Your task is to decide whether the words in CAPITAL letters are real words/brand names.
If you recognize a word or brand name, press the green button.
If you don’t recognize a word or brand name, press the green button.
Try to decide as quick as possible.
Hold your hands ready at the buttons.

Press a button to start the test.

Good luck!

Appendix 4: Results per participant

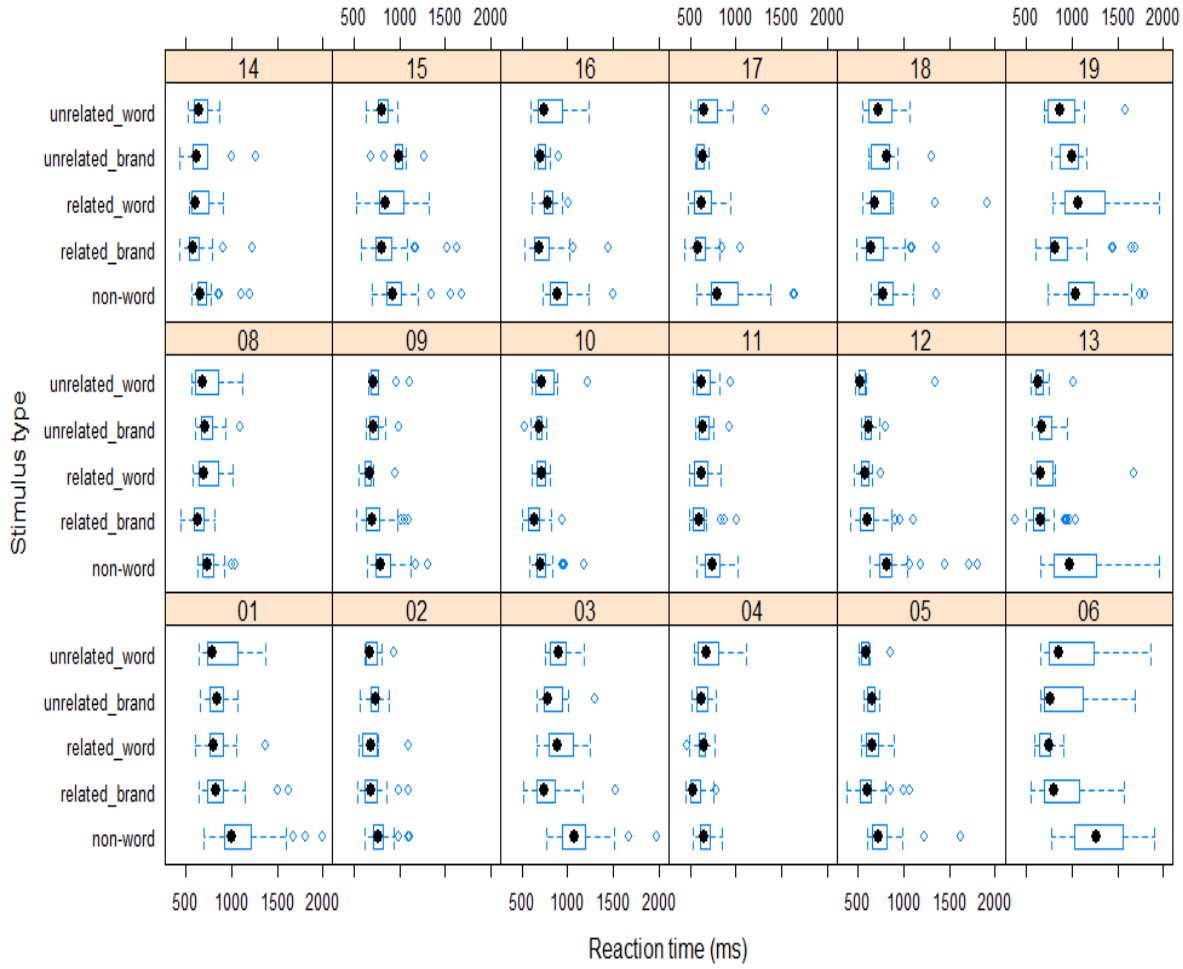


Figure 12: Reaction times per subject by stimulus type in the primed version

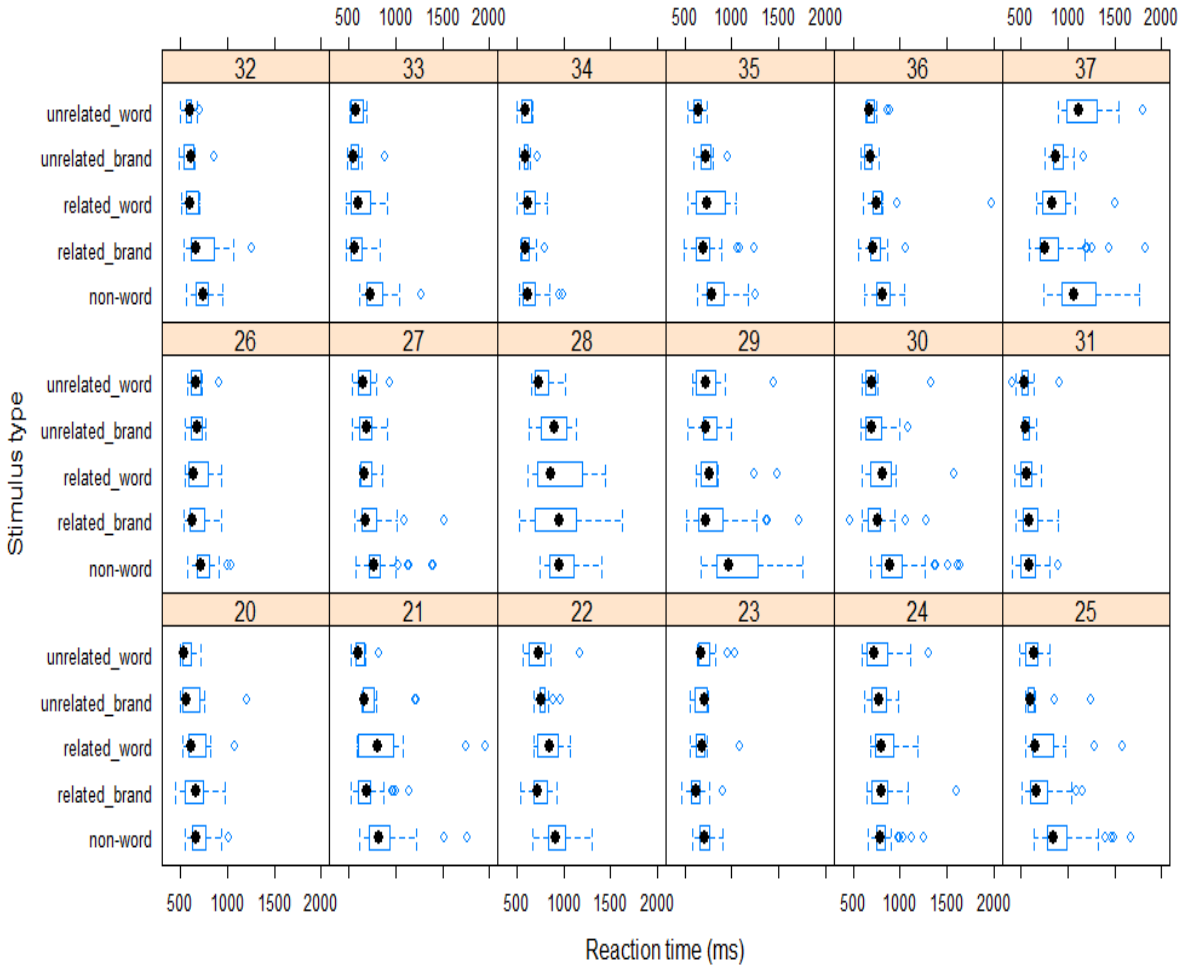


Figure 13: Reaction times per subject by stimulus type in the unprimed version

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