Effects of cognate status, noun type, frequency, and bilingual profile on the tip-of-the-tongue (TOT) phenomenon in Norwegian-English bilinguals.

HELENE ØYA

SUPERVISORS

Linda Ruth Wheeldon

Allison Louise Wetterlin

University of Agder, 2021
Faculty of Humanities and education
Department of Foreign languages and translation

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Abstract

This experimental thesis aimed to investigate the effects of cognate status, frequency, and noun type on the tip-of-the-tongue (TOT) phenomenon in Norwegian-English bilinguals, and how their performance in these conditions relates to individual differences in their bilingual profile such as second language(L2) English proficiency. A bilingual profile was created for each participant based on their answers on an amended version of the Language Experience and Proficiency Questionnaire (Marian, Blumenfeld & Kaushauskaya, 2007). The experimental part of this study included a TOT experiment in two parts: one English and one Norwegian. For both experiments, stimuli consisted of definitions corresponding to a target word of either low or high frequency belonging to one of the following four conditions: cognate common nouns, cognate proper nouns, non-cognate common nouns, or non-cognate proper nouns. At testing, 49 participants were presented with these definitions and asked whether they knew the word, didn't know the word, or if they fell into a TOT state. An analysis of the combined data showed that, as expected, participants experienced more TOTs in their second language (L2) English, relative to their first language (L1) Norwegian, and for low-frequency words relative to high-frequency words. Within the proper noun condition, participants had more TOTs for cognates relative to non-cognates, while such a distinction was not found in the common noun condition. More surprisingly, and contrary to previous findings and the predictions of the literature discussed in this thesis, was the observation that participants experienced more TOTs for cognates relative to non-cognates. It was found that the only factor of bilingual profile predicting TOT occurrences was English proficiency in that increased proficiency led to a decrease in TOTs. While our results on effects of language dominance and frequency are in line with previous findings and/or the reviewed literature, the effects of cognate status were contrary to predictions and previous findings, and will need further investigation within this language set.

Contents

1. Introduction

There is consensus that spoken word production entails at least two stages of processing, one meaning based and one form based (Levelt, 1989; Levelt, Roelofs & Mayer, 1999). That is, to successfully produce an intended utterance, a speaker must first select the intended word from the meaning-based stage, before correctly retrieving the phonological form of the selected word. However, this process is liable to experience retrieval failures, mix-ups and blockages resulting in speech errors. Equally annoying as it is interesting, the tip-of-the-tongue (TOT) phenomenon is probably the most studied kind of speech error. TOTs are difficulties in retrieving the full form of the intended word and could be described as the frustrating feeling you get when you know a word but are not able to retrieve it at the moment (Brown and McNeil, 1966).

Extensive research on the phenomenon suggests that it occurs in several languages, across different modes, and in monolinguals, bilinguals, and multilinguals alike. Interestingly, TOTs occur more frequently in bilinguals and multilinguals than they do for monolinguals. Furthermore, it has been found that language aspects such as the frequency of a word (e.g. Gollan, Montoya, Cera & Sandoval, 2008) and a word's cognate status (e.g. Gollan & Acenas, 2004) affects TOT occurrences. Additionally, language dominance, an aspect of bilingual profile, has been found to affect TOT occurrences as well (Ecke, 2004).

This thesis seeks to further investigate the tip-of-the-tongue phenomenon in bilinguals by aiming to replicate previously observed effects of frequency, cognate status, and language dominance on the TOT phenomenon in our set of Norwegian-English bilinguals. Additionally, we will investigate the effects of noun type crossed with cognate status, and bilingual profile on the phenomenon, as previous research has indicated that these factors might also affect TOT occurrences.

As the focus of this thesis is word production, I begin by describing the classic model of spoken word production (Levelt, 1989). I then turn to models of bilingual word production and discuss the processes of bilingual word activation and selection (see Costa, 2005 for a discussion). This is followed by an introduction of the importance of bilingual profile in research on bilingualism before I discuss a few models of bilingual speech production tapping into different areas of

individual differences. After this, I briefly discuss general advantages and disadvantages to bilingualism before I go into detail on the tip-of-the-tongue phenomenon. Through experimental evidence, I will here describe previous observations in both monolinguals and bilinguals, in addition to what might affect TOT occurrences. I will also discuss two main hypotheses on the background of the TOT phenomenon. Following this, I will describe the critical elements to the current study. Lastly, I will go through the observed results of the current study before discussing them and providing a short conclusion for this thesis.

1.1 Monolingual models of spoken word production

Several models have been proposed aiming to explain language processing, both to account for monolingual (e.g. Levelt et al., 1999; Roelofs, 2000) and bilingual word production (e.g. Costa, 2005; Green 1998). Before looking into where monolingual and bilingual word production differ, however, it is useful to first look at where they are similar, namely monolingual word production.

The process in spoken word production where thoughts underlying words are turned into sounds is called *lexicalisation*. It is generally assumed that lexicalisation is a two-stage process, where the first stage is meaning-based and the second is phonologically based (e.g. Caramazza, 1997; Dell, 1986; Levelt; 1989; Levelt et al., 1999). When producing a word, the speaker must first select a word at the semantic level, before retrieving the phonological form of the selected target at the stage of phonological encoding. While there is little to no dispute about these two stages, there is disagreement about what occurs at the lexical level (Rapp & Goldrick, 2000).

Levelt (1989) argued that in the mental lexicon, each word is represented by a lemma thought to be semantically and syntactically, but not phonologically, specified. Lemmas function as a representational level between the semantic level and the phonological level, making the lemma account arguing for two stages of lexical representation: one semantic or conceptual level where speakers decide what they want to communicate, and a lexical level where lexical

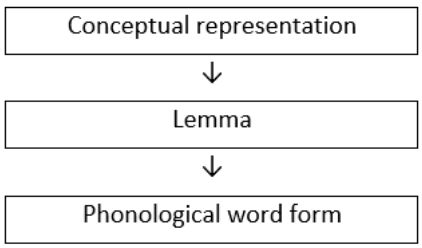

Figure 1: A simplified adaptation of the two-stage model of lexicalisation from Levelt (1989) in Harley, 2014, p410

representations of words along with their grammatical properties are stored (lemma level). According to Levelt (1989), *lemma selection* is when a word is specified in a pre-phonological, abstract way. Moving further, *lexeme* is the second stage where the concrete phonological form is specified (see figure 1). Lemmas are argued to be amodal, meaning that they do not take modality into account. Since lemmas are syntactically specified and are the representational level between semantics and phonology, the lemma account argues that access to lexical syntax occurs before the phonological form is accessed. Factors arguing in favour of a two-stage lexicalisation process includes data on speech errors (Fay and Cutler, 1977), experimental evidence (see e.g. Wheeldon & Monsell, 1992; Monsell, Mathews, and Miller, 1992), neuroscientific evidence (see e.g. van Turennout, Hagoort, & Brown, 1998) and TOT data (e.g. Harley and Brown, 1998; Vigliocco, Antonini, and Garett (1997).

As seen above, central questions in the study of language processing are concerned with how a speaker is choosing a concept, then finding the correct word for that concept before finally retrieving the phonological codes for that word, and how these actions are distributed across levels in a model. Equally important is how these levels, irrespective of their numbers, interact with each other. The next section further discusses Costa's (2005) monolingual model which was based on Levelt's work (e.g., 1999).

Although the forms of representation found at each of the three levels vary greatly (from concepts to words to phonemes), there are two main principles that are key in all of them: activation and selection mechanisms. The term *activation* refers to the availability of representations at the three levels. In speech production, the process starts with the activation of the conceptual representations at the first level. During conceptual processing, it is generally assumed that concepts that are semantically related to the intended concept are activated to some degree in addition to the semantic representation of the intended concept. As seen in figure 2, this could be that when naming the picture of a dog, the semantic relative *cat* also becomes available. Activation from the semantic representations then spreads to the lexical level and activates the corresponding lexical representations of both *cat* and *dog*. The assumption of multiple conceptual representations being activated and in turn spread this activation to their corresponding words at the lexical levels, leads to the system encountering multiple word candidates for production. At this stage, the system needs to decide which lexical node to choose for further processing among all the activated ones. The

decision mechanism in charge of this is called *lexical selection*. When the intended lexical node has been correctly selected, its grammatical properties will be made available and in turn employed to construct the syntactic frame of the word, before finally retrieving the phonological code /dɒg/ at the last step.

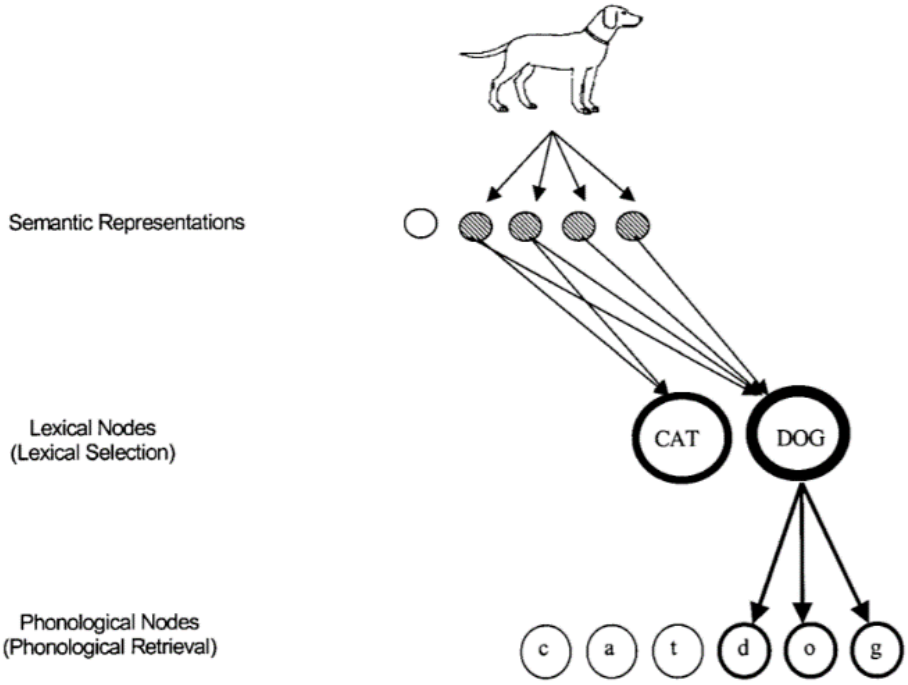

Figure 2: Representation of monolingual speech production based on Levelt's monolingual model. The arrows represent the activation flow and the thickness of the circles are an indication of the activation level. Adapted from Costa, 2005, p. 309

The next step in speech production entails activation from the lexical level spreading to the phonological level, also called the *sublexical* level. The activation and selection processes, and their issues, at this stage are similar to the previous stages. A point of discussion is whether only the selected lexical node spreads activation to the phonological level, or if any activated node spreads some degree of activation to their respective phonological elements. Furthermore, if activation spread is not restricted to the selected lexical node, does the phonological activation of the unintended lexical nodes affect the phonological properties of the intended lexical node? There are two types of models designed to account for this issue: discrete models and cascading models. *Discrete models* of speech production assume that only the phonological properties of the selected lexical node are activated (Levelt, 1989; Levelt et al., 1991; Schriefers, Meyer, & Levelt, 1990). According to these models, the selection process behaves like a filter inhibiting unwanted activation from the lexical level to the phonological level. Given that lexical selection happens at the lexical level, and processing is

discrete as described here, it is expected that phonological activation is restricted to that of the selected lexical node in the response language (for bilinguals). Meaning that, at the level of phonological encoding, monolinguals and bilinguals should be functioning in the same way. *Cascading models* of lexical access assume that the same pattern of activation flows through the entire lexical system. Just as activated conceptual representations spread to their corresponding lexical nodes at the lexical level, all activated lexical nodes, and not just the selected one, spread some degree of activation to their corresponding phonological codes (e.g. Caramazza, 1997; Cutting & Ferreira, 1999; Dell, 1986).

1.2 Bilingual models of spoken word production

The most pressing issue dividing bilingual speech processing from that of monolinguals is the issue of having two languages to select words from. How do bilinguals manage to select words from only the correct language? And what are the effects of having lexical nodes from an unintended language activated? When proposing his language production model, Costa (2005) assumed that activation level is the basic foundation guiding lexical selection, and that the mechanism responsible for lexical selection takes all activated nodes into account, and not only the target one (e.g. Caramazza, 1997; Levelt, 2001; Roelofs, 1992). Large discrepancies in the level of activation between the intended lexical node and other lexical nodes will lead to a faster selection process, while more similar activation levels result in a harder selection process which takes more time (Caramazza & Costa, 2000, 2001; Roelofs, 1992). Figure 3 is a bilingual extension of figure 2 and differs from the original in that it has two lexicons at the lexical stage. As visible from figure 3, it is not clear what effect the activation of lexical nodes in the non-target language has. Do the activated, but not selected, nodes from the non-response language as well as the intended language send any form of activation to the phonological level, like there were indications of in the monolingual model?

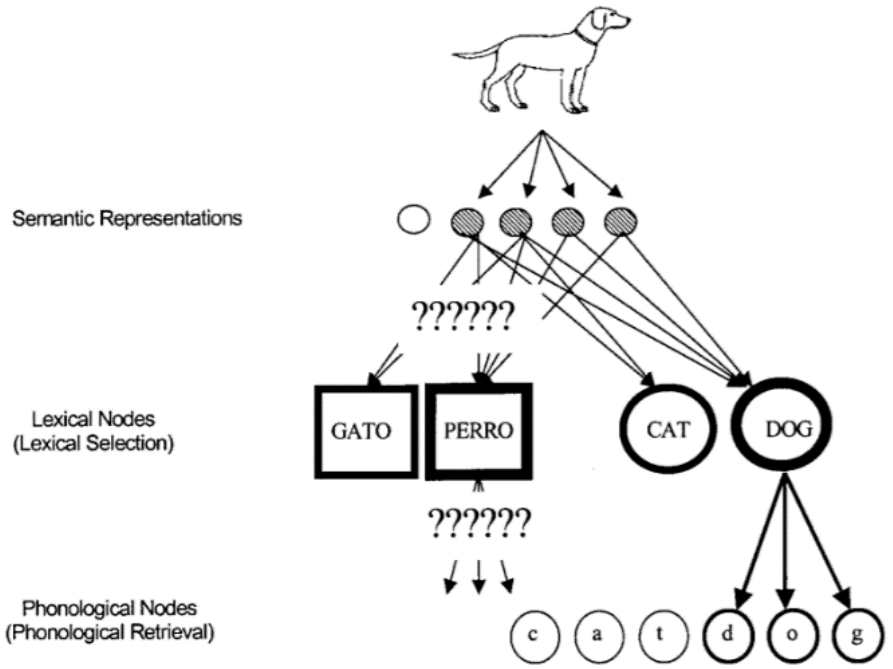

Figure 3: Schematic representation of bilingual speech production. The circles represent lexical nodes in the target language, while the squares represent lexical nodes in the non-target language. Adapted from Costa, 2005, p.311

The choice of which language to use when expressing a message is based on information such as pragmatics and context (e.g. communicating in the local language or English when travelling abroad or using your native language when visiting your grandparents), and not so much to do with the lexical system. Because of this, there is wide agreement among researchers on the assumption that the language specification decision is taken at the conceptual level (De Bot, 1992; Green, 1986; Poulisse & Bongaerts, 1994). There are two main hypothesises regarding which mechanism is behind this decision: the language specific hypothesis (see figure 4) and the language non-specific hypothesis (see figure 5).

The language-specific selection hypothesis assumes that the mechanism in charge of lexical selection is effectively "blind" to the level of activation of lexical nodes belonging to the non-target language. The activation-flow arrows that were sent from the lexical level in figure 3, are not present in figure 4. Instead, there is an additional language specific selection mechanism present that ensures only the activated lexical nodes from the intended language can send activation to the phonological level. Compared with the monolingual model presented in figure 2, there is not much of a difference. In the monolingual model, there simply is no second language that could interfere, and in the language specific model the

presence of translation equivalents from the second language are irrelevant for selection of the target lexical node. This solution could be dubbed the most economical one of the two as if an English-Spanish bilingual wants to say the word *perro* 'dog', why would the mind go through all the trouble of activating the English translation equivalent *dog*?

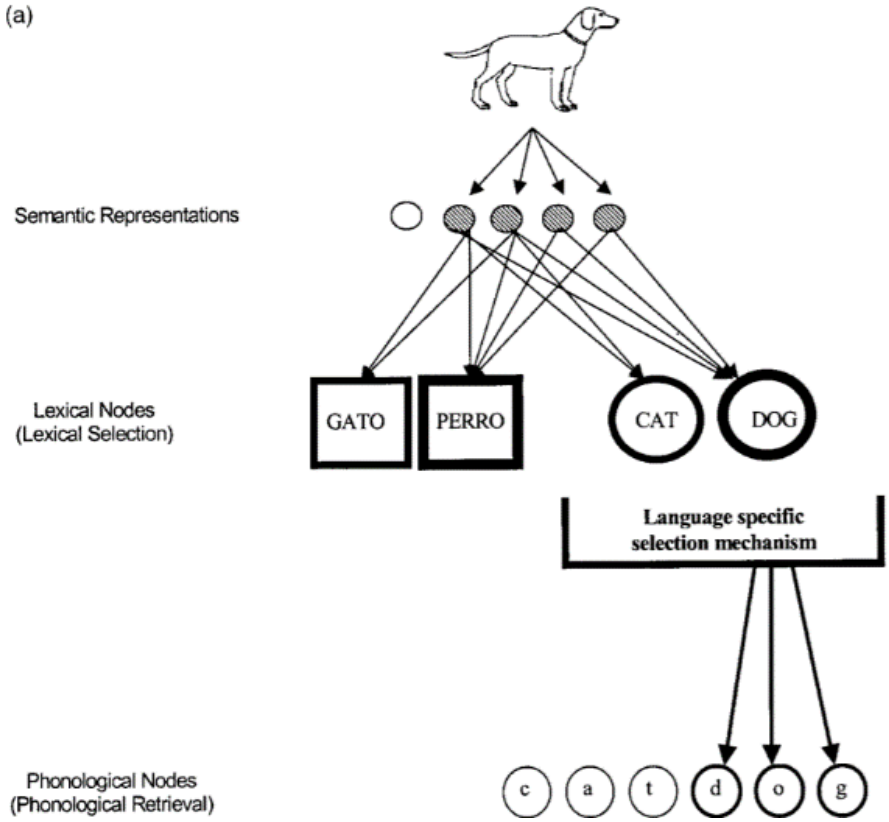

Figure 4: Language specific model Adapted from Costa, 2005, p. 314

Most researchers, however, favour the *language non-specific selection hypothesis* which assumes that the mechanism responsible for selecting the target lexical node is sensitive to the level of activation across both languages, target and non-target (see e.g. Schwarts, Kroll, & Diaz, 2007; Costa, Caramazza & Sebastián-Gallés, 2000; Marian & Spivey, 2003b). Here, the mechanism simply picks out the lexical node with the highest activation level across both languages. Assuming lexical selection involves competition, the level of ease with which this decision is done depends on the discrepancies between the activated lexical nodes belonging to both languages (e.g. Hermans, 2000; Hermans, Bongaerts, De Bot, & Schreuder, 1998). As

seen from the schematic representation in figure 5, the language specific selection mechanism from figure 4 is replaced with a language non-specific selection mechanism.

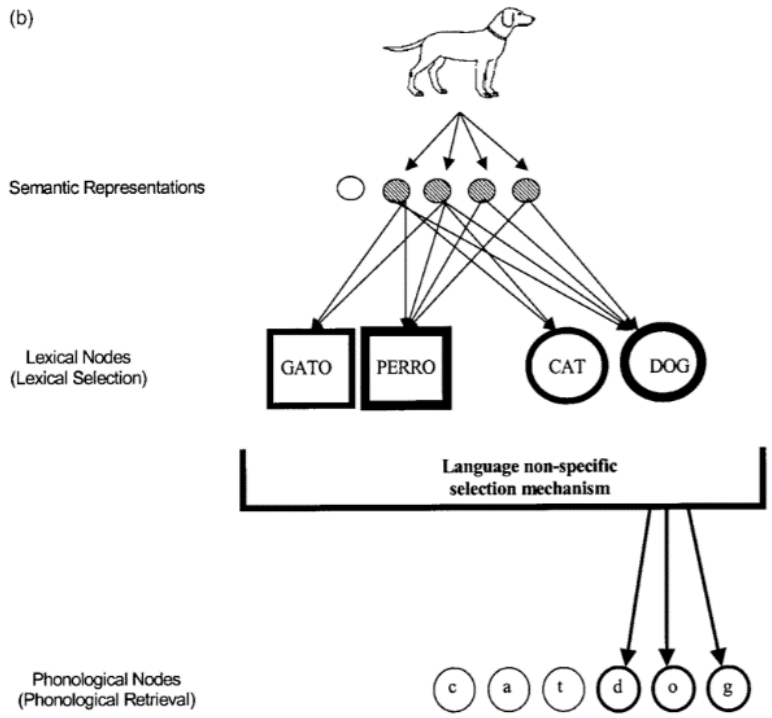

Figure 5: Language non-specific model Adapted from Costa, 2005, p.315

The notion of language non-selectivity is also supported in the Bilingual Interactive Activation (BIA) (Graigner and Dijkstra, 1992; Dijkstra & van Heuven, 1998) model of word comprehension. During the earliest stages of word recognition, the BIA model assumes that activation and inhibition patterns within and across representations are language blind (Graigner & Dijkstra,1992; Dijkstra & Van Heuven, 1998).

The BIA model further assumes that languages with similar orthographies experience parallel activation, leading to competition at lexical and sub-lexical levels. This assumption can be investigated by employing words that share form across languages such as cognates (translation equivalents that share form, e.g. *hand-hånd*); interlingual homographs (words that share form but not meaning, also called false friends: *fence – Fenster* (German for *window*)); and orthographic neighbours (words with a one-letter difference, e.g. *plant - plan<u>e</u>t*). If the assumption of nonselective lexicalisation is correct, then the presence of these words should influence bilinguals' performance on tasks of recognition, while if lexical selection is language selective, then the presence of these words should be irrelevant and bilinguals are predicted to perform like monolingual readers (e.g. Van Hell & Dijkstra, 2002).

The BIA + model (Dijkstra and Van Heuven, 2002) was proposed as an extension of the BIA model accounting for observed patterns of phonological, in addition to orthographic, interaction through both lexical and sub-lexical phonology (see also SOPHIA model by Van Heuven, 2000). Evidence of phonological interactions across languages supports the assumption that non-selectivity is not restricted to languages that share a similar form (e.g. Gollan, Forster, & Frost, 1997). Together, the specificity of the models allows clear predictions about the form of cross-language interactions, with both semantic and phonological representations to be tested during visual word recognition.

As seen above, both the language specific hypothesis and the language non-specific hypothesis make different predictions regarding the role of the language not in use during the process of lexical selection. While the former simply deem the existence of a non-response language irrelevant in the process, the latter assumes that lexical nodes from the unintended language may interfere. However, the two theories are underspecified in many respects. For instance, the specific mechanism that restricts consideration of lexical selection to only one language in the language specific model is not specified. In the same way, the language non-selective model is lacking in explaining exactly how it prevents lexical nodes from the unintended language to be selected. However, different hypotheses addressing these matters have been proposed.

The binding-by-checking mechanism proposed by Levelt et al., (1999) is one proposed solution to the issue of the language-specific selection mechanism. The mechanism ensures that the speaker's intended meaning matches that of the selected lexical node. However, this checking mechanism is assumed to be sensitive to both languages of a bilingual. Should the language of the selected lexical node not match that of the intended language, it is registered as a mismatch by the checking mechanism and discarded, thus ensuring that only lexical nodes belonging to the target language are eventually produced. As an explanation for involuntary intrusions from the non-target language, Levelt et al., (1999) argue that two errors need to be present. First, a word belonging to the wrong language must be selected. Second, a failure must occur in the checking mechanism that binds the target conceptual representation to the target language with the correct lexical node.

For the language non-specific hypothesis, there are two main proposals as to how the selection of the intended language is ensured. The first one assumes that lexical nodes in the

response language are activated more intensely than lexical nodes in the non-target language, which would guarantee that the highest level of activation is found with the lexical node in the target language (see e.g. Poulisse, 1999). The second proposal assumes an inhibitory process actively suppressing the lexical nodes from the language not in use, meaning that the lexical nodes of the target language would always achieve a higher level of activation and thus be selected.

Another issue that must be considered is how the phonological repertoires of a bilingual's two languages are represented. In the case of a language-specific selection mechanism, there would need to exist two separate phonological repertoires so that one could presuppose a retrieval mechanism sensitive to the level of activation of only one phonological repertoire. However, should there be a certain overlap between the two phonological repertoires of a bilingual, then the activation of a translation equivalent in the non-target language should affect the level of difficulty in retrieving the phonological makeup of the target word.

Although the precise mechanisms at work remain unclear, many studies have investigated whether the flow of activation moves freely from the semantic system to both of a bilingual's lexical systems regardless of the language in use. Poulisse and Bongaerts (1994; but see also Poulisse, 1999) conducted a study on spontaneous slips of the tongue in both high- and low proficient Dutch-English bilinguals showing an effect of the first language system. They found that high proficient speakers had considerably less L1 intrusions (16 out of 3361 words) compared to low proficient speakers (246 L1 intrusions out of 2795 words produced). These findings suggest that there is simultaneous activation of both languages in a bilingual, as there would be no L1 intrusions if there was a total blockage of activation from the non-target language. Secondly, the results also suggest that proficiency in a language has a negative impact on the probability of selecting lexical items from an unintended language.

Hermans et al. (1998) found evidence supporting the notion of language non-specific activation flow at all stages from a series of picture-word interference experiments. Here they had Dutch-English bilinguals naming pictures in their second language while ignoring distractor words from either their first or second language. In the conditions of interest, distractor words were phonologically related to the translation of the target. That is, if the participant was supposed to name a picture of a mountain in English, the distractor phonologically related to the translation of the target (*berg* in Dutch) would be *berm*. The

hypothesis was that if activation flows in a manner that activates the target's translation in the non-response language, then lexical selection of the target node in the target language should be harder (take longer time) when the target's translation receives extra activation from the phonologically related distractor word, compared to when the distractor word was not phonologically related to the target's translation (*kaars*). The results obtained supported the hypothesis' assumptions about naming latencies being slower in the conditions with a phonologically related distractor word. This further supports the idea of a language non-selective activation flow and that lexical nodes from both languages are considered during lexical selection.

The notion of whether there is phonological activation of the target's translation in the other language has also been investigated through looking at the impact of cognate status. Costa et al. (2000) looked at whether cognate status of translation words affected the speed it took to produce them in picture naming and hypothesised that retrieval of phonological makeup of the target word would be easier for translation pairs that were cognates, compared to translation pairs that were non-cognates, should the phonological representation of the target's translation also be activated. The reasoning behind this hypothesis is that the phonological features belonging to the target word would receive activation from both the lexical node in the target language and from the translation of the lexical node in the non-response language, leading to a very high level of activation, which results in easier lexical access and visible shorter naming latencies. For non-cognates, this elevated activation would not occur as the target and its translation equivalent would activate different phonological properties. Costa et al. (2000) found that naming latencies were indeed faster for cognates than for non-cognates and their results thus further support non-selective lexical access where lexical nodes from the language not in use also spreads activation to their phonological properties.

In the models discussed above, the differences between bilinguals have not been addressed. Of course, bilinguals differ in many ways such as language dominance, proficiency and usage, age of acquisition, similarity between language sets, immersion etc.. These differences in profile may affect how their languages are both represented and processed. In the next section, I will discuss how research has approached individual differences as a factor in bilingual word production.

1.3 Bilingual profile

As we have seen from Costa's model (2005), bilingual speech production requires certain mechanisms not necessary in monolinguals to be able to select the correct word in the correct language. This finding has led researchers to further investigate if these mechanisms affect the bilingual brain in other areas than just speech processing. It has been argued that the use of one more language is an important factor for shaping individual performance in non-verbal tasks involving processes of cognitive control (see Bialystok, Craik, Green and Gollan, 2009 for a review). The argument is that bilinguals experience enhanced skills in cognitive control due to the constant cognitive demands bilingual speakers experience during language control. The bilingual brain is in turn said to employ these enhanced skills when asked to perform non-verbal tasks involving these same control processes. This intriguing proposal raises an important question. What defines a bilingual and how bilingual do you have to be to benefit from its advantages?

The term bilingualism is hard to define. While some people are of the opinion that one needs to be fully proficient in two languages to qualify for being bilingual, others deem being able to communicate in another language sufficient. Considering that individual differences such as proficiency might affect not only a bilingual's status as bilingual, but also how they process language and how these languages are represented in the mind, several questionnaires have been developed that investigates aspects of bilingual profile and how they might affect language representation and processing.

Anderson, Mak, Chani & Bialystok (2018) designed the Language and Social Background Questionnaire (LSBQ) aiming to resolve issues regarding the absence of a proper definition of bilingualism and a standard means of assessing individuals' degree of bilingualism. It was developed specifically for use on bilingual young adults living in communities where English was the official language, with the factors employed to evaluate their degree of bilingualism including extent of proficiency, in addition to mapping usage of a non-English language at home and socially.

Marian, Blumenfeld and Kaushanskaya (2007) proposed the Language Experience and Proficiency Questionnaire (LEAP-Q) as a reliable and valid way of assessing language profiles in bilinguals and multilinguals through self-reports. The LEAP-Q asks participants to list the

languages they know in order of dominance, specify the order of acquisition, percentage of exposure to each language, and language preference in speaking and reading. It also collects personal information such as cultural identification and education level. Finally, the questionnaire includes a language part where participants rate every one of their languages on age of acquisition (AoA) and proficiency in reading and speaking, immersion in different environments, proficiency levels for speaking, understanding, and reading, contributors to language learning, current exposure, and foreign accent. Through two experiments, they found the questionnaire to predict reliable relationships between behavioural measures and the self-reported ratings of language dominance, preference, proficiency, experience, and usage, to name a few, for healthy adult bilinguals and multilinguals with a literacy level equivalent to someone with a high school education or higher.

Apart from personal individual differences like AoA, proficiency levels, extent of language experience, and language use as investigated by the LEAP-Q, the set of languages in a bilingual might itself also be an important factor. For instance, does typography and orthography of languages affect language representation and production in bilinguals? Many studies looking into bilingualism have included language sets that are orthographically similar like Spanish-English, or even orthographically and typologically similar like Catalan-Spanish. When languages are typologically similar, they might be spoken interchangeably with more ease than typologically different languages, a feat which some propose require greater control (see e.g. Costa, Hernandez & Sebastián-Gallés, 2008; Marcecová, Asanowicz, Krivá and Wodniecka, 2013).

Although a study initially investigating the benefits of bilingualism on non-linguistic tasks, Tao, Marcecová, Taft, Asanowicz and Wodniecka (2011) provided appealing insight on factors of bilingual profile when they investigated the effect of AoA on Chinese-English bilinguals, a language set with different morphology, orthography, phonology, and syntax. They employed young adults that had acquired their L2 either early or late, and found that early bilinguals reported being English dominant, while the late bilinguals were more balanced speakers. Although both bilingual groups performed better than an English monolingual control group on a set of tasks in executive measures, indicating that the bilingual advantage (e.g. increased executive function, see Bialystok, 2011 for a discussion) is not restricted to similar languages, their findings revealed differences in performance between the bilingual groups. Results

suggested that different aspects of performance can be attributed to different factors of bilingual profile as an advantage of mediation monitoring were more affected by age of L2 acquisition, rather than balance between languages, while the opposite was suggested for conflict resolution.

If these differences in AoA affected bilinguals' performance on executive measures differently, would the same apply to other factors of bilingual profile like language dominance and proficiency, and could these in turn be extended to also affect language representation or production? For instance, considering that age of language acquisition often is closely linked to proficiency levels in that language, could differences observed for AoA in executive measures be extended to also apply for proficiency on representation or production of language?

1.4 Effects of bilingual profile

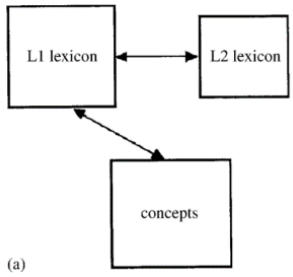

Figure 6: Word Association model. Adapted from Kroll and Tokowicz, 2005, p.544

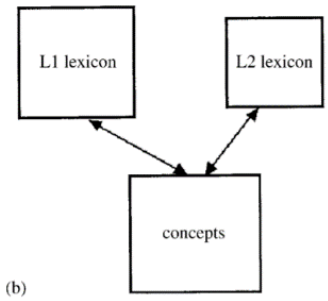

Figure 7: Concept Mediation model. Adapted from Kroll and Tokowicz, 2005, p. 544

The Revised Hierarchical Model (Kroll & Stewart, 1994) is one model of bilingual speech processing that have been proposed to account for the developmental sequence of proficiency previously found in bilingual speakers (see Potter et al., 1984). The model (figure 8) incorporates the connections found in the previous models of Word Association (see figure 6) and Concept Mediation (see figure 7) (see Potter, So, Von Eckardt & Feldman, 1984), but makes two critical assumptions about how strong the connections are between concepts and words in bilingual memory. First, it is assumed that words from bilinguals' first language have a stronger connection to concepts compared to their second language. Second, it is assumed that words from bilinguals' second language are more strongly connected to their corresponding translation equivalent in their first language than the other way around. The asymmetries that arise from these assumptions are hypothesised to reflect the impact of learning a second language in bilinguals who already have a fully developed lexicon for words in their first language and corresponding concepts. The RHM

suggests that second language learners, at the early stages of acquisition, take advantage of the word-to-concept links that already exists in their first language to access meaning for new words in their second language. This exploitation leads to formation of a strong lexical connection from L2 to L1 during learning. Over time, feedback may create L1-to-L2 links at this level, but due to the learner not having to use their L2 in the same way, these links will be weaker than those from L2 to L1. With growing L2 proficiency, learners develop the ability to directly process L2 words conceptually. However, it is assumed that the strength of connections between words and concepts are greater for L1 than for L2 except for the most balanced bilinguals. These assumed asymmetries between L1, L2 and word-to-concepts links predict an asymmetric performance in translation. According to the model, forward translation (L1 to L2) is conceptually mediated, while backwards translation (L2 to L1) proceeds directly through the lexical connections from L2 words to their L1 translation equivalent. Because the lexical connections of L1 words rely on going via the concepts before reaching their translation equivalents in L2 (see figure 8), forward translation is expected to take longer to perform than backward translation and are more likely to involve semantics. It is further assumed that the connection from L2 to concepts gets stronger parallel with an increase in L2 proficiency, resulting in less translation asymmetry and increased degree of conceptually mediated translation from L2 to L1.

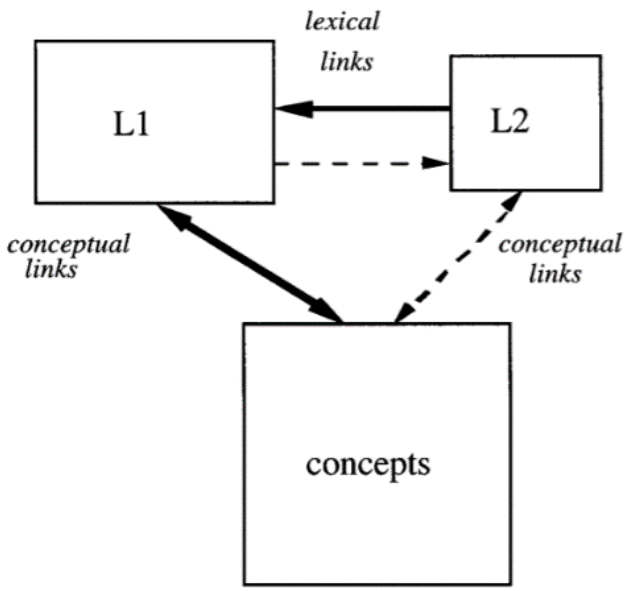

Figure 8: The Revised Hierarchical Model. Adapted from Kroll and Tokowicz, 2005, p. 545

Several aspects and predictions made by the Revised Hierarchical Model have been tested since its proposal, mostly through translation experiments with bilinguals of varying proficiency (e.g. Sholl, Sankaranarayanan & Kroll, 1995; Francis, Tokowicz and Kroll, 2003). Kroll and Stewart (2005) investigated the predictions made by the RHM that only forward translation would be conceptually mediated and that this in turn would make the translation process slower than for backward translation. In the experiment, relatively proficient Dutch-English bilinguals were asked to translate words from L1 to L2 and the other way around. To investigate whether semantics were engaged during forward translation, the semantic context of the translation lists were manipulated, making it possible to see if this affected naming/translation latencies (category interference). Stimuli consisted of one semantically categorised list (animals, vegetables, furniture etc) and one semantically mixed list. The experiment included two conditions: one naming condition and one translation condition. In the former, participants were asked to produce the word on the screen exactly as it appeared, while in the translation condition, they were asked to produce the translation equivalent of the presented word. In line with the predictions of the RHM, the results showed that translation from L1 to L2 were slower when the same words were presented in the categorised lists than when they appeared in the mixed condition, while translation from L2 to L1 remained unaffected by this manipulation. This supports the hypothesis that only forward translation is conceptually mediated.

The developmental aspect of the RHM that suggests a transition in the acquisition process from relying on translation equivalents between L1 and L2 to being able to directly mediate concepts have also been examined by several studies (see e.g. Kroll, Michael, Tokowicz and Dufour, 2002; Sunderman, 2002). Talamas, Kroll and Dufour (1999) had one set of proficient bilinguals and one group of less proficient bilinguals perform a translation recognition task (DeGroot, 1992b) where they were asked to indicate whether a presented pair of words were translation pairs or not. The critical conditions included foils that were related in form (e.g. *man- hambre* "hunger") or meaning related (e.g. *man-mujer* "woman" instead of translations (e.g. *man-hombre* "man"). The results showed that the more proficient group had more interference from the meaning related foils, than for the form related foils, while the opposite seemed to be true for the less proficient group. These results argue in favour of a developmental shift from form to meaning as proficiency increases in L2.

As discussed here, many studies have found evidence supporting the predictions of the RHM, but there have also been studies where evidence conflicts with the predictions. La Heij, Kerling and Van der Velden (1996) had Dutch-English bilinguals perform the same task as in Kroll and Stewart (1994). The critical condition consisted of picture primes related to the target word. Similar to the results of Kroll and Stewart (1994), La Heij et al. (1996) found little effect of semantic context when naming words. However, contrary to the results of Kroll and Stewart (1994) and Sholl et al. (1995), La Heij et al. (1996) found significant semantic effects of picture primes for translations in both directions. These results suggest that both forwards and backwards translation are conceptually mediated. As the participants were deemed similar to those of Kroll and Stewart (1994), it was dismissed that results were due to an effect of participants. However, Francis et al. (2003) found that translation from L1 to L2 experienced facilitation from the previous translation only if the previous translation were in the same direction, while translation from L2 to L1 experienced facilitation regardless of the direction. These results suggest several things. First, it suggests that the two directions of translation possibly engage different component processes. Second, as bilinguals get more proficient, the two translation directions become more similar due to the asymmetrical priming disappearing resulting in both directions getting primed regardless of the direction of the previous trial. Finally, and most importantly in regard to the findings of La Heij et al. (1996), within an individual, it may be possible that some words are mediated conceptually while others are not. In Francis et al.'s (2003) study, the "easier" words in the stimuli sets, recognisable by their high frequency, all showed symmetrical priming across both groups. In La Heij et al. (1996), most items were of high frequency and were repeated many times, while in Kroll and Stewart (1994) items had a much lower frequency on average and were only presented one time per participant. The patterns found in Francis et al. (2003) suggests that both the items included in the stimuli and the proficiency of bilinguals are likely to affect the probability of asymmetric translation performance. Together, the findings mentioned here stress the developmental aspects of becoming bilingual: transitions from less to more proficient are also relevant to individual words, in addition to the individual bilingual.

Having seen how increased proficiency might alter language representation and production, the next question that needs answering is that of language dominance. The bilingual groups in Tao et al. (2011) reported being either English dominant or more balanced speakers, and

together with their reported AoA, these differences led to measurable differences in performance. Could maybe the aspect of language dominance affect the nature of language production or how language is represented in the mind, like seen for language proficiency in the RHM?

The hypothesis that lexical selection in the intended language is achieved through inhibition of lexical nodes belonging to the language not in use is one of the ways models within speech production attempts to account for how the correct language ends up getting selected (e.g. Green, 1986, 1998; Meuter & Allport, 1999). The Inhibitory Control (IC) model was proposed by Green (1998) and is, with multiple levels of control, the most specific implementation of this mechanism. Like other models of speech production discussed so far, the IC model assumes that speech production begins with the activation of a conceptual representation. As seen in figure 9, activation from representations at the conceptual level spreads not only to the lexico-semantic system, but also to an additional system called the supervisory attentional system (SAS). SAS is responsible for controlling the activation of task schemas for specific aims within language processing. For instance, the task schema for naming a number or a picture in your first language would look different from a task schema for doing the same things in your second language, or even carry out a translation from your L1 to your L2. It is assumed that inhibition takes place at the lexical level and that lexical nodes all have language tags specifying to which language they belong. Furthermore, during the process of lexical access, all words with a language tag from the language not in use are inhibited and thus not possible to select.

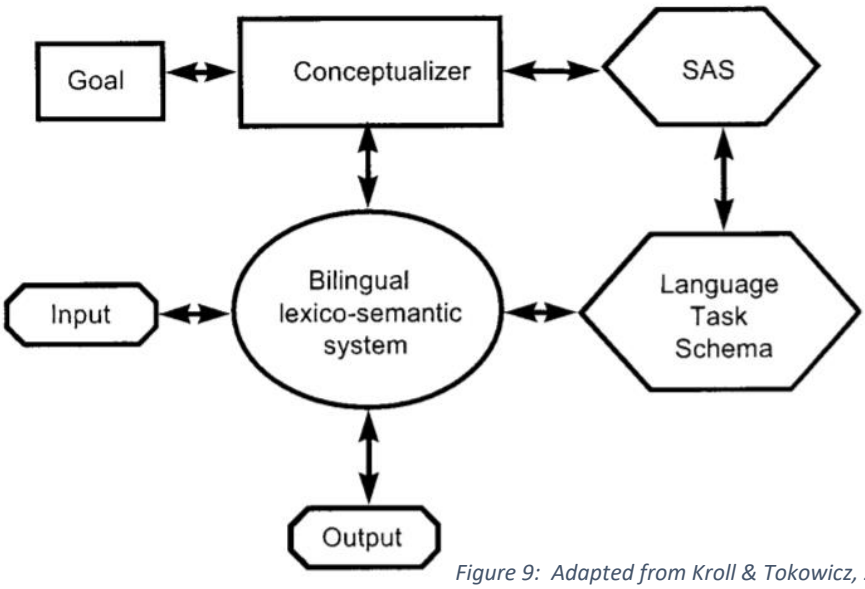

Figure 9: Adapted from Kroll & Tokowicz, 2005, p. 541

The ICM makes three important assumptions regarding lexical selection and this inhibitory mechanism. First, it is important to stress that the applied inhibition of lexical nodes in the non-target language is reactive in the sense that it only begins after activation of lexical nodes. For this reactive mechanism, it is assumed that the more active a lexical node in the non-target language is, the more inhibited it will be. Second, it is also assumed that, despite the presence of this inhibition mechanism, lexical selection is affected by interference from lexical nodes belonging to the non-target language. Third, the model assumes that processing is discrete between the lexical and phonological level, meaning that only the selected lexical node from the intended language retrieves its phonological representations.

The most fascinating evidence that supports the ICM and the notion of inhibitory control of a bilingual's lexical systems comes from experiments on language switching. Meuter and Allport (1999) investigated whether the direction of a language switch affected language switch cost, with switch cost being the measurable difference in time between switch-trials (from one language to another) and no-switch trials (same language for both trials). That is, would the switch cost from L1 to L2 differ from the switch cost from L2 to L1? The experimenters had bilinguals name digits presented in lists in either L1 or L2 depending on the colour of the screen for each trial. Naming latencies for both when trials were preceded by the same language (no-switch trials) and for when subsequent trials required naming in different languages (switch trials) were collected and analysed. Unsurprisingly, results showed that naming latencies were faster in no-switch trials compared to switch trials, displaying the cost of switching. Within switch-trials, the switch cost appeared to be greater when switching from your less dominant L2 to your dominant L1, than the other way around. These results were taken as supporting the notion that the non-response language of a bilingual is inhibited. The interesting notion that switch costs are greater from L2 to L1 was argued to reflect that naming in one's less dominant second language requires a very strong inhibition of one's first language. This elevated inhibition results in it taking a longer time to raise the activation level of the first language when the preceding trial was done in the second language. When naming in your first language, your second language is not as strongly inhibited as it confers less competition, and it is thus easier to switch to your L2 when needed. Meuter and Allport's (1999) results are thus consistent with the assumption that the level of inhibition required is proportional to the

level of activation of the lexical nodes in the unintended language. They also ascertained that the degree of the asymmetrical switching cost was affected by the level of proficiency in participants' L2. One could argue that this would suggest that participants with a high L2 proficiency would experience greater switching costs compared to low-proficient bilinguals due to them having to suppress both languages very hard. However, the results showed that proficient bilinguals experienced a smaller switch cost, regardless of the switch direction, compared to low-proficiency bilinguals. These results were later replicated by Costa and Santesteban (2004b) who compared switching costs in proficient bilinguals and L2 and L3 learners. Together, these results assume that the reactive inhibitory process is only functioning in lexical selection when a bilingual's proficiency in their L2 is low. This means that switching costs observed for more fluent bilinguals like those from Costa and Santesteban (2004b), would merely reflect the time it took to switch the task, rather than the after-effects of the inhibitory process.

Another model has attempted to link language profile and control in a more sophisticated way. Green and Abutalebi (2013) proposed the Adaptive Control Hypothesis (ACH) as a stronger suggestion to previous research indicating that to achieve their desired goals, bilingual individuals increase their cognitive control. The stronger claim of the ACH proposes instead that it is the language processes themselves that adapt to the demands repeatedly placed upon them by various interactional contexts. It is argued that the current interactional context is what drives the adaptive response, and that it is done to avoid an interactional cost.

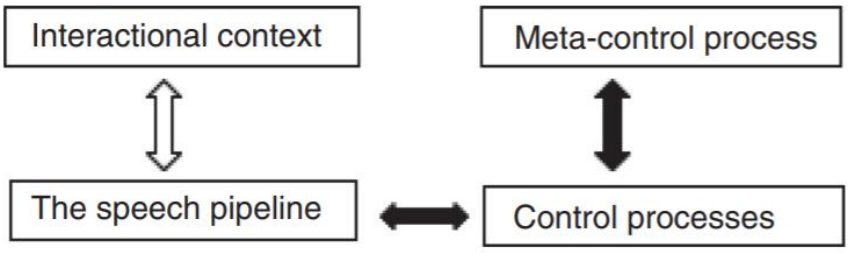

Figure 10:: Basic structure of the ACH. the dark arrows depict the flow of internal control processes Adapted from Green and Abutalebi (2013), p. 517.

As seen from figure 10, the conceptual architecture of the ACH distinguishes the interactional context, the speech pipeline and the meta-control process. The speech pipeline refers to the conceptual-affective-linguistic-sensori-monitor representations employed in comprehension

and production of speech, while meta-control processes refer to the processes controlling these representations in working memory in order to achieve communicative goals, and to the processes in charge of setting parameters of these control processes. It is these parameters that in the ACH adapt and mediate skill changes. From a neural perspective, adaptation might occur through change in capacity or structural resources (e.g. grey matter density), regional efficiency (e.g. through tuning or changing the degree of response in neural populations) or network connectivity (e.g. white matter connectivity). The parameters are then hypothesised to proceed with capturing the elements of these changes, such as transmission efficiency across the network, how different control processes coordinate, and the flexibility and persistence of control. In short, in the ACH, adaptation of control processes refers to the changing of how one or more parameters work (e.g. their efficiency or neural capacity), or how they work together with and are connected to other control processes.

More specifically, the most critical aspect of the ACH is that the three real-world interactional contexts of single-language, dual-language, and dense code-switching contributes certain networks to be recruited in order to cope with the various demands that they place upon the eight language control processes of goal maintenance, conflict monitoring, interference suppression, salient cue detection, selective response inhibition, task disengagement, task engagement, and opportunistic planning (Abutalebi and Green, 2016; Calabria, Costa, Green & Abutalebi, 2018; Green and Abutalebi, 2013).

Table:1: This table shows which interactional contexts that place demands on which control processes. Adapted from Abutalebi and Green, 2013, p. 519

Demands on language control processes in bilingual speakers as a function of the interactional context relative to demands on the processes in monolingual speakers in a monolingual context

	Interactional contexts		
Control processes	*Single language*	*Dual language*	*Dense code-switching*
Goal maintenance	+	**+**	=
Interference control: conflict monitoring and interference suppression	+	**+**	=
Salient cue detection	=	+	=
Selective response inhibition	=	+	=
Task disengagement	=	+	=
Task engagement	=	+	=
Opportunistic planning	=	=	**+**

+ indicates the context increases the demand on that control process (more so if bolded); = indicates that the context is neutral in its effects. Please see main text for explanation of the control processes.

The cognitive processes reckoned to be fundamental to language control cover intending to speak in a given language, selecting the target response, inhibiting words from the unintended language, monitoring speech for potential intrusions (Costa, Miozzo & Caramazza, 1999; Kroll, Bobb & Wodniecka, 2006; Abutalebi & Green, 2007), and engaging and disengaging language (Green and Abutalebi, 2013). These are in turn orchestrated by a network of corticial and subcorticial brain areas, the same areas which are closely related to executive control.

In single-language contexts, the use of languages is separated into different environments (e.g. L1 at home, and L2 at work and outside the home), and language switching very rarely occurs. As seen from table 1, single-language contexts place demands only on goal maintenance and interference control, which is governed by the frontal control regions, especially the left inferior frontal gyrus (Abutalebi and Green, 2016). In dual-language contexts both languages are used, but generally with different speakers. In this context, switching may occur within conversations, but not utterances. In addition to placing a greater demand on goal maintenance and interference control, dual-language contexts additionally place a great demand on control processes (except from opportunistic planning) to keep disruptive elements from occurring in a conversation. This greater demand in turn requires a greater control network including the inferior parietal lobe, the bilateral inferior frontal gyrus, cerebellum, anterior cingulate cortex, basal ganglia and thalamus (Abutalebi and Green, 2016). In dense code-switching contexts speakers of the same languages switch continually between languages mixing words and sentences where they see fit, even within a single utterance. This “free flow” causes this third interactional context to only place demands on the control process of opportunistic planning, which are governed by the left inferior frontal gyrus and the cerebellum. What the Adaptive Control Hypothesis suggests is that increased or continued interaction in these contexts will put more pressure on the neural regions that govern them, which in turn leads to increased neural and cognitive adaptations.

The ACH could be implemented into Green’s (1998) Inhibitory Control model. Here, the ACH predicts that task schemas for each language compete during the single and dual language contexts, while they cooperate in the dense code-switching context. This means that the way schemas are coordinated is affecting the control processes that are associated with them, which in turn leads us to the basic prediction of the ACH that in different contexts, speakers will reflect different patterns of adaptive response. Speakers in a dual-language context, an

everyday context for most bilinguals, will experience the greatest demands on goal maintenance, conflict monitoring and interference suppression.

Clark (1996) defined the prototypical use of conversations and the language used in them as joint actions where the ultimate goal is to minimise the effort made by both parties to achieve an understandable interaction that runs smoothly, also known as the interactional cost. Abutalebi and Green (2013) viewed this cost as a factor motivating adaptive changes in control processes. For conversations to run as smoothly as possible (i.e. obtain a low interactional cost by e.g. not having your single-language conversation interrupted by a switch in language), the control processes involving interference suppression, goal maintenance and conflict monitoring will need to be adapted.

Lai & O'Brien (2020) investigated the assumptions, predictions, and interactional contexts of the ACH by measuring English-Mandarin bilinguals on their self-reported engagements in the three interactional contexts and on word production and sentential language switches through switching tasks that were either alternating, semi-cued or uncued. The researchers also measured cognitive control processes in verbal and non-verbal interference control, goal maintenance, task engagement and disengagement, and selective response inhibition. Their results were partly in favour of the model. They found that a higher degree of engagement in the dual-language context were positively, but not exclusively, linked to cognitive engagement and disengagement on verbal tasks, while non-verbal interference control and goal maintenance were linked to uncued inter-sentential language switching. The authors also expressed concerns about the distinctiveness of the three interactional contexts in the real-life world as they might not be evident in a multilingual society due to findings suggesting the existence of fluidity in bilingual interactional contexts. Together, the authors interpret these findings as revealing the complexity of interactions including cognitive control processes and language switching with distinct domains.

1.5 Effects of bilingualism: advantages and disadvantages

As briefly mentioned earlier, prior research has found both advantages and disadvantages to being bilingual. In addition to the obvious non-cognitive advantage of being able to communicate in more than one language, and thus with more people, evidence from studies

on bilingualism argues for the presence of certain cognitive advantages as well, such as cognitive reserve (see e.g. Kousaie and Philips, 2017) and enhanced executive functioning (EF) (see e.g. Tao et al., 2011). The main argument behind bilinguals developing these enhanced features compared to monolinguals is rooted in the well-documented statement arguing for non-selective language activation. As previously discussed, this means that bilinguals must constantly choose which language to use and which to inhibit, even in highly monolingual contexts like Abutalebi and Green's (2013) single-language context (Bialystok, 2011). Researchers believe it is this constant exercise of the mind that confers the cognitive advantages that have been observed, as studies suggest that the mechanism recruited into linguistic processing by the bilingual brain in order to cope with the potential conflict of two competing languages is the executive control system (Bialystok, 2011). The executive control system is assumed to be a domain-general system with core components consisting of shifting, updating (working memory) and inhibition, making it involved in processes requiring selection or conflict resolution (see Miyake et al., 2000). This bilingual advantage in cognitive functioning has been observed across the entire lifespan, from young children whose cognition is still developing (e.g. Park, Weismer, & Kaushanskaya, 2018; Carslson & Meltzoff, 2008), through adolescents (e.g. Chung-Fat-Yim, Himel & Bialystok, 2019) and young adults (Tao et al, 2011), to older adults with declining cognition experiencing healthy (e.g. Kousaie and Philips, 2017) and unhealthy ageing (e.g. Bialystok, Craik, and Freedman, 2007). Emmorey, Luk, Pyers and Bialystok (2008) conducted an experiment on bimodal bilinguals to see whether the bilingual advantage was due to extensive training in selecting one language while inhibiting the other. The authors argued that since bimodal bilinguals can speak and cogesture at the same time, there is no need for them to select a language in the same way as a unimodal bilingual must. The results showed that bimodal bilinguals did not exhibit the executive function advantages observed in unimodal bilinguals (Tao et al., 2011: Kousaie & Philipps, 2017). These results suggest that the bilingual advantage on executive function measures is not just a product of being able to speak two languages, but more specifically being able to select one and inhibit the other when speaking.

However, being bilingual also confers certain disadvantages. Research on bilingualism has found that a bilingual's native language changes as a result of active use of the second language, meaning that speech production in bilinguals differs from monolingual speech

production in both languages (see Kroll & Gollan, 2014 for a discussion). Studies have shown that bilingualism has a negative impact on a bilingual's vocabulary range. Bialystok, Luk, Peets and Yang (2010) found that English monolingual children obtained higher scores on a receptive vocabulary test than bilingual children for all ages tested (3-10 years), despite the bilinguals being fluent in English and using it at school daily (but see Nicoladis & Jiang, 2018). Bialystok et al.'s (2010) findings are consistent with other reported findings comparing bilinguals and monolinguals on vocabulary knowledge across the entire lifespan (Bialystok, 2001). It has also been found that bilingual children experience slower language development compared to their monolingual peers (see e.g. Hoff et al., 2012; Smithson, Paradis and Nicoladis, 2014; Bedore & Peña, 2008). Bilinguals also tend to perform worse than monolinguals on standard tests of verbal fluency like the Boston naming test. Here, bilinguals have slower naming latencies when naming pictures if they do not know the translation equivalent in their other language (Gollan, Montoya, Fennema-Notestine, and Morris, 2005; Poarch and Van Hell, 2012). The standard neuropsychological assessment of verbal fluency is often split into category fluency and letter fluency. When tested for category fluency, the participant must name as many items within a category (e.g. furniture) as they can. The ability to make categorised lists mainly relies on linguistic processing, and the performance is related to grey matter density in the left inferior temporal cortex, which in turn is associated with linguistic ability. In other words, category fluency reflects only one's vocabulary. Letter fluency, on the other hand, where participants are asked to name as many items as possible beginning with a certain letter, additionally relies on executive control. Performance here is related to grey matter density in the head of caudate and the pre-supplementary motor, which both are regions of the executive function network (Grogan, Green, Ali, Crinion, & Price, 2009). This means that letter fluency also reflects executive control in addition to vocabulary. Typically, bilingual participants in randomised groups perform worse than monolinguals for category fluency, while results are more mixed for letter fluency (e.g. Sandoval, Gollan, Ferreira, & Salmon, 2010). These results initially reflect a smaller vocabulary in bilinguals than in monolinguals. However, when both groups were matched on vocabulary size prior to testing, they performed equivalent on category fluency, while bilinguals outperformed monolinguals in letter fluency (Bialystok, Craik and Luk, 2008b; Luo, Luk and Bialystok, 2010). This means that when matched for lexical access and vocabulary, bilinguals outperformed

monolinguals on a verbal task when the condition required executive functioning, supporting the notion of enhanced executive control in bilinguals.

Bilinguals have also been found to experience increased difficulties in word retrieval. With an additional language in the brain to keep track of, it is not surprising that bilinguals have been found to experience the tip-of-the-tongue phenomenon more often than monolinguals (e.g. Gollan and Silverberg, 2001; Gollan & Acenas, 2004).

1.6 The tip-of-the-tongue phenomenon (TOT)

The tip-of-the-tongue phenomenon is as frustrating as it is compelling. TOTs were first closely studied and described by Brown and McNeil (1966) and have since become one of the most studied forms of speech errors. They are characterised by speakers not being able to immediately recover from them and tending to remain suspended in the middle of an utterance until they finally retrieve the word or simply give up. It is important to note that TOTs are very different from not knowing a word or feeling that you ought to know this word (see Schwartz, 2006;2008 for a discussion). For your retrieval failure to be characterized as a TOT, retrieval needs to feel imminent, like it is on the tip of your tongue. While in a TOT state, speakers often try to describe their intended word with the hopes that their conversation partners will recognize it and produce it.

Although several things may cause speech errors (i.e.. misunderstandings, intention, etc.), they are usually recognised as a product of errors in the speech production process, and thus provides valuable insight on the nature of this process (see e.g Ecke, 2018). To see where in speech production TOTs occur, we need to revisit the two-stage model of lexical access where the first stage in the process is a meaning-based level (step 1), while the second level is form based (step 2). Implemented into such a model, TOTs are believed to reflect successful completion of step 1 (accessing meaning), but failure to complete the second step (retrieve the fully specified phonological form of the target lexical node) (e.g. Burke, Mackay, Worthley & Wade, 1991; Levelt et al., 1999). This notion is supported by findings that “victims” of TOTs are often able to recall partial grammatical information such as grammatical gender (Vigliocco et al., 1997). While it is disputed whether TOTs are a result of partial retrieval or blockage (see Meyer and Bock, 1992 for a discussion), research suggests that in either way it is indubitably

partial, as studies have found that people in a TOT state are able to retrieve partial phonological information like initial or last sound or letter, or number of syllables (e.g. Pureza, Soares and Comesaña, 2015). Having investigated what TOTs are, the next question that needs answering is; who gets them?

The TOT phenomenon is believed to be universal. In a language survey, Schwartz (1999) found that almost 90% of the languages included used the same tongue metaphor as in English to explain the feeling. This was also the case for non-Indo-European languages like Vietnamese and Cheyenne. Brennen, Vikan and Dypdahl (2007) also found that speakers of a Mayan language called Q'eqchi', which lacks a term for the phenomenon, recognised the description and reported having experienced it many times. Thompson, Emmorey & Gollan (2005) found that users of ASL (American Sign Language) have a "tip-of-the-finger" expression for when they are sure they know the visual sign but are unable to recall the hand movements. Speakers of Chinese have also reported having a "tip-of-the-pen" feeling where they know the spoken word and are on the verge of recalling the corresponding written character (Sun, Vinson, Vigliocco, 1998). There is even an expression called "tip-of-the-nose" where there is a strong feeling that the name of a familiar smell will be recalled when smelled (see Cleary, Konkel, Nomi & McCabe, 2010, but also Jonssen and Olssen, 2003).

While most TOT data are experimentally induced (e.g. Gollan, Montoya, Bonanni, 2005; Gollan & Acenas, 2004), there have also been studies employing self-reports (Tytus, 2016; Experiment 1 in Gollan et al., 2005). Although lab induced TOTs might be easier to control and evaluate, some studies suggest that participants of all ages experience an increased number of TOTs under evaluative observation, possibly due to stress arising from being evaluated and observed. (e.g. Schmank & James, 2020; James, Schmank, Castro and Buchanan, 2018). Although lab induced TOTs might not accurately reflect the frequency with which TOTs occur outside the lab, research from these types of studies provide information on other aspects of this phenomenon. For instance, the notion of TOTs being universal raises a question of predictability. Are all people equally inclined to fall into a TOT state? And could factors like language aspects or individual difference affect TOT occurrences?

Research on TOTs has found that age is an important factor in the number of TOT occurrences. TOTs are experienced across the whole developmental trajectory from children (Hanly and Vandenberg, 2009) to young adults (Gollan & Acenas, 2004), and further to older adults

(Brown & Nix, 1996; Schwartz & Frazier, 2005), with older adults experiencing an increased amount of TOT occurrences, both normally occurring and lab induced (e.g. Brown & Nix, 1996; James & Burke, 2000; Schwartz, 2002). TOTs have also been found to occur more frequently for children and adolescents with dyslexia relative to normally developing children and adolescents (Hanly & Vandenberg, 2009; Faust, Dimitrovsky, & Davidi, 1997; Faust, Dimitrovsky, & Shacht, 2003; Faust & Scharfstein-Friedman, 2003). The phenomenon has been observed in monolinguals, bilinguals, and multilinguals alike, with experimental evidence indicating that they tend to occur more often in bilinguals and multilinguals compared to monolinguals (e.g. Gollan & Silverberg, 2001; Gollan & Acenas, 2004).

Looking at TOTs in bilinguals is especially interesting as the additional language in their mind already affects how they process speech, and it is interesting to see how they deal with this retrieval failure and what might affect it. Kreiner and Degani (2015) investigated the effects of brief first language exposure (short film in Russian) to long term use (Hebrew immersion) on TOT occurrences in early (>5 years) and late (>11 years) Russian-Hebrew bilinguals and found that both contexts modulated TOTs. The bilingual groups were compared to each other and to a monolingual Hebrew group on a picture naming task before and after watching a short film in Russian. Before the movie, late bilinguals experienced a significant increase in TOT occurrences, while early bilinguals did not differ significantly from the monolingual group. Following the film, however, both bilingual groups differed from the monolingual group in performance. This finding was later replicated by Stasenko and Gollan (2018) in Spanish-English bilinguals and English monolinguals. Interestingly, the English monolinguals in Stasenko and Gollan (2018) also displayed effects of the Spanish movies showed to them. Together, these results suggest that long-term, short term and even brief pseudo-immersion of a language may interfere with lexical retrieval.

The tip-of-the-tongue phenomenon is a popular field of research, and several studies have been done looking at different language aspects in relation to it, including cognate status (Gollan and Acenas, 2004) and syllable position and word length (Pureza, Soares and Comesaña, 2015). Research have also investigated what might help resolve TOT states (e.g. Brédart, 2018), what might increase the likelihood of repeating a TOT state (Oliver, Li, Harley and Humphreys, 2019), and how priming of factors like translation (Gollan, Ferreira, Cera and

Flett, 2014), semantics and phonology (Quang, Cai and Zhang, 2020) and syllabic pseudo-homophones (Pureza, Soares and Comesaña, 2013) affects TOT occurrences.

One language aspect that has proven to be exceptionally tricky for production and retrieval in both monolinguals and bilinguals are proper nouns. Most naturally occurring TOTs are for proper nouns (Cohen and Burke, 1993; Valentine, Brennen & Bredart, 1996) and they have been found to be both more difficult to learn than biographical information (Cohen & Faulkner, 1986; McWeeny, Young, Hay, & Ellis, 1987), and more difficult to recall when learned (e.g., Young, Hay, & Ellis, 1985).

One theory behind this difficulty is connected to the effects in the semantic system. It is assumed that while we may know much information about specific individuals, not many aspects of meaning are associated consistently with particular names (Cohen, 1990; Semenza, 1997; Valentine et al., 1996). Semenza and Zettin (1989) argued for proper names being "pure referring expressions" as they are used to refer to single individuals rather than more instances of the same kind. This aspect is unique to proper nouns and is represented in some models by a special proper noun phrase node which is being processed prior to whole word lexical level representations, but following distributed semantic representations (Burke, Locantore, Austin & Chae, 2004). The retrieval of proper noun nodes is assumed to be especially difficult due to only a single connection linking the phrasal node to the necessary lexical representations within the semantic system. This leads to less activation opportunities, making proper nouns especially vulnerable to failures in retrieval relative to concepts with multiple converging links providing strong activation (e.g. *chair* receiving activation from the prototypical sense of chair, but also *stool* and other furniture for sitting) (Burke et al, 1991). As a result of this difficulty, one could argue that bilinguals should experience more TOTs for proper nouns relative to monolinguals. However, since most proper nouns are the same in every language (*Barack Obama* is *Barack Obama* in English and Norwegian), bilinguals should be effectually monolingual for these words in the same way that we saw for cognates above. Additionally, while cognates may be prone to idiosyncratic syntactic differences like grammatical gender (e.g. *hamburgesa* is feminine in Spanish and *hamburger* is masculine in Hebrew), proper nouns do not depend on such specifications and might in fact share one single lexical representation across languages. Gollan, Bonanni et al. (2005) investigated proper nouns' effect on the TOT phenomenon in both bilinguals and monolinguals and found

that while bilinguals experienced TOTs significantly more often for other words, they fell into a TOT state equally often for proper nouns as did monolinguals.

As seen above, data has been collected on a whole array of factors' and aspects' relation to TOT occurrences. But how are these data best analysed and interpreted? Gollan and Brown (2006) investigated the effects of age and bilingualism in relation to target word difficulty over two experiments. Their first experiment had monolingual young adults and older adults name pictured objects with either difficult or easier names and revealed that increased age led to increased TOT occurrences for difficult, but not easy targets. The second experiment had young adult bilinguals and monolinguals perform the same task and showed that bilinguals experienced more TOT occurrences relative to monolinguals on easy targets while they had fewer for difficult targets. Based on previous interpretations of TOT data, the observed age and bilingual effects on TOTs were dependent on target difficulty in ways implying incompatible conclusions about effect of group differences in retrieval ability. Based on their own findings and thorough analysis of previous research, Gollan and Brown (2006) argued that implications of group differences in previous research might have been obscured by the employment of problematic measures in TOT experiments. Although an increase in TOTs is often assumed to reflect a relative inability to access intended word forms, Gollan and Brown (2006) argued that partial retrievals like TOTs should be considered a better option relative to no retrieval at all. They further argued that greater amounts of raw TOT numbers did not necessarily have to imply retrieval deficits, but that TOTs may instead reflect improved abilities in accessing lexical representation. The authors distinguished five different responses occurring during TOT elicitation referring to either successful or failed completion of the two steps of lexical access:

i) GOTs (as in "I got it", following Koriat & Lieblich, 1974) reflecting successful completion of step 1 and step 2.

ii) positive TOTs/+TOTs are TOTs for the experimentally intended target, and reflect successful completion of step 1, but failure of step 2.

iii) negative TOTs/-TOTs are TOTs for words other than the intended target, and reflect a failed attempt to complete step 1 and step 2.

iiii) notGOTs are when speakers might recognise the experimentally intended target, even though they might fail to retrieve it or retrieve an incorrect word at their first attempt. This response reflects a failure to complete both steps.

iiiii) postDK refer to when the speaker does not know the intended word after being provided with the word form. This response reflects a failure to complete both steps.

Gollan and Brown (2006) further argued that as +TOTs and GOTs were the only responses reflecting successful completion of step 1, and of which +TOTs were the only response reflecting successful completion of step 1, but failed completion of step 2, the proportion of failures in completing only the second step could be calculated in the following manner:

$$\frac{TOTs}{(TOTs + GOTs)}$$

Furthermore, the three other responses (-TOTs, postDKs, and notGOTs) all reflect a failure to complete the first step, leading to the following calculation for proportions of step 1 failures, with N being the total number of target words, to be:

$$\frac{N - (TOTs + GOTs)}{N}$$

Considering step 1 failures reflect an inability to access the meaning of the experimentally intended target word, and retrieval of step 2 only can be attempted after successful completion of step 1, failure of step 1 reflects the proportion of trials where there was no opportunity for the speaker to fall into a TOT state. Further on, failure of step 2 completion reflects the proportion of trials where speakers fell into a TOT state after step 1 completion. The authors argue that by looking into every type of response in a TOT experiment, the two-step approach will provide a more thorough characterisation of group differences when studying lexical retrieval. Furthermore, they argue that the theoretically framed outcomes discussed above clarify TOT data implications for models of language production, bilingualism, and cognitive ageing.

Having discussed what TOTs are, who gets them, and what individual differences and language aspects might increase the chances of getting them, the last question that needs answering concerns how they arise. In this next section, I discuss two main hypotheses aiming at

explaining the increased number of TOTs and general disadvantages bilinguals experience compared to monolinguals: the weaker links hypothesis and the competition account.

The weaker links hypothesis, also called the frequency-lag hypothesis, was proposed by Gollan and colleagues to explain why bilinguals are disadvantaged relative to monolinguals on certain production tasks (Gollan & Acenas, 2004; Gollan, Bonanni et al, 2005; Gollan, Montoya et al, 2005; Gollan, Montoya & Werner, 2002; Gollan and Silverberg, 2001). The background for the hypothesis is that because bilinguals speak two languages, they must split the time spent speaking each language, causing them to speak each of their languages less than a monolingual, indirectly causing a bilingual effect on lexical retrieval. It is assumed that because bilinguals use words in each language less frequently than what monolinguals do for their single language, lexical representations in both a bilingual's languages receive less overall practice relative to the lexical system in a monolingual. As time passes, this results in weaker links between the semantic level and the phonological level in a bilingual, leading to reduced accessibility of words in both languages, as frequency of use correlates positively with the ease with which words are produced. This suggests that bilingual word production will effectively be overall slower not only in L2 compared to L1, but also in L1 compared to monolingual word production. Thus, the weaker links hypothesis draws parallels between bilingualism, language use patterns, and frequency effects where increased use lead to better lexical accessibility. What is interesting about this assumption is that the effect of bilingualism is attributed to frequency, the same mechanism influencing accessibility in all speakers, rather than a mechanism more unique to bilingualism. In other words, the same mechanism that is employed to explain why monolingual speakers spend longer time retrieving low-frequency words relative to high-frequency words, is extended to also explain why bilinguals experience disadvantages on lexical production tasks. According to the hypothesis, the weakened links should be especially weak at the point in production where frequency effects have shown to be most prominent for all speakers.

When investigating the tip-of-the-tongue phenomenon in bilinguals, Gollan and Acenas (2004) found evidence supporting activation of phonological properties from lexical nodes belonging to the non-response language. Assuming that TOTs are products of failed phonological retrieval of the target word, TOTs should occur more frequently for non-cognates than for cognates as the availability of phonemes of cognates would be higher if they receive dual

activation, as predicted by the weaker links hypothesis. Results supported the weaker links hypothesis as participants experienced less TOTs for cognate words relative to non-cognates. Furthermore, the researchers argued that the observed cognate effects were a result of the target's translation sending activation to the phonological representations of the target when the translation pairs are cognates, making the phonological representation more available for retrieval and thus resulting in less TOTs. Similarly, the findings from Gollan, Bonnani, et al's (2005) study on proper nouns also support the weaker links hypothesis' notion that words that are similar in both languages should reduce the bilingual disadvantage, as bilinguals are effectively monolingual for those words.

The competition for selection account (e.g. Green, 1998; Kroll et al., 2006), also called the interference or inhibitory account, argues for the bilingual disadvantage being a product of the constant competition between candidates from both a bilingual's two languages. As previously mentioned, bilinguals experience intense competition whenever they speak because they know two words (translations) for each concept that fit their intended meaning, while monolinguals know just one (except from when dealing with synonyms like *couch* and *sofa*, in which monolinguals behave more like bilinguals (see e.g. Jescheniak & Schriefers, 1998; Peterson and Savoy, 1998)). According to this account, the same feature (competition between lexical candidates from both languages) that results in the bilingual advantages on non-linguistic tasks, is also responsible for the bilingual disadvantage on tasks of lexical processing.

Considering increased TOT occurrences are attributed to either reduced frequency-of-use relative to monolinguals or between-language interference at either the semantic or phonological level, Pyers, Gollan & Emmorey (2009) argued that the case of bimodal bilinguals would help decide between these alternatives as a bimodal bilingual's two languages lack phonological overlap. When comparing ASL-English bilinguals, English monolinguals, and Spanish-English bilinguals on a picture-naming test they found that the bimodal bilinguals had more TOTs than English monolinguals, and equal amounts as the unimodal bilinguals. Considering bimodal bilinguals experience no phonological overlap, but still had more TOTs than the monolingual group, these data exclude blockage of phonological representations as the exclusive source of increased TOTs in bilinguals. Furthermore, as bimodal bilinguals had a slight advantage over unimodal bilinguals in correct retrievals, the findings are coherent with

semantic interference, and phonological blocking only having a minor role. However, although arguing that within the competition account, TOTs were more likely the result of semantic rather than phonological competition, Pyers et al. (2009) favoured reduced frequency-of-use as the most comprehensive explanation for increased TOTs in all bilinguals.

However, it is important to note that the hypotheses are not mutually exclusive as they may be used at the same time to account for how language processing is affected by different aspects of bilingualism. It is rather a question of which mechanism is the most efficient at explaining bilingual performance in comparison to monolinguals at a given task. For instance, some aspects of bilingual performance that are best explained by the weaker links hypothesis include the finding that bilinguals experience a greater disadvantage for words they know in just one language, both when it comes to naming latencies in picture naming tasks (Gollan, Montoya, et al, 2005) and TOT rates (Gollan & Acenas, 2004). These results are difficult to implement in the competition account as bilinguals would be effectively monolingual for words they know in just one language, and non-existing translation equivalents cannot compete for selection. The weaker links hypothesis is also better suited to explain why bilinguals experience a disadvantage relative to monolinguals even when speaking in their dominant language when there is little evidence supporting the notion that language production in the dominant language can experience strong interference from the less dominant language (but see Jared & Kroll, 2001 and Kroll et al., 2006). However, both hypotheses can account for Ecke's (2004) findings that bilinguals are more likely to fall into a TOT state when speaking in their less dominant language relative to their dominant language. Here, the weaker links hypothesis attributes the findings to stronger links between lexical and phonological representations in the most dominant language relative to their less dominant language as a result of frequency-of-use (in line with the RHM), while the competition account attributes it to the less dominant language conferring less competition in dominant-language production than the other way around (in line with the ICM).

The standard predictions of the two hypotheses depend on the language processing models they are implemented into. For the weaker links hypothesis, the crucial element is how the models deal with the frequency effect mechanism. As previously mentioned, many models of language production (e.g. Caramazza, 1997; Dell, 1986, Levelt et al., 1999) and comprehension, both monolingual (e.g. McClelland and Rumelhart, 1981) and bilingual

(Dijkstra and Van Heuven, 2002) make predictions equal or similar to the following to explain frequency effects:

i) increased use leads to lexical representations accumulating baseline levels of activation,
ii) these baseline levels are in turn heightened with increased use proportionate to their distance from the activation threshold,
iii) lexical selection takes place when activation levels reach the threshold.

The ceiling effect from the second assumption where increased use results in heightened lexical accessibility predicts that low-frequency words will experience a higher effect of different degrees of usage relative to high-frequency words. This prediction in turn creates four other predictions of how ageing, frequency and bilingualism might interact in order to affect the production of language.

i) The first prediction is equal to that of the weaker links hypothesis and assumes that bilinguals will experience greater frequency effects relative to monolinguals because they use words from each language less than monolinguals.
ii) The second prediction assumes that the frequency effects should be larger for the non-dominant language than for the dominant language as it is used less.
iii) The third prediction assumes that younger adults should experience greater frequency effects relative to older adults after controlling for slowing related to ageing (e.g. Cerella, 1985; Faust, Balota, Spieler & Ferraro, 1999) as they have had less practice speaking compared to older adults (e.g. Murray and Forster, 2004).
iv) The fourth prediction assumes that the bilingual disadvantage will decrease with age as bilinguals are able to “catch up” with monolinguals as they would have had more time to practice.

For the competition account, the crucial element in speech production models is the existence of dual-language activation. As previously seen, while most models agree on language non-selectivity, there is still debate whether languages compete for activation (e.g. Green, 1998) or not (e.g. Costa et al., 1999), or if it is task-dependant (Kroll et al., 2006). Should the competition account be used to explain the bilingual disadvantage, two assumptions on speech production must be made. First, semantically related candidates from both languages

are activated and compete for selection during language production (e.g. Cutting & Ferreira, 1999; Levelt et al, 1999; Wheeldon & Monsell, 1992). Second, the non-dominant language is able to compete hard enough for production in the dominant language to be slowed. Following these assumptions, the competition account predicts that frequency effects only modulate the bilingual advantage at the same point in language production where competition between languages arise. Should frequency effects arise at the phonological level after competition between semantically related candidates has been resolved, no frequency modulations on the bilingual disadvantage are assumed (e.g. Harley & Brown, 1998; Levelt et al, 1999). Gollan et al. (2008) assumed no language competition at the phonological level (e.g. Hermans et al., 1998) as experimental research has found facilitation of phonological overlap in both monolinguals (e.g. Harley and Brown, 1998) and bilinguals (e.g. Gollan & Acenas, 2004; Costa et al, 2000).

Experimental evidence (e.g. Alario, Costa & Caramazza, 2002; Dell, 1990; Caramazza, Costa, Miozzo & Bi, 2001) offered an alternative account where lexical selection is affected by word frequency at the point in production when multiple semantically related candidates are active. For models assuming feedback from the phonological level to the lexical level, lexical selection should be affected by frequency (e.g. Cutting and Ferreira, 1999; Dell, 1986), and would thus predict, like the weaker links account, that frequency modulates the bilingual disadvantage if translation equivalents compete for selection. Without making explicit assumptions about the nature of selection competition, it is hard to predict precisely how frequency and competition interact. Gollan et al (2008) suggested that if bilinguals could be considered to be effectively "more bilingual" for words with high frequency and it was assumed that words of low frequency in the non-dominant language would be especially unlikely to interfere in dominant language production, then retrieval of high-frequency words should be affected more than low-frequency words by between-language competition. This prediction is in the opposite direction of the weaker links hypothesis. The competition account would then further suggest that as bilinguals age, their ability to control interference will decrease (Hernandez & Kohnert, 1999), thus increasing the bilingual disadvantage (e.g. Logan & Balota, 2003; Taylor and Burke, 2002), especially when naming pictures of low-frequency words (Spieler & Griffin, 2006).

Following the above assumptions, Gollan et al (2008) investigated the weaker links hypothesis by examining frequency effects in bilinguals compared to monolinguals (experiment 1),

between the dominant and non-dominant language within bilinguals (experiment 1 and 2), and how this might change with increasing age (experiment 2). In their first experiment they found that bilinguals named pictures more slowly than monolinguals, and that discrepancies between performances both between bilinguals and monolinguals and between a bilinguals' dominant and non-dominant language was greater for low-frequency words than for high-frequency words. In the second experiment they found smaller frequency effects in older bilingual adults compared to young bilingual adults in the non-dominant language, all in line with the weaker links hypothesis. However, when controlling for slower reaction times related to ageing, no age-related changes of significance in frequency effects in the dominant language were found. That is, non-dominant language production was "catching up" to dominant language production, but bilingual dominant language production was not "catching up" to monolingual production. This particular finding cannot be easily explained by either account (see Gollan et al, 2008 for a discussion), and highlights the notion that neither of them are able to account for all findings, alone or together.

Here, we have seen that the two hypotheses are not mutually exclusive as they are able to sensibly account for experimental evidence on different areas. This further builds on the complexity of bilingual spoken word production and suggests that both frequency and competition are likely to play a role in the bilingual disadvantage and TOTs, but in different ways. Having seen that different language aspects such as frequency, cognate status and proper nouns, and bilingual profile factors such as language dominance are likely to affect TOT rates in bilinguals, could this also be extended to include other aspects of individual differences in bilingual profile such as proficiency and usage, in the same way we saw them affect speech processing?

1.7 The current study

In the current study we investigated the effects of bilingual language profile, cognate status, noun type, and frequency on the tip-of-the-tongue (TOT) phenomenon in Norwegian-English bilinguals. The study consisted of one bilingual profile questionnaire in addition to the TOT experiment.

The employed questionnaire was an adaptation of the LEAP-Q by Marian et al. (2007). In it, participants reported their own language history, experience, proficiency, and usage, as it has been found that self-ratings tend to be quite accurate (see Marian et al., 2007; Anderson, 2018). The LEAP-Q was included in the current study for profiling purposes to investigate whether certain aspects of their bilingual history and experience, or their proficiency and usage would affect or predict the number of TOT occurrences in each of their languages.

Our stimuli for the TOT experiment consisted of definitions and questions for selected target words. We chose definitions rather than pictures which are normally employed (Gollan et al., 2008; Gollan & Acenas, 2004) as some words (e.g. abstract nouns) are easier to define than draw (e.g. *pandemic*). We developed two stimuli sets for each language to control for stimuli effects, and within these sets we counterbalanced the order of words to control for effects of order. This was done to make sure that none of the effects that we potentially observed could be attributed to selection or arrangement of stimuli. Half of our stimuli consisted of cognates while the other half were non-cognates. Cognate status was manipulated in order to check for the possible cognate facilitation effects that have been observed in previous TOT research (e.g. Gollan & Acenas, 2004; Costa et al., 2000). In addition to cognates, we also manipulated noun type as half of our words were common nouns and half of our words were proper nouns. This manipulation was done to check for possible effects of noun type, as proper nouns have been found to be notoriously difficult to retrieve (see Gollan, Bonanni, et al., 2005). The last manipulation included matching stimuli across all sets for frequency as both main hypotheses regarding TOT occurrences make predictions about frequency effects and these effects have been observed in previous studies (e.g. Gollan et al, 2008, Gollan and Silverberg, 2001). Some of our stimuli was adapted from Avila (2019) and augmented to better fit our purpose e.g. employ more high-frequency words to create a comparable frequency range. As we were also interested in seeing what phonological information participants in a TOT state were able to retrieve about the target, participants who fell in a TOT state were asked whether they remembered any letters or phonemes from the word, where in the word these might be localised, and how many syllables it had.

Contrary to many other TOT studies (e.g. Gollan, Bonanni, et al, 2005; Gollan and Silverberg, 2001), we employed bilinguals with uniform language sets, making it easier to compare their results across the different conditions. The study of Norwegian-English bilinguals is particularly

interesting due to certain language similarities and dissimilarities and the globalised environment they live in. In the next section, I will discuss aspects of the English language that are similar and dissimilar to the Norwegian language.

1.7.1 A comparison of languages

As is the case for most languages, the similarities found between the English and Norwegian languages can unsurprisingly be attributed to their shared language ancestry. Both languages are derived from the Germanic branch of the Indo-European language family, with English deriving from the West Germanic branch, and Norwegian deriving from the North Germanic branch (see figure 11) (Bucchini & Moulton, 2018).

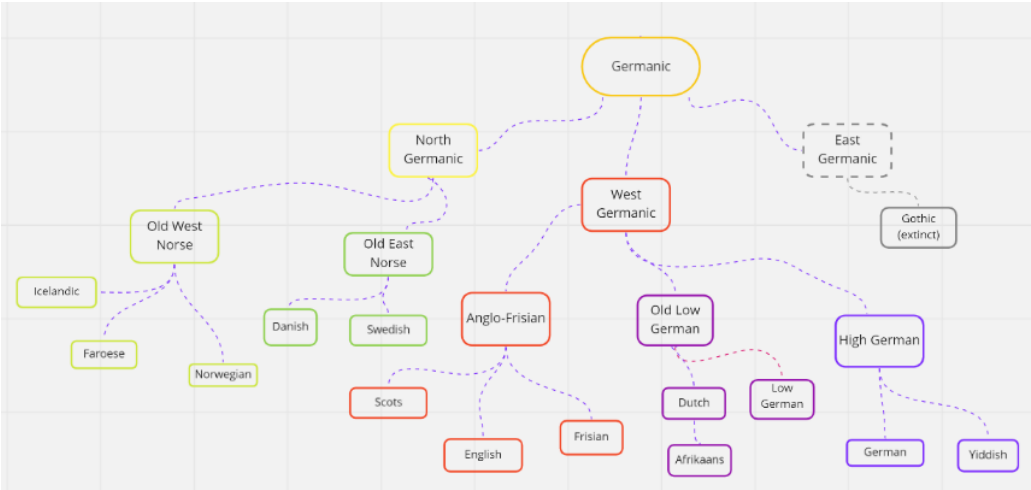

Figure 11: Simplified language tree showing the shared language ancestry between English and Norwegian based on descriptions in Bucchini & Moulton, 2018)

Despite belonging to two different branches, English and Norwegian have several features in common, some even making English more similar to Norwegian and other North Germanic languages compared to other West Germanic languages like German and Dutch. Eamonds and Faarlund (2014) point out some interesting syntactical similarities between English and Norwegian. For instance, English and Norwegian have the same syntactic structure when it comes to e.g. word order. In English and Norwegian, the object of the sentence is placed right after the verb, while in Dutch and German it is put at the end (see table 2). In addition to word order, English and Norwegian are both able to have a preposition at the end of sentences, split

infinitives and have group genitives, all of which is impossible in both German and Dutch (see Eamonds & Farlund, 2014 for a discussion).

Table 2: Examples of word order in Norwegian, English, Dutch and German (Emonds & Faarlund, 2014)

Norwegian	English	Dutch	German
Jeg har lest boken	I have read the book	Ik heb het boek gelezen	Ich habe das Buch gelesen

Like all Germanic languages, both English and Norwegian use the same Latin script. The Norwegian alphabet includes all the 26 letters present in the English one, in addition to *æ, ø* and *å*. Even though the English language has been heavily influenced by Latin languages such as French since the split from the other Germanic languages due to it being the language of the ruling class, English and Norwegian have a fair share of phonological similarities. As both languages have several different dialects and accents with different phoneme inventories, we have decided to focus on the Received Pronunciation (RP) for English and Urban East Norwegian (UEN) for Norwegian, unless otherwise specified. The phoneme inventories of RP and UEN are quite similar in size with RP having 24 consonant phonemes and 20 vowel phonemes, while UEN has 23 consonant phonemes and 25 vowel phonemes.

Table 3: Overview of shared consonant phonemes in addition to consonant phonemes that are language specific, which black indicating shared, blue indicating Rp specific and green indicating UEN specific.

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Glottal
Plosive	p b			t d		ʈ ɖ		k g	
Nasal	m			m		ɳ		ŋ	
Tap or flap				ɾ		ɽ			
Fricative		f v	θ ð	s z	ʃ ʒ	ʂ	ç		h
Affricate					ʧ ʤ				
Approximant		ʋ w			r		j		
Lateral approximant				l		ɭ			

* English also has the labio-velar approximant /w/

As seen from table 3, RP and UEN have 14 consonant phonemes in common, and 10 and 9 language specific, respectively. Most notably, the UEN inventory includes retroflex consonant phonemes, none of which are present in RP. Additionally, RP includes postalveolar and dental consonant phonemes, all of which are absent in the UEN inventory.

For vowel phonemes, the differences are more prominent. As seen from figures 12, 13 and 14, UEN and RP only have five shared monothongs ;/ i:,ə, æ, u:, ɑ:/. Additionally, many of the short monothongs found in figure 13 have a long corresponding realisation found in figure 14, emphasising that long/short contrasts in UEN are often phonemically contrastive, in contrast to many of the vowels found in RP. Finally, as seen table 4, RP and UEN does not share any diphthongs.

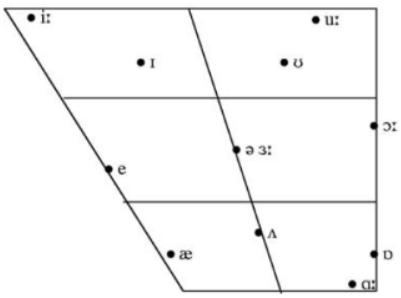

Figure 12: RP monothongs. Adapted from Roach, 2004, p.242

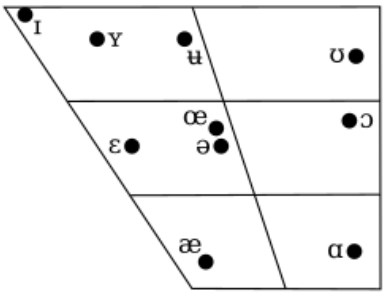

Figure 13: Short monothongs of UEN. Adapted from Kristoffersen, 2000, p 16-17.

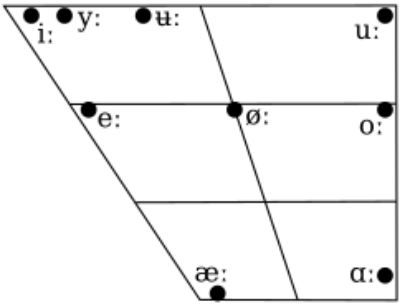

Figure 14: Long monothongs of UEN. Adapted from Kristoffersen, 2000, p. 16-17

Table 4: Dipthong inventories of RP and UEN

RP	UEN
/eɪ/, /aɪ/, /ɔɪ/, /əʊ/, /aʊ/, /ɪə/, /eə/, /ʊə/	Common:/æj/, /æw/, /œj/ Marginal: /ɔj/, /ʉj/, /ɑj/

The similarities found in the phoneme inventories make it easier for Norwegian learners to speak well-articulated English relative to speakers of a language that does not share as many consonant or vowel phonemes. However, the differences may in turn pose challenges as new sounds may be hard to articulate properly, especially if there is a native phoneme that is similar (e.g. / ʊ/ for /v/)

Norwegian and English are also morphologically different. One aspect of morphology dividing the two languages are verb and noun inflections. When conjugating a verb in English, you must pay attention to the subject's person in addition to tense. As seen in table 5, the verb *to be* is conjugated differently for first and third person singular in the present tense, while in the past

tense it is conjugated differently for the third person singular. For *to walk*, the first- and third-person singular are the same, but differs from the rest, while in the past tense the verb is the same for all subjects. In contrast, the Norwegian language only demands you pay attention to tense.

Table 5: Example of subject-verb agreement in English, and the absence of in Norwegian.

		English		Norwegian		
		Infinitive			Infinitive	
Tense	Subject	To be	To walk	Subject	Å være	Å gå
Present	I You He/she/it We You (pl) They	**Am** Are **Is** Are Are Are	Walk Walk **Walks** Walk Walk Walk	Jeg Du/de(polite) Han/hun/det Vi Dere De	Er	Går
Past	I You He/she/it We You (pl) They	**Was** Were **Was** Were Were Were	Walked	Jeg Du/de(polite) Han/hun/det Vi Dere De	Var	Gikk

Further on, neither English nor Norwegian operates with all the four grammatical cases of nominative, accusative, dative, and genitive that are common in the West-Germanic language German. Instead, both languages employ the nominative and oblique (here, a mix of accusative and dative), with Norwegian also using the genitive case, as seen in table 6.

Table 6: Examples of grammatical cases in English and Norwegian.

Case	English	Norwegian
Nominative	She likes ice cream	Hun liker is
Oblique	He gave her ice cream	Han ga henne is
Genitive	~~It is her ice cream*~~	Det er hennes is.
* English does not have genitive		

The English language does not operate with grammatical genders, while Norwegian does. However, although the Norwegian language does have masculine, feminine and neutral

nouns, they are not as overt to identify as in e.g. Spanish, and the rules applying to them are not as strict as in e.g. German[1].

Firstly, the grammatical genders in Norwegian are only identifiable either in the definite singular form, in the indefinite singular form together with the indefinite article, or, in the case of a neuter, in the indefinite plural. In Norwegian, the indefinite article corresponds to the noun's gender and is placed in front of the noun, while the definite article, also corresponding to the noun's gender, is incorporated as a suffix rather than a separate article (see table 7).

Table 7: Examples of genders, or lack thereof, in Norwegian and English.

Indefinite singular	Definite singular	Indefinite plural	Definite plural
En båt (m) A boat	Båten (m) The boat	Båter (m) Boats	Båtene(m) The boats
Ei jente (f) A girl	Jenta (f) The girl	Jenter (f) Girls	Jentene (f) The girls
Et fjell (n) A mountain	Fjellet (n) The mountain	Fjell (n) Mountains	Fjellene (n) The mountains

Finally, let us revisit the remark about rules for grammatical genders being less strict than for other languages. In Norwegian, the grammatical genders may be dialectal, which may prove challenging to learners of Norwegian. For instance, the dialect spoken in the city of Bergen conjugate all nouns elsewhere in Norway considered feminine as masculine (*brygga(f)* into *bryggen(m)**). Across the rest of the country, there are also some nouns where the correct gender is seldom used (*et kompliment**(n) rather than *en compliment*[2]*(m))*, and some where the nature of the gender is under great dispute (*en strikk(m) – et strikk**(n)).

The shared language history between English and Norwegian has resulted in many cognates between the languages. As seen from previously discussed studies, cognates are of particular interest in studies of bilinguals as a word's cognate status predicts how we expect bilinguals to perform on word/picture naming tasks and what this says about bilingual language processing. It is important to stress that cognates are defined differently in psycholinguistics than for historical linguistics. The historical definition refers to words with a common

[1] The exception for this is the other official written Norwegian language *Nynorsk*, which has stricter rules for conjugating nouns.

[2] Språkrådet.no states that in 2015 it was opened up for conjugating "compliment" as neutral, much due to everyone already using it that way, in addition to the previously correct masculine form.

etymological origin, while in psycholinguistics it refers to translation equivalents sharing form. In this thesis, the latter is employed. It will thus be interesting to see if the similarities between the languages affect the number of TOT occurrences, in the same way observed for picture naming latencies (Costa et al., 2000). Interestingly, many easier, high frequency everyday words such as *cup* and *husband* are often of Germanic and Old Norse origin, while the complex, low frequency terms such as *diagnosis* and *incubation* are often of Latinate or Greek origin, as visible from table 8.

Table 8: Examples of shared cognates- and their origin - in English and Norwegian.

Examples of cognates		
English	**Norwegian**	**Origin**
Waffle	Vaffel	Germanic *wafel*
Cup	Kopp	Old Norse *koppr*
Thursday	Torsdag	Old Norse *Þórsdagr*
Husband	Husbond	Old Norse *hūsbōndi*
Tree	Tre	Germanic/ Old Norse *Trewa/tré*
Diagnosis	Diagnose	Greek *diágnosis*
Incubation	Inkubasjon	Latin *Incubation, incubationis*

One morphological aspect of Norwegian that greatly differs from English is compounding of words. While the English language can also construct large compounds, this is done in several words. Similarly to Dutch and German, the Norwegian language can add on additional words to their original words and thus create large single-word compounds. Consider the words in table 9:

Table 9: Examples of compounding in English, Norwegian, Dutch and German.

Same-word comparisons			
English	**Norwegian**	**Dutch**	**German**
Chocolate cake	Sjokoladekake	Chocoladetaart	Schokoladentorte
Cup holder	Koppholder	Bekerhouder	Getränkenhalter
Carrier's liability insurance	Transportøransvarforsikring	Vervoerdersaansprakelijkheidsverzekering	Trägerhaftplichtversicherung

Comparisons for different words	
English	**Norwegian**
County traffic safety committee secretariat manager function	Fylkestrafikksikkerhetsutvalgsekretariatslederfunkjson
	Dutch
Refers to committee member of a committee preparing a procession at a children's carnival (netherlandsbynumbers.com)).	Kindercarnevalsoptochtvoorbereidingswerkzaamheden
	German
Refers to a law for regulating the labelling of beef (thoughtco.com)	Ringfleischetikettierungsüberwachungsaufgabenübertragungsgesetz

1.7.2 A globalised living environment

Norway is a relatively small country with relatively few inhabitants (5 391 369 as of January 1st, 2021 (ssb.no)), and its language is primarily spoken within its borders (although understood in the Scandinavian countries). Thus, it is understandable why Norwegians have been dependent on learning a second language to communicate with people outside their own borders. As most Norwegian-English bilinguals become bilinguals through school education rather than immersion due to immigration, it is of interest to see whether the effects observed for other language sets will be found in this set of bilinguals. In Norway,

children generally start learning English in first grade (age six), although some begin the learning process even earlier. Furthermore, acquiring English outside of school is made easier by all television shows and movies being subtitled rather than dubbed, contrary to e.g. Germany and France, unless they are made for children. In today's technological society, Norwegian youth receive much English input through e.g. the internet, various media, and books. This constant input from their second language in contexts that would normally be single language (Green and Abutalebi, 2013), leads to a lot of code-switching in the speech of Norwegian youths.

Considering this, the AoA and language background in our participants are expected to be very uniform, an aspect which may predict overall subtle differences in proficiency and usage. The early AoA and constantly living in an environment where code-switching is ordinary and accepted in most oral contexts, makes Norwegians especially interesting to look at in relation to TOTs as several predictions related to speech processing models and the bilingual disadvantage can be derived from their living environment.

1.7.3 Predictions

In our study, we investigated whether we would be able to replicate previously observed effects of cognate status, proper nouns, and frequency, as well as language dominance, on TOT states in our set of bilinguals. We employed Norwegian-English bilinguals; a language set barely investigated. New to our study is the manipulation of cognate status crossed with noun type. Here, we were interested in seeing whether we would see effects of these conditions on TOT rates. Also new to our study is the addition of bilingual profile as a possible effect on TOTs. Here, we were interested in seeing what individual differences might affect TOT rates and how.

Cognate status

In line with a cascading and language non-selective production model, the weaker links hypothesis predicts fewer TOTs for cognates relative to non-cognates as the lexical representation would be equal or similar in both languages and thus have a stronger link to its phonological makeup. Furthermore, it is predicted that the same number of TOTs will occur

across both languages for cognates as the shared representations should yield no frequency differences.

In contrast, considering there is no competition happening at the phonological level as suggested by Gollan et al (2008), the competition account predicts that cognate status should be irrelevant because word selection is unaffected by phonology and there should thus be the same amount of TOT occurrences for cognates and non-cognates in both languages.

Noun type

The weaker links hypothesis predicts more TOTS for proper nouns relative to common nouns, especially for the non-cognate ones. It is expected that the number of TOTs for cognate proper nouns is the same across languages as the shared representations should yield no differences in frequency.

The competition account predicts that if representations are shared for cognate proper nouns, this should result in fewer TOTS relative to non-cognate proper nouns which should result in increased TOT occurrences due to competing lexical candidates.

Frequency

The weaker links predicts that there will be less TOT occurrences for high-frequency words as their frequent use is believed to strengthen the link between lexical representations and phonological representations, making them have a higher baseline activation level and thus make them easier to retrieve.

The competition account predicts that there will either be no significant frequency effects or be more TOT occurrences for high-frequency words with most instances occurring for common nouns as more, similar lexical candidates competing will slow retrieval and cause the speaker to fall into a TOT state.

Bilingual profile

Firstly, we predict more TOTs in L2 English relative to L1 Norwegian as seen in Ecke (2004). Given that one's first language, especially in the case of Norwegian-English bilinguals, is often the most dominant and most used language, it should have a higher baseline activation level and thus be easier to retrieve according to the RHM. For the weaker links hypothesis, this

elevated L1 activation level should result in easier retrieval and less TOTs for L1 relative to L2. Similarly, the competition account predicts that the number of TOT occurrences are affected by language dominance in addition to other factors related to language dominance e.g. proficiency and frequency. As a result of this, participants are expected to experience less TOTs in their dominant language relative to their nondominant one due to less competition from the non-intended language, which is in line with the architecture of the ICM.

In line with the architecture of the RHM and ICM, the weaker links hypothesis predicts that participants who spend more time in environments where Norwegian is used will experience more TOTs in English relative to Norwegian due the amount of baseline activation and because the strength of the links between lexical and phonological representations correlate positively with frequency of use. Furthermore, people who spend more time in environments where Norwegian is used will experience greater access to correct phonology during a TOT state in Norwegian relative to the lesser used English. Lastly, while predictions for proficiency is harder to formulate as increased proficiency is often connected to increased frequency of use and/ or early age of acquisition, the weaker links hypothesis predicts that increased proficiency should result in less TOTs in that language due to higher baseline activations.

The competition account predicts that participants who often switch between their L1 and L2 will experience less TOTs, as they according to the ACH (Green and Abutalebi, 2013) are better trained at dealing with competition. In line with the ICM (Green, 1998), the competition account also predicts that participants who report high proficiency will experience fewer TOTs due to more training in inhibiting the language not in use during language production.

2. Method

2.1 Participants

56 Norwegian-English bilingual participants between the age of 18-34 (avg=25,18) were recruited through Facebook announcements and through our own acquaintances. All participants reported having normal or corrected to normal vision and hearing, and no language impairments such as dyslexia or stuttering. They only spoke Norwegian at home (aside from perhaps English), had a reasonable proficiency of English, and no significant knowledge of additional languages. After completion of the experiment, participants were debriefed and compensated with a gift card at the campus bookstore. The study was ethically approved by Norsk senter for forskningsdata/NSD (the Norwegian Centre for Research Data).

2.2 LEAP-Q

For our study we employed an amended version of The Language Experience and Proficiency Questionnaire/LEAP-Q (Marian et al., 2007). Our amendments included design changes, removal of ambiguities, and adding to/leaving out questions and options. The content changes to the questionnaire are further explained and discussed in this section. Our amended version and the original LEAP-Q (Marian et al., 2007) are both included, respectively, in appendix 1 and 2.

Our amended version consists of three sections, rather than the two parts of the original, and includes a screening part, questions on language background, and finally, questions about language proficiency and use. Our questionnaire was revised to be anonymised. Participants were instead given a participant number upon registration which followed them throughout the study.

We designed the screening section as a separate section of the questionnaire, making it include questions on personal information as well as inclusion criteria, both from the original study and new ones added for the purpose of this study. These questions were listed separately from the language background and proficiency questions to quickly determine

whether participants were eligible or not. The language background section was designed to further determine participants' eligibility by looking into their language history. In addition to the question on percentage of time exposed to each of one's languages from the original LEAP-Q, we added questions on percentage spent speaking and reading in one's languages, to better capture language use/immersion. For further mapping of language use, we asked whether participants felt that they had once been better in one of their languages, and, if participants reported this to be the case, then in which language and at what age. Finally, our revised version included questions on language preference in the cognitive situations of solving simple mathematical questions, dreaming, expressing anger or affection, and talking to themselves.

Since only our participants' use of Norwegian and English were of interest in this study, the set-up of the language section in the original LEAP-Q was altered in our amended version. Instead of answering questions for each of their languages one at a time, participants were rating their own proficiency, acquisition, and exposure contributors in both Norwegian and English simultaneously. We found this to be more time efficient and organised when only testing one specific language set. In this way, it would also be easier for the participants to compare their languages as they would have their answers and ratings to both languages in front of them.

First, participants were asked how much time they had spent in each language environment. Our amended version separated the question on school/workplace into four separate questions, specifying whether it was a work or school environment, and whether the language in question was spoken some or all the time. By splitting the original question, we aimed at getting a clearer sense of what kind of environments our participants had spent time in. When asking our participants about factors contributing to language learning, we added school and education as a separate factor, as we were interested in seeing the connection between formal learning, proficiency, and TOT occurrences. We also altered some of the other factors to either include a wider spectre (i.e. adding colleagues to friends) or more updated factors in line with today's modern and technological society (i.e. substituting listening to radio for music/media). The latter was also the case for the questions on exposure to each factor. When asking participants to rate their own proficiency, we added pronunciation, writing, grammar, vocabulary, and spelling as factors for them to consider in order to capture a wider aspect of their proficiency. We removed the questions on accent from the original LEAP-Q as these were

deemed irrelevant to our study. Lastly, we added questions on switching proficiency and switching habits as some of our predictions concerned these factors. All questions that were not related to age were rated on a 0-10 scale, which we provided an explanation of.

2.3 TOT experiment

2.3.1 Design

Since our main objective was to investigate the number of TOTs in both languages of our participants, we constructed one experiment in English and one in Norwegian. We were also interested in seeing whether we would be able to replicate the cognate effect previously found in TOT studies. Therefore, we manipulated cognate status (cognate vs non-cognate) crossed with noun type (common noun vs proper noun) within both languages, effectively giving us four conditions: cognate common noun (CCN), cognate proper noun (CPN), non-cognate common noun (NCN), and non-cognate proper noun (NPN). An example of each condition in each language can be found in table 10. Our last stimuli manipulation included frequency, leading words in all conditions across both languages to being matched for frequency. Here, 1-3 fpm was considered low-frequency, while 4-7 fpm was considered high-frequency (see appendix 3 for target word frequency data).

Table 10: Examples of each condition in both languages employed in our study.

Norwegian			
Cognate common nouns	**Cognate proper nouns**	**Non-cognate common nouns**	**Non-cognate proper nouns**
Hieroglyf	Almaas	Rogn	Tussi
English			
Cognate common nouns	**Cognate proper nouns**	**Non-cognate common nouns**	**Non-cognate proper nouns**
Hypochondriac	Cumberbatch	Municipality	Ghostbusters

Together, the manipulations of language, cognate status, noun type and frequency led to the following construction. Each experiment (one in each language) consisted of a total of 80

words split into two sets (EngL1/EngL2 and NorL1/Nor2). Each set consisted of 10 cognate common nouns, 10 non-cognate common nouns, 10 common proper nouns, and 10 non-cognate proper nouns, and were matched for frequency (see table 12 for mean frequencies by language and condition). These conditions were all within subject and between items. Each target word was accompanied by a definition and three foils (semantic, phonological, and random). Each set consisted of two blocks, with the same number of each condition in a randomized order, with a pause in-between. To control for the possibility of order of stimuli affecting our results, we counterbalanced the lists so that EngL1a would start with the first block, while EngL1b would start with the second block.

2.3.2 Stimuli

The full set of stimuli can be found in appendix 4.

2.3.2.1 Target words

Before selecting stimuli, we made a list of criteria for our target words. Firstly, all words had to be nouns. Stimuli could also only consist of common nouns and proper nouns. In order to cross noun type with cognate status, we also had to make sure that half of our stimuli were cognates and half were non-cognates, and that these conditions were evenly distributed across the noun type conditions, allowing for the four aforementioned conditions. Additionally, in order to look for frequency effects, we had to make sure that our stimuli included a range of frequency, from very low to high, across and within all conditions.

We avoided synonyms where both words were equally used as it was crucial for our experiment that there were not many candidates in the lexicon at retrieval. Because of this, we also wanted to avoid abstract nouns as they would in general be harder to define than concrete nouns. We aimed at avoiding direct translations as we did not want our participants to be able to guess the right word, but rather actually know them. We also wanted to exclude words belonging to more than one word class as this could affect the frequency, as a word inherits the frequency of its lemma.

To look words up in the corpora, stimuli could only consist of single words. This meant that for proper nouns, we had to select which of the names of a celebrity, fictional character, or place with multiple names to use. We could also only use single-word compounds. As TOTs often occur for words one know or have heard of, but do not use that often, we had to make assumptions for what the average participant in our selected age group (18-35) could be expected to know or have heard of. Unfortunately, the circumstances of this study did not allow for a pre-test. Therefore, all assumptions and remarks about what participants potentially would and would not know were based entirely on our own experiences and testing/questioning of family and friends who for different reasons disqualified as participants. Most words we came up with were looked up in both Norwegian and English corpora, as they might be better suited to one language or the other due to morphology or frequency.

We employed online corpora to find the frequency of our target words. For our English stimuli, we employed Subtlex-UK (van Heuven, Mandera, Keuleers and Brysbaert, 2014). The Subtlex-UK corpus consists of 201.3 million words collected from the subtitles of 45,099 BBC broadcasts (from nine different channels) between January 2010 and December 2012 (van Heuven et al., 2014). For our Norwegian stimuli, we employed the first version of NoWac (Guevara, 2010). This corpus consists of 700 million words and were collected by automatically going through all documents on the .no domain on the internet between November 2009 to January 2010.

One positive aspect of NoWac was that it displayed instances of use for the lemma searched for and similar lemmas, making it easier to see what the frequency of our particular lemma and word class was. Subtlex, however, only displayed the dominant position. This meant that we had to be extra careful with homonyms in English stimuli, as we would not be given the difference between the adjective sense of a word and the noun sense, or even the different definitions within the same word class. For example, the lemma “cast” could be both a noun and a verb, and within these word classes, it may refer to different concepts like *actors in performance* (n), *moulded structure* (n), *throwing aside* (v) or *selecting for an activity* (v). In NoWac, a similar lemma would be categorised, and all instances of the lemma and even similar ones would be put into the fitting category.

We used frequency per million (fpm) as a comparable unit across the sets in our two languages, given their considerable difference in size. Frequency per million is found by dividing the number of hits in the corpora by the number of entries in the corpora. For Norwegian this meant dividing the number of hits on 700, and for Subtlex, it meant dividing the Freq count on 201,3. In NoWac, some of the lemmas were identified as unknown when it came to part of speech. In the instances where this amount was only a small part of the total we used the entire lemma count. If it made up a significant part of the total we either used only the known lemma count or dispatched the word.

2.3.2.2 Definitions

When target words had been selected, we came up with definitions for each word that would be presented to the participants during trials. When making definitions, our criteria included accuracy and space. Firstly, because we tried to limit the number of possible responses by leaving out synonyms, our definitions had to be very accurate and clear enough to lead our participant directly to the target word, with no room for misinterpretations, should they know it. We also had to make sure that our definitions were concise enough to fit into OpenSesame (Mathôt, Schreij & Theeuwes, 2012), the program used for executing the experiment. This process helped exclude a great deal of words from the stimuli that were either clear synonyms or hard to define because of their abstract qualities. In instances where words with clear synonyms were included in the stimuli, the competing synonym was used in the definition.

2.3.2.3 Foils

In addition to target words and definitions, our stimuli consisted of foils that would be presented to participants at the end of the TOT-questioning. All target word had three foils; one semantically similar alternative (i.e. different character in the same movie (Bilbo for Gollum), field (Kant for Freud), genre (Ariel for Aurora) or a similar term (atheist for agnostic)); one phonologically similar alternative (multiplicity for municipality), and one random alternative, usually a word in the same word class as the target word. Example of a target word with its three foils is given in both languages in table 11.

Table 11: Example of a target word and its respective semantic, phonological, and random foil

English			
Target word	Semantic foil	Phonological foil	Random foil
Chernobyl	Hiroshima	Chernabog	Pribyl
Norwegian			
Target word	Semantic foil	Phonological foil	Random foil
Hieroglyf	Helleristninger	Hiragana	Sanskrit

2.3.2.4 Matching

All selected target words had to be matched across conditions for frequency and length (letters, phonemes, syllables). Stimuli were matched across sets, conditions and languages using mean averages of frequency, letters, phonemes, and syllables. Averages from the four sets of non-cognate proper nouns (consisting of 10 words each) were set as a starting point, as non-cognate proper nouns had proved to be the hardest condition to find eligible words in, and we wanted to change these sets as little as possible. When matching averages, we allowed for a range of about 1,5 for frequency (range= 1,51-2,46) and syllables (range= 2,10-3,4). Table 12 displays mean averages for each condition in the sets. When matching for length, we took into consideration that Norwegian words on average are longer than English ones due to single-word compounding, thus allowing for a larger discrepancy here if necessary. This led to the range for phonemes being between 5,8-8,5(variation=2,7), while for letters it was 6,50-9,10(variation= 2,6). When counting phonemes, we used UEN for the Norwegian stimuli and RP for the English stimuli, both dialects which does not pronounce the /r/ in many instances. The matching process excluded many otherwise eligible words due to frequency or morphology.

Table 12: Mean averages of syllables, phonemes, letters, and fpm across all four conditions in both sets of both languages.

	NOR1				ENG2			
	Syllables	Phonemes	Letters	fpm	Syllables	Phonemes	Letters	fpm
CCN	3,4	8,2	8,6	2,37	3,00	7,00	7,4	1,87
NCN	2,2	5,8	6,5	1,51	2,7	6,4	7,2	2,13
CPN	2,6	6,4	7,6	1,99	2,20	6,00	7,10	2,38
NPN	2,6	6,7	7,4	1,54	2,4	6,2	6,9	1,87

	NOR2				ENG2			
	Syllables	Phonemes	Letters	fpm	Syllables	Phonemes	Letters	fpm
CCN	3,2	7,8	8,4	2,42	2,8	7,1	8,1	2,13
NCN	2,3	6,1	6,4	1,54	3,00	6,6	7,6	2,03
CPN	2,3	6,4	7,1	1,62	2,10	5,80	6,50	2,46
NPN	3,2	8,5	9,1	1,52	2,3	6,2	7,00	2,04

2.3.3 Procedure

Participants completed the LEAP-Q before the first experimental session, with their answers being discussed with the experimenter before the experiment itself started. The experiment was conducted in two sessions, one in Norwegian and one in English. Participants were divided so that one half completed the first set (either a or b version), while the other half completed the second set (either a or b version). All participants began with the Norwegian set as previous research have shown that switching from L2 to L1 has a long-lasting effect on word finding and word productions, while the effect is significantly less the other way around (Costa and Santesteban, 2004).

In the experiment, participants were tested individually either in a room together with an experimenter or digitally over Zoom or Microsoft Teams. During the physical tests, experimenter and participants were seated at least 1 metre apart according to Covid-19 regulations, and seating space was disinfected between participants. Physical testing was administered on a 14inch laptop connected to an external screen angled towards the participant, while digital testing was administered through screen sharing on either Zoom or

Microsoft Teams. The program employed for both types of testing was OpenSesame (Mathôt et al., 2012).

At testing, participants were first given an oral description of the TOT state before they were presented with an informational page with instructions on how to complete the study, in addition to oral clarifications by the experimenter as needed. Definitions to target words were presented in a fixed random order, and participants were asked to respond with either 1/yes, 2/no or 3/TOT, respectively indicating knowing the word, not knowing the word, or getting a TOT. If participants responded knowing the word, they were asked to say it out loud, and the experimenter would log it as either right(1) or wrong (2). If participants responded not knowing the word, the experimenter proceeded to the next trial. If participants reported falling into a TOT state, the experimenter proceeded to ask them about what information they knew about the target word;

i) whether they could guess any sounds or letters in the target word?

ii) whether they knew where in the word these sounds or letters were(only present if letters or sounds were given in the previous question)?

iii) whether they could guess the number of syllables?

If the TOT was resolved during these questions, this was registered. If the questions did not lead to TOT resolution, participants were presented with a list of words and asked whether the word they had been thinking of was on the list. The list included, in a randomised order, the target word, a semantic foil, a phonological foil, and a random foil, in addition to the option “none of the above”. The informational page in both languages can be found in appendix 5 together with a stimuli sample from both languages.

3. Results

3.1 Leap-Q results

Participants

A total of 51 participants completed our amended version of the LEAP-Q (Marian et al., 2007). Participants (f=36) were between 18 and 34 years of age (avg=25,18). All but one participant reported being born in Norway, while all participants reported being Norwegian residents. Participants varied in years of education from 12,5 to 23 (avg=16,79) with highest education level varying between completed high school education to completed master's degree.

All but two participants reported identifying most with Norwegian culture (avg= 9,37 out of 10). 27 participants reported identifying with a second culture (avg=2 out of 10), 13 participants reported identifying with a third culture (avg=1,02 of 10), 4 participants reported identifying with a fourth culture (avg=0,04) and two participants reported a fifth culture (avg= <0,01).

Language background and dominance

All but three participants reported Norwegian as their L1 and English as their L2, the remaining three had English as their L1 and Norwegian as their L2. 18 participants reported knowledge of a third language, one person reported knowledge of a fourth while no one reported knowledge of a fifth language. These languages included Danish, German, Japanese, Spanish, Swedish, French and Norwegian Sign Language (NSL).

Participants who reported knowledge of only two languages (n=33), all reported their L1(NOR=31) to be their most dominant language and their L2 to be their least dominant language. Participants who reported knowledge of more than two languages, all listed their L1 as the most dominant, L2 as the second to most dominant, and then L3 and L4 respectively where applied. All participants reported that they had acquired their L1 and most dominant language first, then L2 and then L3 and L4 respectively where applied.

Over half of the participants reported once being better in one of their languages, with most of these languages including their L2(n=15), some their L3(n=10) and even some their L1(n=6).

This decrease in proficiency was reported to happen between the ages of 10 and 30 (avg=20,67 years).

When asked about which language they would choose when dreaming, expressing anger or affection, performing simple maths, or talking to themselves, almost all participants reported doing all tasks in Norwegian, with some reporting using English for some or all, both L1 and L2 or even their third language in one instance.

Language exposure and use.

As can be seen in table 13, participants reported being exposed to their L1 over half of the time on average, while exposure to L2 on average accounted for a little below half of the time. Most participants reported spending more time speaking their L1 relative to their L2, while time spent reading in each language seemed to be more distributed across ones two languages. When speaking with someone proficient in both their L1 and L2, most participants reported choosing to do so in their L1.

Table 13: Data displaying time spent using/being exposed to each language spoken

	L1 Norwegian		L2 English	
Language background measures in %	**AVG**	**Range**	**AVG**	**Range**
Time exposed to each language[a]	59,6	25-95	39,2	5-75
Time spent speaking each language[b]	77,8	20-100	21,2	0-80
Time spent reading in each language[b]	52,6	10-99	46,7	1-90
Time spent in chosen language	82,2	10-100	17,2	0-90

[a] Average exposure in terms of talking, listening, and reading.
[b] On average

Table 14 displays the mean average and range of the age reported by participants for duration of immersion in certain environments and age when a certain set of milestones occurred. On average, participants reported having spent more time in Norwegian (fully or part-time) language environment for all measures apart from a school where English was spoken SOME of the time. On average, participants also reported being younger for all milestones when they occurred in Norwegian compared to when they occurred for English.

Table 14: Data displaying duration of immersion in different environments in addition to age when certain milestones occurred.

Immersion duration and age milestones	Norwegian		English	
	AVG	Range	AVG	Range
Time spent in each language environment[a]				
Country	24,52	18,67- 32,58	1,96	0-22,92
Family	25,24	18,67- 34,92	1,94	0-34,92
School ALL of the time	14,33	0-20,08	0,73	0-13
School SOME of the time	5,25	0-23,58	6,75	0-18,08
Work ALL of the time	5,75	0-20,58	0,12	0-3
Work SOME of the time	2,66	0-20,58	1,44	0-10
Age milestones[b]				
Hearing on a regular basis	0,12	0-3	7,06	0-14
Attained fluency	4,31	0-16	13,90	6-23
Started reading	5,18	3-8	7,84	5-13
Became fluent reading	8,14	5-19	13,24	8-22

[a] Age in years and months
[b] Age in years

As seen from table 15, participants rated family interaction as the most important contributor to acquisition of Norwegian followed respectively by interactions with friends and colleagues, school and education, reading, watching TV/streaming, listening to music/media and self-instruction. For acquisition of English, school and education were rated as the most important contributor before reading, listening to music/media, interacting with friends/family, self-instruction, and family interactions.

Participants reported being exposed to Norwegian most in context of family, followed respectively by friends, reading, watching tv/streaming, listening to music and other media, and lastly through self-instruction. For English language, the biggest contributors to exposure were watching TV/streaming, closely followed by listening to music/media and then reading, interactions with friends, self-instruction, and family interactions respectively.

Table 15: Mean and ranges for measures of proficiency, contributors to language learning, and exposure to language.

Measures of proficiency, contributors to language learning, and exposure to language	Norwegian		English	
	AVG	Range	AVG	Range
Contribution to language learning[a]				
Interacting with friends/colleagues	7,75	0-10	6,08	0-10
Interacting with family	9,33	5-10	2,49	0-10
Reading	6,84	0-10	7,20	2-10
School and education	7,53	2-10	7,57	0-10
Self-instruction	1,27	0-10	2,71	0-10
Watching TV/streaming	3,92	0-10	7,55	2-10
Listening to music/media	3,25	0-10	6,37	2-10
Extent of language exposure[b]				
Interacting with friends	9,14	4-10	3,76	0-10
Interacting with family	9,35	0-10	1,10	0-9
Reading	5,31	0-10	6,94	1-10
Self-instruction	1,12	0-10	1,69	0-10
Watching TV/streaming	3,41	0-10	8,14	4-10
Listening to music/media	3,33	0-10	8,0	4-10
Self-reported proficiency[c]				
Speaking	9,53	5-10	7,78	4-10
Pronunciation	9,47	6-10	7,02	2-10
Listening	9,76	6-10	8,49	6-10
Reading	9,55	3-10	8,31	3-10
Writing	9,12	5-10	7,76	4-10
Grammar	8,43	4-10	6,92	3-10
Vocabulary	8,67	6-10	7,18	4-10
Spelling	8,69	4-10	6,98	3-10

[a]Range: 0= not a contributor, 5= moderate contributor, 10= most important contributor
[b]Range: 0= never, 5= half of the time, 10= almost always
[c]Range: 0= none; 1= very low; 2= low, 3= fair; 4= slightly less than adequate; 5= adequate; 6= slightly more than adequate; 7= good; 8= very good; 9= excellent; 10=perfect

When asked to rate their own proficiency, participants reported a higher proficiency on average in Norwegian, compared to English. For both languages, listening (comprehension), reading, and speaking respectively were on average the highest rated factors, while grammar was on average rated the factor with lowest proficiency. For the other factors, pronunciation, writing, spelling, and vocabulary were respectively rated with high proficiency in Norwegian, while for English, the middle factors consisted of writing, pronunciation, vocabulary and spelling respectively.

When asked to rate their own level of proficiency in switching between languages when needed, participants reported an average of 8,10 out of 10 (range=4-10). All but seven participants reported accidentally mixing words and sentences from English and Norwegian when speaking with someone who knows both languages. When asked to rate occurrences of accidental intrusions, participants reported an average of 3,76 (range= 0-8) for accidental

intrusions of English into Norwegian, while for accidental intrusion of Norwegian into English the average was 1,73 (range=0-5). All but five participants reported intentionally mixing words and sentences from English and Norwegian when speaking with someone who knows both languages. When asked to rate occurrences of intentional intrusions, participants reported an average of 4,41 (range= 0-10) for intentional use of English in Norwegian, while the average reported for intentional use of Norwegian while speaking English was 2,08 (range=0-9).

3.2 Factor analysis

The full data set including all the information collected from the questionnaire and consisting of 128 variables can be found in appendix 6. Before the analysis, all information from the screening section (see appendix 1 for amended LEAP-Q) was removed (n=7 variables). Next, non-numerical information on languages spoken and language dominance was removed(n=15), along with all questions on culture (n=10), decline in language proficiency (n=3) and language preference for specific tasks (n=4). The questions on years and months spent in various language environments (n=12) were removed in addition to the non-numerical questions on switching proficiency(n=2), leaving 75 variables. Another 29 variables were removed due to little to no variation in the answers, a lot of which included Norwegian variables due to our uniform set.

A correlation matrix was made for the remaining 46 variables to determine the degree of covariance in the set (see appendix 7 for analysis input). One variable with no correlations of minimum 0,3 with another variable was removed from the final analysis set due to insufficient co-variation. One of any pair of variables that correlated 0,9 or higher were also removed. In cases where the L1 and L2 version of a variable correlated this highly, the L2 version was kept while the L1 version was removed (L2 being deemed more interesting in this study). This led to the removal of variables on time spent speaking (Q4a), reading (Q5a) and being exposed to(Q3a) their L1 in addition to choosing to speak in their L1 when speaking with someone knowing the same languages as oneself (Q6a).

For within-language variables that correlated highly, one of the pairings was also removed. This led to English spelling proficiency(Q4n) being removed instead of English grammar proficiency(Q4p) (the latter being deemed slightly more relevant as it covers more), and contribution(Q2g) and exposure(Q3f) to music/media in Norwegian were removed instead of

contribution(Q2f) and exposure(Q3e) to TV/streaming (the latter being rated higher) in Norwegian.

The remaining 38 variables were submitted to a factor analysis. The number of suggested factor groupings varied from 3 (parallel analysis) to 12 (eigenvalues). Investigation of the output (see appendix 8) showed that four factors provided the most interpretable groupings. These four factors are shown in table 16 and accounted for 47% of all variance.

Table 16: Display of factors and the variables that load onto them.

Factor 1: English proficiency	Loading values	Factor 2: Spoken English proficiency	Loading values
Q4n English grammar proficiency	0,84	Q4b Time spent speaking L2	0,68
Q4m English writing proficiency	0,82	Q5b Age of Norwegian speaking fluency	0,60
Q4l English reading proficiency	0,82	Q5d Age of Norwegian reading fluency	0.59
Q4o English vocabulary proficiency	0,78	Q6b Choosing to speak L2	0.59
Q4k English listening proficiency	0,74	Q3b Exposure to L2	0.57
Q4i English speaking proficiency	0,71	Q2i Contribution: family interactions: English	0.44
Q4j English pronunciation proficiency	0,69	Q3g Exposure: friend interactions: English	0.41
Q3i Exposure to English in reading	0,65	Q7a Accidental intrusions of Eng. in Nor.	0.37
Q6 Switching proficiency	0,60	Q4o English vocabulary proficiency	0.33
Q2j Contribution of reading to English	0,59	Q4j English pronunciation proficiency	0.33
Q2d Contribution of school to Norwegian	0,43	Q5b Time spent reading in L2	0.33
Q7a Accidental intrusion of Eng. in Nor.	0,41	Q2c Contribution: reading: Norwegian	-0.37
Q2c Contribution: reading: Norwegian	0,41	Q2d Contribution: school: Norwegian	-0.40
Q5b Time spent reading in L2	0,38	Q3c Exposure: reading: Norwegian	-0.44
Q5b Age when attained Norwegian speaking fluency	0,36	Q3e Exposure: TV/streaming: Norwegian	-0.71
Q5d Age when attained Norwegian reading fluency	0,35		
Q3g Exposure to English: interactions with friends	0,35		
Q3l Exposure to English: listening to music/media	0,35		
Q2k Contribution of school to English	0,33		
Q6b Percentage choosing to speak L2	0,31		
Q2i Contribution: interacting with family/friends: English	0,31		
Q3k Contribution: TV/streaming: English	0,31		
Proportion of variance in %	**0,19**	**Proportion of variance in %**	**0,11**
Cumulative variance	**0,19**	**Cumulative variance**	**0,30**

Factor 3: Informal leaning of English	Loading values	Factor 4: Age of English Acquisition	Loading values
Q2m Contribution: TV/streaming: English	0.69	Q5h Age of English reading fluency	0.69
Q2n Contribution: music/media: English	0.65	Q5e Age of starting to hear English	0.65
Q3k Exposure: TV/streaming: English	0.62	Q5f Age of English speaking fluency	0.62
Q3l Exposure: music/media: English	0.61	Q5g Age of starting to read in English	0.61
Q2j Contribution: reading: English	0.51	Q2h Contribution: friend interactions: English	0.51
Q3b Exposure: to L2	0.48	Q2c Contribution: reading: Norwegian	0.48
Q6 Switching proficiency	0.47	Q2f Contribution: TV/streaming: Norwegian	0.47
Q3g Exposure: friend interactions: English	-0.37	Q7b Accidental intrusions of Nor. in Eng.	-0.37
Q2l Contribution: self-instruction: English	-0.58	Q8a Intentional substitutions of Eng. in Nor.	-0.58
Q5b Time spent reading in L2			
Q5b Age of Norwegian speaking fluency			
Q5h Age of English reading fluency			
Proportion of variance in %	**0,09**	**Proportion of variance in %**	**0,09**
Cumulative variance	**0,39**	**Cumulative variance**	**0,47**

The first factor included only positively loading variables. The highest loading factors were all English language proficiency ratings (grammar, writing, reading, vocabulary, listening, speaking, pronunciation) followed by variables of different measures' contribution to English acquisition (reading, music, school, family interactions), exposure to English in certain environments/interactions(reading, interactions with friends, music, watching TV/streaming), ratings of switching proficiency and accidental intrusion of English into Norwegian, and time spend reading in L2 (English for most participants) and choosing to speak in L2. The only Norwegian variables included in this factor were contribution of school and reading to acquisition of Norwegian and the age when one became fluent in reading and speaking Norwegian. Together, this suggests that this factor is describing ***English language proficiency***.

The second factor included a mix of positive and negative variables where the highest loading variables were time spent speaking L2, followed by age of becoming fluent in speaking and reading Norwegian. The other positive variables included percentage of time choosing to speak in L2, time spent exposed to L2 and time spent reading in L2, in addition to English proficiency ratings for vocabulary and pronunciation, accidental intrusions of English into Norwegian, contributions of family interactions to English acquisition, and exposure to English through interactions with friends. The negative loading variables were all Norwegian measures of the more formal kind and included contribution of school and reading to Norwegian acquisition, and exposure of Norwegian through reading and watching TV/streaming. Although the hardest factor of the four to name concisely, the highest loading variables suggested that this factor was an index of ***spoken English proficiency***.

Factor 3 consisted of a mix of positive and negative variables where all the positive variables were contributions to English acquisition (watching TV/streaming, music, reading, self-instruction); exposure to English through TV/streaming, music, and interactions with friends; switching proficiency; time spent reading in L2, and time exposed to L2. The negative variables were both Norwegian ones and included age of becoming fluent in speaking and reading in Norwegian. Therefore, this factor was interpreted as a measure of ***informal learning of English***.

Factor 4 consisted of a mix of positive and negative variables where all the highest loading variables were age for milestones such as reading and speaking fluency, and starting to hear and read in English. Other positive variables included contribution of interactions with friends

to English acquisition, and contribution of reading and watching TV/streaming to Norwegian acquisition. The negative variables in this factor consisted of accidental intrusions of Norwegian in English and intentional substitutions of English into Norwegian. Later acquisition of English was also associated with more reading and watching TV/streaming in Norwegian. Based on this, the factor was interpreted as describing ***Age of English Acquisition***.

3.3 Experimental results

Data from the TOT experiment were collected from 49 participants who each completed 40 trials (10 items by condition crossing type of noun and cognate status in either list 1 or list 2(n=24) in either Norwegian or English. Due to little variability between the lists in each language, the lists are treated as one data set within each language.

3.3.1 Analysis of vocabulary knowledge

Our first analysis investigated the vocabulary knowledge of our participants by looking at the probability of "know" + "posTOT" responses relative to all trials (following Gollan & Brown, 2006). Responses to stimuli included "TOT", "know" and "I don't know". TOT responses in total numbered 357 (9,3%), out of which 235 (65% of all TOTS and 6,2% of the full data set) were true TOTs (PosTOT). The rest of the TOT responses were categorised as negative TOTs (not actual TOTs) and were registered with the "I don't know" responses. The resulting pattern of means across conditions is shown in figure 15.

Table 17: Probability of know and posTOT responses, indicators of vocabulary knowledge, relative to all trials. Significant effects are in bold

Probability of know and +TOT relative to all trials				
	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	1.02	0.13	7.62	0.00
language [en, -0.5; no, 0.5]	**0.58**	**0.16**	**3.57**	**0.00**
typeName [common, -0.5; proper, 0.5]	**0.31**	**0.16**	**1.90**	**0.06**
Cognate [cognate, -0.5; proper, 0.5]	-0.01	0.16	-0.09	0.93
frequency [continuous from -1.89 to 0.23]	**0.30**	**0.12**	**2.45**	**0.01**
language:frequency	-0.09	0.25	-0.35	0.73
typeName:frequency	-0.23	0.25	-0.93	0.35
Cognate:frequency	0.21	0.25	0.84	0.40
language:typeName	-0.33	0.32	-1.01	0.31
language:Cognate	0.02	0.32	0.05	0.96
typeName:Cognate	0.48	0.32	1.49	0.14
language:typeName:frequency	0.84	0.50	1.69	0.09
language:Cognate:frequency	0.44	0.50	0.88	0.38
typeName:Cognate:frequency	0.12	0.50	0.23	0.82
language:typeName:Cognate	-0.26	0.65	-0.40	0.69
language:typeName:Cognate:frequency	-0.77	0.99	-0.77	0.44

A linear mixed effects model was run including the conditions of our manipulations, and the output can be seen in table 17. The model yielded a significant main effect of language, indicating that participants knew more words in Norwegian than in English. There was also a main effect of frequency, indicating that participants knew more high-frequency words than they did low-frequency words (see figure 15). The borderline effect of noun type suggests that the proper nouns and common nouns employed in this study behaved somewhat differently, although the effect was not significant. As can be seen in figure 15 the pattern for proper nouns differs from that of common nouns especially for English low-frequency words.

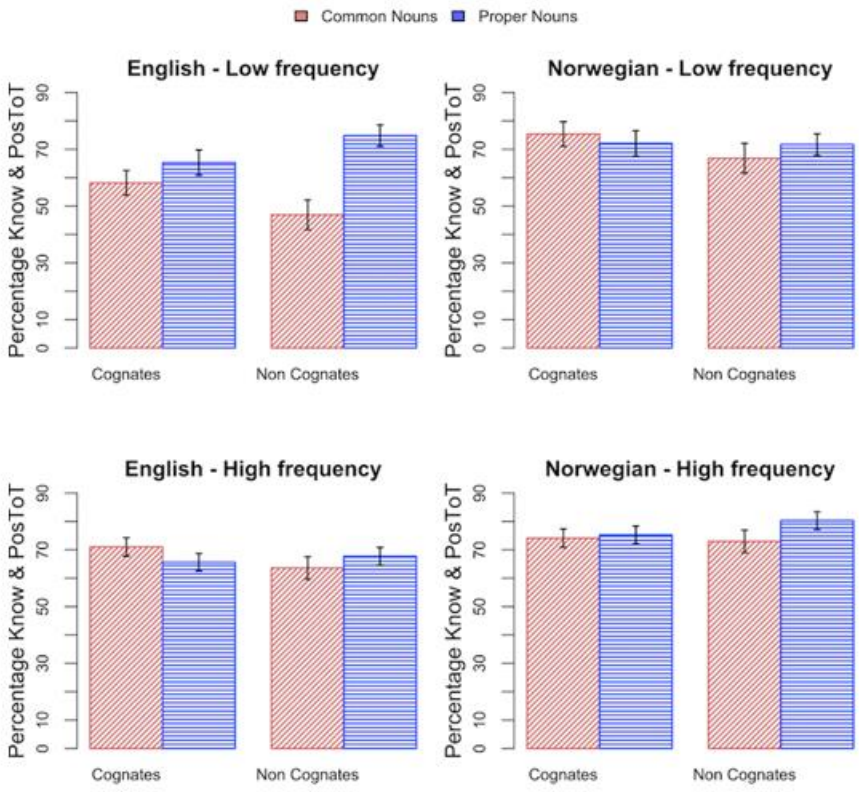

Figure 15: These graphs display the significant and borderline results from table 17. The graphs represent the percentage of combined "know" and "+TOT" responses for either low-frequency or high-frequency words in English or Norwegian across all four conditions (Cognate common nouns (CCN); Cognate proper nouns (CPN); Non-cognate common noun (NCN); Non-cognate proper noun (NPN).

3.3.2 Analysis of TOTs

The second analysis was run to investigate the effects of proportion of TOT responses. While posTOTs and "know" responses reflect successful completion of step 1, as seen in the first analysis, posTOTs represents successful completion of step 1, but failed completion of step 2. The proportion of responses reflecting failed retrieval solely on step 2 and thus entered to the analysis are: $\frac{posTOTs}{(posTOTs+knows)}$. Prior to analysis, "I don't know" (28%) and negTOT (3,27%) responses were discarded. The resulting means are shown in figure 16.

Table 18: Probability of posTOTs, indicator of target words participants know but cannot retrieve, relative to know responses. Significant effects are in bold.

Probability of positive TOT relative to Know				
	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-2.69	0.16	-17.01	<
language	**-0.43**	**0.19**	**-2.24**	**0.03**
typeName	0.20	0.19	1.06	0.29
Cognate	**-0.42**	**0.19**	**-2.22**	**0.03**
frequency	**-0.33**	**0.15**	**-2.27**	**0.02**
language:frequency	0.08	0.30	0.26	0.80
typeName:frequency	0.09	0.29	0.31	0.76
Cognate:frequency	0.06	0.29	0.20	0.84
language:typeName	0.14	0.38	0.36	0.72
language:Cognate	0.30	0.38	0.79	0.43
typeName:Cognate	**-1.05**	**0.38**	**-2.75**	**0.01**
language:typeName:frequency	0.60	0.59	1.00	0.32
language:Cognate:frequency	0.24	0.59	0.41	0.68
typeName:Cognate:frequency	-0.67	0.59	-1.14	0.25
language:typeName:Cognate	-0.13	0.76	-0.18	0.86
language:typeName:Cognate:frequency	1.71	1.20	1.43	0.15

A linear mixed effects model with the same structure as for vocabulary knowledge was run, and the output can be seen in table 18. The model showed a main effect of language and figure 16 shows that participants had more TOTs in English than they did in Norwegian. A main effect of cognate status revealed that, overall, participants had more TOTs for cognates compared to non-cognates. There was also a main effect of frequency indicating that participants had more TOTs for infrequent words relative to frequent ones. Finally, there was a significant interaction of noun type and cognate status. As can be seen in figure 16, proper nouns show more TOTs for cognate words than non-cognate words, whereas common nouns do not.

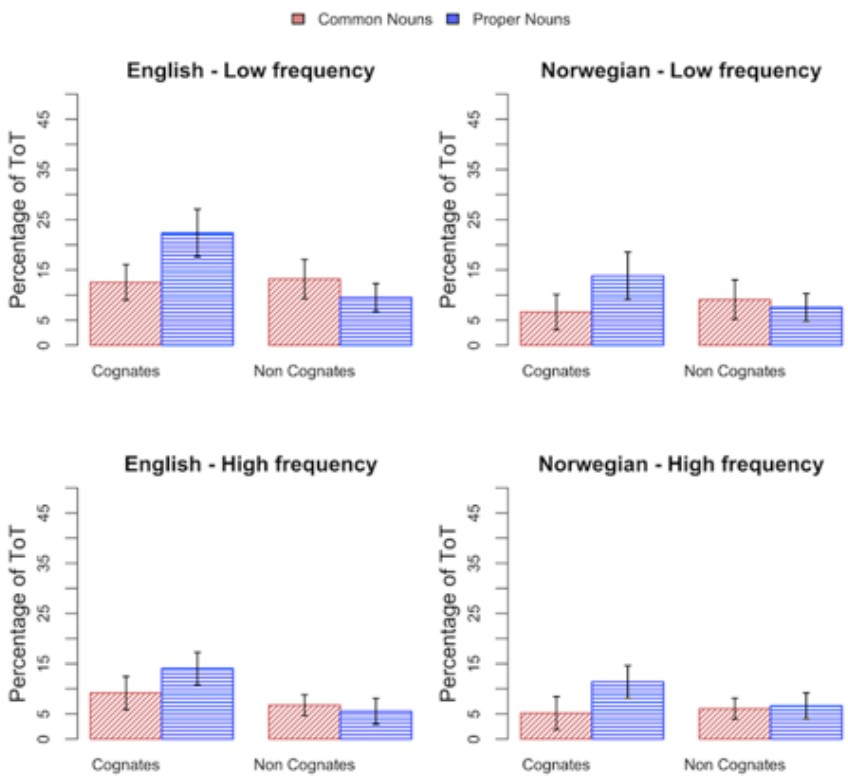

Figure 16: Percentage of TOTs across all manipulations and conditions in both languages.

In addition to all the above analyses of TOT data, an analysis on the amount of correct phonology retrieved during a TOT state was run, but there were no significant effects (tables and graphs for this analysis can be found in appendix 9).

3.3.3 Analysis of effects of individual differences in factors

The last analyses investigated the effects of individual differences, represented by the factors from the factor analysis (English proficiency, spoken English proficiency, informal learning of English, and age of English acquisition) on vocabulary knowledge (table 19) and TOT occurrences (table 20).

For the analysis of vocabulary knowledge, a linear mixed effects model was run including participant values for each of these factors, and the output can be seen in table 19. The effect of each factor on vocabulary knowledge is shown in the graphs in figure 17. The model yielded a main effect of *English proficiency* indicating that proficiency positively correlated with vocabulary knowledge. *Spoken English proficiency* was also a significant predictor of

vocabulary knowledge in our participants. Another main effect, *age of English acquisition*, indicated that later acquisition of English positively correlated with vocabulary knowledge. There was also a significant interaction of *English proficiency* and cognate status. As visible from figure 17, while vocabulary knowledge increases with increased proficiency, this benefit is particularly visible for non-cognates.

Table 19: The table displays the relation between vocabulary knowledge and individual factors. Significant factors are in bold.

Probability of know and +TOT relative to I don't Know				
	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	0.87	0.17	5.04	<0.01
EngProficiency	**0.50**	**0.13**	**3.92**	**<0.01**
SpokenEngProficiency	**0.39**	**0.13**	**2.96**	**<0.01**
InfEngLearning	-0.15	0.12	-1.25	0.21
AoAEng	**0.27**	**0.12**	**2.23**	**0.03**
Cognate	0.01	0.26	0.00	1.00
EngProficiency:Cognate	**0.25**	**0.12**	**2.19**	**0.03**
SpokenEngProficiency:Cognate	0.13	0.13	1.03	0.30
InfEngLearning:Cognate	-0.15	0.11	-1.36	0.17
AoAEng:Cognate	-0.19	0.11	-1.68	0.09

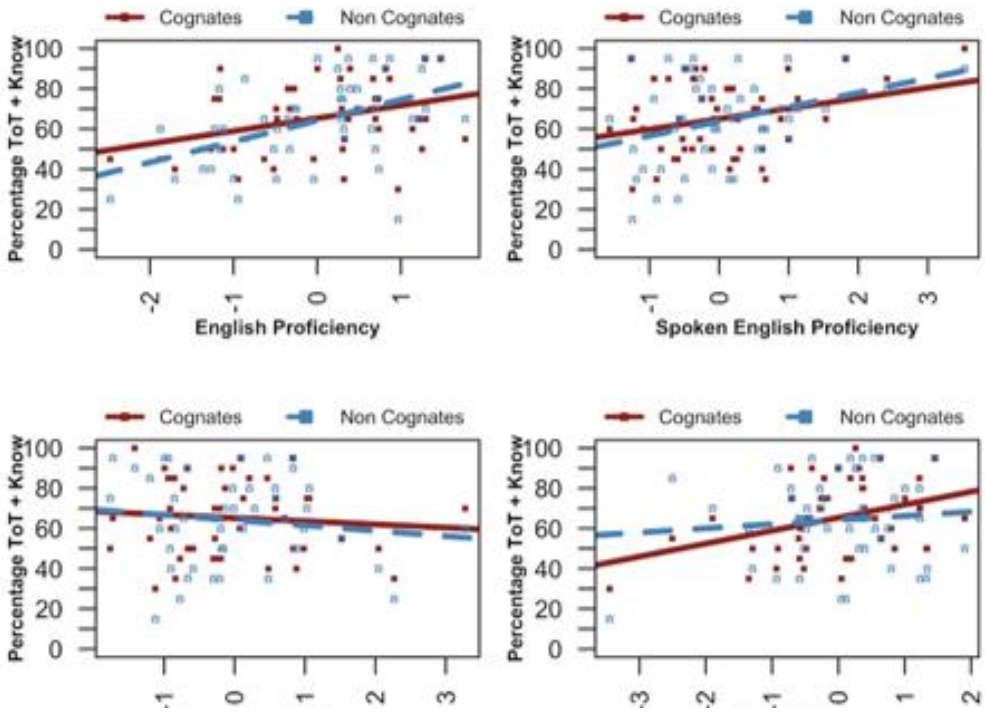

Figure 17: Percentage of TOT and know responses across the factors of English proficiency, spoken English proficiency, informal English learning, and age of English acquisition.

The last analysis looked at TOTs relative to "know +TOT" responses. For this analysis, all "I don't know" responses (32%) and negTOTs (2,81%) were discarded before the rest of the data were entered into the analysis. A linear mixed effects model with the same structure as for the relationship between vocabulary knowledge and individual differences was run and the output can be seen in table 20 and figure 18.

Table 20: Probability of all TOT responses, indicator of what they know but cannot retrieve, relative to know responses. Significant effects are in bold.

Probability of TOT relative to Know				
	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-2.71	0.22	-12.41	< 2e-16
EngProficiency	**-0.48**	**0.17**	**-2.75**	**0.01**
SpokenEngProficiency	0.01	0.16	0.06	0.95
InfEngLearning	-0.08	0.16	-0.48	0.63
AoAEng	0.13	0.18	0.72	0.47
Cognate	**-0.59**	**0.30**	**-1.98**	**0.05**
EngProficiency:Cognate	-0.31	0.23	-1.32	0.19
SpokenEngProficiency:Cognate	0.00	0.20	0.00	1.00
InfEngLearning:Cognate	-0.02	0.22	-0.07	0.94
AoAEng:Cognate	-0.11	0.24	-0.45	0.65

As shown in table 20, there were two significant effects(p=>0,05): English proficiency(p=0,01) and cognate status (p=0,05). The main effect of *English proficiency* indicates that proficiency negatively correlates with TOT occurrences meaning that increased proficiency leads to a decrease in TOTs. The significant effect of cognate status indicates that cognates and non-cognates behaved differently in that, overall, there were more observed TOTs for cognates relative to non-cognates. The latter effect is visible from the two upper graphs in figure 18. As seen from both table 20 and figure 18, *English proficiency* is the only predictor of TOT occurrences out of our factors.

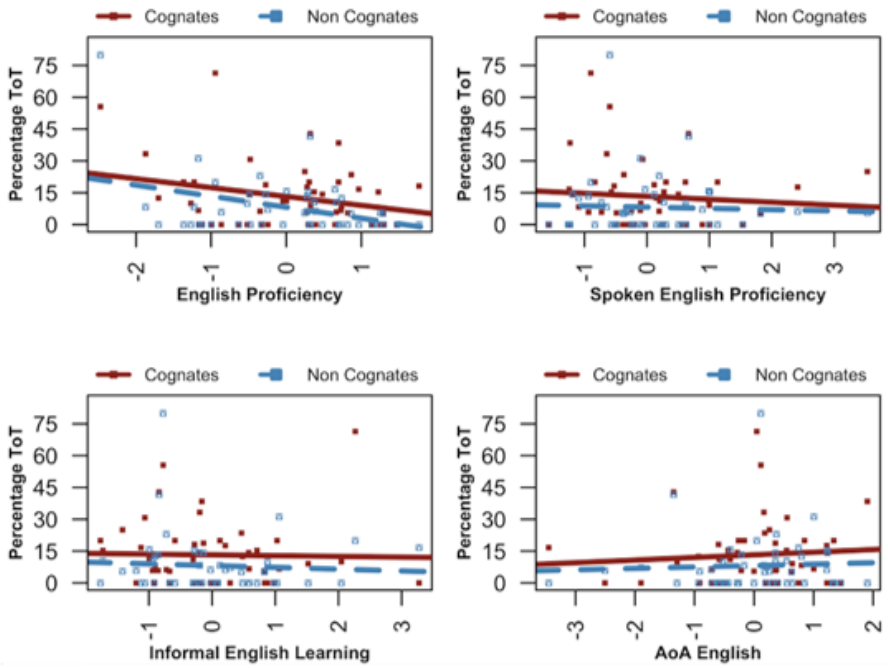

Figure 18: Percentage of TOT responses across the factors of English proficiency, spoken English proficiency, informal English learning, and age of English acquisition.

4. Discussion

The aim of the current research was to investigate the relationship between bilingual profile, cognate status, noun type, and frequency on the tip-of-the-tongue phenomenon in Norwegian-English bilinguals. We aimed to replicate cognate and frequency effects found in other TOT studies (e.g. Gollan & Acenas, 2004, Gollan & Silverberg, 2001), and added to current research by crossing noun type with cognate status, and by employing a relatively uniform set of bilinguals with the language set Norwegian-English. Additionally, we investigated whether other aspects of individual differences in bilingual profile predicted TOT occurrences, like previously seen for language dominance. A bilingual profile was created for each participant based on their answers on an amended version of the Language Experience and Proficiency Questionnaire (Marian et al., 2007). This questionnaire collected information on language background and experience, in addition to having participants rate their own proficiency, and contributors to language acquisition in Norwegian and English. The experimental part of the project included a tip-of-the-tongue experiment where we manipulated frequency and cognate status crossed with noun type. Here, participants were given definitions and were asked to reply whether they knew the word, didn't know the word, or if they fell into a TOT state. The collected data was analysed to map knowledge and TOT contributors, and bilingual profile aspects on this. For knowledge, we found that participants had a greater vocabulary in Norwegian than they did in English, and that they knew more high-frequency words than they did low-frequency words. There was also indication of proper nouns and common nouns behaving somewhat differently, although this effect was not significant. For TOT contributors, we found that participants experienced more TOTs in English than they did in Norwegian, that they experienced more TOTs for infrequent words relative to frequent ones, and that they experienced more TOTs for cognates relative to non-cognates. We also found that proper nouns showed more TOTs in the cognate condition compared to the non-cognate condition, while this effect was not present for common nouns. For bilingual profile factors on knowledge, we found that English proficiency positively correlated with vocabulary knowledge, this being especially true for non-cognates, and that spoken English proficiency was a significant predictor of vocabulary knowledge. Further on, later age of English acquisition positively correlated with vocabulary knowledge. For bilingual profile factors as TOT contributors, we found a negative correlation between English proficiency and

TOT occurrences, meaning that participants had less TOTs in English the more proficient they were, and that, surprisingly, there were more observed TOTs for cognates relative to non-cognates. The next section discusses our findings in greater detail while relating them to literature where possible.

Cognate status

The analysis of our data of the relationship between cognate status and TOT occurrences yielded two significant results. Most significant was the interaction between cognate status and noun type(p=0,1), indicating that within cognates, there was a difference in TOT occurrences between proper nouns and common nouns. This finding will be further discussed in the noun type section.

Our observation of increased amounts of TOT occurrences for cognate words relative to non-cognate ones is surprising in that neither the competition account nor the weaker links hypothesis had predicted the outcome. While there was a cognate facilitation effect, contrary to what the competition account predicted, this effect was heading in the opposite direction of what the weaker links hypothesis had predicted (Gollan et al., 2008). This same effect was observed in Avila (2019) and cannot overtly be explained by any of the literature discussed in this thesis.

Although nothing more than speculations, the experimental environment itself may have prevented us from observing the expected pattern. Although an observation mainly from the "I don't know" responses, it is interesting to note that it seemed like many of our participants were disadvantaged rather than helped by the similar form of cognates as they, perhaps due to the experimental environment they were in, were expecting harder and more difficult words. It was almost as if they couldn't believe that the answer could be "that easy". An example from a participant thinking out loud is given below.

Target word: *inflasjon* (inflation)

"I know that it is *inflation* in English, but it sounds so weird with *inflasjon* in Norwegian, so I'll go with "I don't know" on this one".

This was observed for both languages. Potentially, this could also be a result of the experimenters telling participants in advance not to try to guess the correct term, but rather be honest with what they knew and what they did not know. In further research, it could also

be interesting to investigate whether this confusion could be a result of switching and usage habits in Norwegian young adults.

Moving on, the weaker links hypothesis had further hypothesised that the same number of TOTs would occur for cognates across both languages due to shared representation. However, figure 16 reveals a tendency of more TOTs for cognates in English, both in the common noun and proper noun conditions. This is again contrary to both hypotheses. Although we did not observe the expected facilitation effect of cognates that have been observed in previous studies, it is nevertheless clear that cognate status does facilitate effects. Why we were not able to replicate a positive effect in our Norwegian-English bilinguals, remains unknown, but should be investigated further in the future.

One way to check if the observed patterns were a product of stimuli effects would be to add a monolingual control group. As monolinguals only know one language, cognate status would be of no importance to their processing, and it would thus be possible to see if the target words were just difficult or whether the experimental environment or switching/exposure habits play a role in this reversed facilitation effect. However, monolingual young adult Norwegians are hard to come by, especially in university settings where we recruited most of our participants, so this is easier said than done. One could have cooperated with a British university (as we used a British corpora and spelling), but then the current stimuli would in turn be unapt as it was designed to include what we assumed a native Norwegian would know of British culture and vocabulary, rather than what a native Brit would know of their own culture and language. Thus, the two groups would have needed separate stimuli sets.

Noun type

The analysis of our data of the relationship between noun type and TOT occurrences yielded one significant result (p=0,1). More TOTs were observed for cognate proper nouns relative to non-cognate proper nouns, while this distinction was not found in common nouns. This observation is contrasting with the competition account predicting fewer TOTs for cognate proper nouns relative to non-cognate proper nouns due to the latter condition experiencing more competition.

The weaker links hypothesis did predict more TOTs for proper nouns relative to common nouns, which we found. However, its prediction that this would be especially true in the non-

cognate condition was not found here. While there were more TOTs for proper nouns in the cognate condition, for both high and low frequency and in both languages, the same could not be said for the non-cognate condition, as seen in figure 16. Here, the reversed seemed to be true in the English low-frequency condition, while in the other conditions the differences between proper nouns and common nouns were too marginal to comment on.

The weaker links hypothesis further predicted that the amount of cognate proper nouns should be the same across both languages, however, this was not the case in our data. As seen from figure 16, it is significantly higher for English in the low-frequency condition, while it is more marginal in the high-frequency condition. While we managed to partly replicate the effect of increased number of TOTs for proper nouns predicted by the weaker links hypothesis, it remains unknown why this was only the case in the cognate condition and not the non-cognate condition. However, a look upon the analysis of vocabulary knowledge might shed some light on the situation.

The analysis of vocabulary knowledge revealed a borderline effect of noun type suggesting behavioural differences for proper nouns relative to common nouns, especially for low frequency words in English. Although one must be careful making assumptions on borderline results, it could be worth comparing the graphs in figure 15 (vocabulary knowledge) to figure 16 (TOT occurrences). In figure 15, the graphs for non-cognate words are reversed from those in figure 16 in that the bars for proper nouns are higher than for common nouns in all conditions, and especially the English low-frequency condition. The observation that our participants knew more words from this condition helps explain that they had less TOTs than anticipated for this condition. What remains unknown, however, is why this is the case.

Although the differences are only marginal in the other conditions, it is very prominent in the English low-frequency condition and is thus worthy of discussion. One aspect that could have affected this pattern of results so diversely is our stimuli. Finding non-cognate proper nouns in English that we believed the average participant would know of, but might have difficulty with retrieving, was very difficult. Since we believed that “GOT”-responses would yield more valuable information than “NOT”-responses, the selected stimuli might have been easier relative to the low-frequent non-cognate common nouns.

Additionally, the age of the corpora could be an issue as words may change frequency very quickly. For instance, "*pandemi*" (pandemic) was one of the words employed in Avila's (2019) study, with a frequency of 1,7 in NoWac, and could then have been considered a good candidate for inducing possible TOTs. However, with the ongoing Covid-19 pandemic, the word has become a word in everyday use, and the frequency collected 10 years ago would not mirror today's use. It is thus a good example of how stimuli might look good on paper, but fail to mirror contemporary reality when frequency rates are not updated. Furthermore, the corpora categorised many fantasy characters as low-frequent words, however, it could be assumed that the names of the characters are more frequent on an oral basis today (relative to e.g. BBC subtitles ten years ago).

It is also worth mentioning that, in addition to being notoriously hard to retrieve, proper nouns are problematic in other senses. While they are interesting to look at in relation to TOTs, they are probably not the best measure of vocabulary knowledge as they could be considered a more encyclopaedic knowledge (e.g. trivia questions) and might have more to do with the extent of exposure to different fields rather than extent of vocabulary knowledge.

Frequency

When analysing our data, frequency turned out to be the only language aspect factor where we were able to fully replicate findings of previous studies (e.g. Gollan et al., 2008; Gollan & Silverberg, 2001). Here we found that our participants knew more high-frequency words compared to low-frequency ones. Parallel to this, participants experienced more TOTs for low-frequency words relative to high-frequency words. Although we had made no specific predictions regarding frequency effects on participants' knowledge in advance, it is sensible that participants had more knowledge of and found it easier to retrieve words that they might encounter frequently relative to words that may appear more infrequently. This correlates nicely with the weaker links hypothesis' prediction that increased use of words leads to a higher degree of baseline level activation for these same words. Additionally, increased use should lead to stronger links between lexical representations and phonological representations, which together with increased activation levels makes these words easier to retrieve. Because of this, high frequency words should be easier to retrieve and cause fewer TOTs relative to low-frequency words.

In contrast, the competition account predicted that frequency should either yield no facilitation or affect TOTs in the opposite direction of what the weaker links had predicted, with more TOTs occurring for high frequent words, due to increased activation leading to increased competition. Furthermore, the competition account predicted that, within the high-frequency condition, there should be more TOTs for common nouns, as these frequently used words should result in more competition. Neither of these predictions correlated with our findings, as the differences between common nouns and proper nouns in the high-frequency condition were too marginal to be discussed. However, in the low-frequency conditions, there were tendencies of this pattern, although insignificant. Together, this suggests that the competition account is less apt than the weaker links hypothesis at explaining the frequency facilitation, at least in our data.

One aspect to consider when studying frequency is the specificity that often characterises low-frequent words. Many low-frequency words are field-specific terms, and unless you are familiar with the field, there is really no way one can expect people to know them. For instance, low frequency words in our study included household items such as *sausenebb* or *ladle*. While *ladle* might not be so infrequently used among native speakers, fewer Norwegians could be expected to frequently cook in their second language, and the term might thus be easier to forget. *Sausenebb*, on the other side, is a piece of china that few people in our age group could be expected to have in their homes, and might thus not be the first china piece coming to mind when browsing one's mind for an item fitting the given definition. Low frequency words also included medical terms such as *kateter*, and field-specific terms such as *inauguration*, both of which require some kind of background should you be expected to know them. One cannot really blame a healthy 19-year-old with no medical history for not knowing what a *kateter* is, or someone completely unfamiliar with the election process of the US president to know the term *inauguration*.

However, participants in the present study were mostly young adults (avg=25,18 years), and it is not unexpected that they may experience increased knowledge of these infrequent field-specific words as they age. The weaker links hypothesis predicts that, with age, bilingual speakers will catch up with monolingual speakers, with whom they are disadvantaged to at a young age, due to more practice, experience, and usage. Although an informal observation, unofficial pre-tests of the stimuli done on ineligible participants such as parents or friends with

different language sets revealed that these infrequent words were more often known by older persons relative to younger ones. As this is exactly what the weaker links hypothesis predicts on age developments, it would be highly interesting to see whether this unofficial tendency could be replicated in a proper study comparing young and older participants within this language set.

Our definitions may also be at fault, as we had to base the general knowledge of our participants on our own expectations, experiences, and assumptions. For instance, definitions for celebrities often included some of the work they had featured in. Due to space, however, our selection of work had to be limited to what we believed our participants were most likely to have either seen or heard of, which might not be accurate in all cases. Although this may be a contributing factor to our diverse results, it is challenging to see how this could have been done differently, as there will always be individual differences of experience in a set of participants. One aspect that could have helped, however, is doing a pre-test of the stimuli to ensure that our assumptions of what a person in our target group could be expected to know were correct. In this thesis, there was unfortunately not enough time nor resources to carry out a pre-test. However, this should be considered in future research.

Bilingual profile

The analysis of effects of bilingual profile on vocabulary knowledge yielded four significant effects. *English Proficiency* and *Spoken English Proficiency* were both reported as being significant ($p=<0.01$) predictors of vocabulary knowledge in our set of participants. While we made no predictions on vocabulary knowledge before testing, it makes sense that increased proficiency should lead to increased vocabulary knowledge, as increased proficiency is often a result of increased usage and exposure, which in turn are great contributors to extending one's vocabulary. This finding could also have been predicted by both hypotheses as language dominance and proficiency are factors that should facilitate either easier retrieval or less competition. Moving on, the next significant effect was that of *Age of Acquisition* on vocabulary knowledge, indicating that the later our participants started acquiring English, the more words they know in that language. This last finding is unexpected and cannot be overtly explained by the literature previously discussed in this thesis.

The last significant factor for vocabulary knowledge was a correlation between *English Proficiency* and cognate status. This correlation reveals that while English proficiency was overall a factor for increased vocabulary knowledge, this was especially true for non-cognates. This is not surprising as non-cognates are new to the vocabulary as opposed to cognates, which may already exist as a form-sharing translation equivalent in the other language.

The analysis of TOTs in relation to bilingual profile yielded two significant results, *English proficiency* and cognate status, with *English proficiency* being the only predictor of TOT occurrences out of the four bilingual profile factors entered into the model. Similarly to vocabulary knowledge, it is unsurprising that increased proficiency led to a decrease in TOT states. The weaker links hypothesis attributes this to the links between lexical and phonological representation growing stronger with proficiency, thus making words easier to retrieve. The competition account predicts the same outcome, but attributes the result to increased proficiency, in much the same way as dominance works in the ICM (Green, 1998), making it a stronger competitor to the unintended language.

As seen from figure 16, our participants experienced TOTs more often in their less dominant L2 English compared to the dominant L1 Norwegian. This observation is supported by the ICM and the RHM (Kroll & Stewart, 1994), and was predicted by both the weaker links hypothesis and the competition account. As a model of language proficiency, the RHM argues that the L1, which in most cases is the most dominant language, has a stronger connection between words and concepts compared to the L2. Similarly, the ICM, as a model of language dominance, propose that it is easier to inhibit the less dominant language relative to the dominant one. Although in different ways, both models predict that retrieval in the most dominant/proficient language should be easier relative to the less dominant/proficient language as this would either receive more competition (competition account) or have weaker links between concepts and words (weaker links).

Both hypotheses, in addition to some of the previously discussed models of individual differences, made predictions on effects of language exposure and switching habits on TOT occurrences. Here, the weaker links predicted that participants who spent more time in Norwegian-speaking environments would experience more TOTs in English. Furthermore, these same participants should have greater access to phonology because of the strengthening of links between lexical and phonological representation that comes with

increased and frequent use. However, neither of these predictions were present in our data as no correlation between these participant value and TOT occurrences were significant. As mentioned earlier, the model running partial retrieval of phonological representations in relation to TOTs yielded no significant results at all. This was disappointing, as the ACH (Green & Abutalebi, 2013) had made clear predictions that proficient switchers should, due to more training in inhibiting competitors and handling competition, be better retrievers and thus experience fewer TOTs relative to those who are not. One possible factor that may have prevented this pattern is the uniformity of our participants. Initially, we believed we had managed to recruit quite a diverse group when it came to proficiency, exposure, and usage habits, as we had recruited students studying different subjects, participants from both outside and within the international student environment, and participants outside of the university with both English-speaking and Norwegian-speaking working environments, but an analysis of the LEAP-Q results contradicted that. Investigating the differences between high- and low-proficient Norwegian-English bilinguals on TOT occurrences would thus be interesting for future research.

Furthermore, cultural differences may play a role in self-reports on proficiency measures, as some cultures are more likely to underestimate themselves. However, since most predictions regarding proficiency were supported by our data, the only exception being phonological retrieval and switching proficiency, there is little reason to believe the self-reported ratings in this study were inaccurate.

Further research

The most pressing issue with our data that demands further investigation is the cognate facilitation effect going in the wrong direction from what most bilingual speech production models and the weaker links hypothesis predicts. As we were unable to replicate positive cognate facilitation effects previously observed in other studies in our participants, it would be interesting to investigate why this was the case, especially considering this was also the observation in another master's thesis (Avila, 2019) done at the University of Agder. While comparing a monolingual group to our group of bilinguals might be challenging, a study including a proper pre-test of the stimuli could provide insight if the observed patterns are due to stimuli deficits or something else. Furthermore, a future experiment should include an

equal or larger number of participants, to rule out power effects, and include an even more diverse set of bilinguals in terms of average exposure, usage, and proficiency.

Another aspect we were unable to replicate in our Norwegian-English bilinguals was more TOTs in the non-cognate proper noun condition. Again, this could be due to stimuli, both in terms of outdated corpora and cultural differences. However, it should be worth investigating further.

As many of the words we wanted to use were not searchable in the available corpora or had a frequency we assumed were not accurately reflecting today's usage, a study done with updated corpora would be very interesting.

During testing, experimenters took notes of the thought process of our participants, and while our notes did not make it into the analysis, an investigation of individual performance could have been interesting. For instance, when asked what the first name of Germany's Chancellor was, one participant responded *Merkela*, which is quite evidently a mix of the Chancellor's full name *Angela Merkel*. This and other interesting answers where either phonology or semantics had been mixed up, could have revealed interesting suggestions about lexical selection.

Contrary to ACH predictions, no effect of language switching on TOT occurrences was significant, and neither was the correlation between exposure and phonological retrieval. This finding, or rather lack thereof, demands further investigating. Additionally, it would be interesting to see whether participants were able to recall translation equivalents while in a TOT state, as the RHM assumes that words in the second language are more closely linked to the translation equivalent in the other language, than what is the case for the first language. Considering this, would there be an observable discrepancy between recalled translation equivalents from either L1 or L2? Does trying to recall a translation equivalent help or further prevent retrieval of the intended target? Furthermore, does switching habits affect the ability to recall translation equivalents from the unintended language, when the intended one is blocked?

5. Conclusion

In this thesis, we aimed to replicate previous findings of cognate status and frequency effects on the tip-of-the-tongue phenomenon in a set of Norwegian-English bilinguals and extended current research by also investigating the effects of bilingual profile on TOT occurrences and crossing cognate status with noun type. For the new additions to the field, our predictions were drawn from literature on bilingual speech processing models of individual differences and the weaker links hypothesis and the competition account. We collected the experimental results from a TOT experiment completed in both Norwegian and English by each participant, and a bilingual profile was established for each participant based on their reports and self-ratings in an amended LEAP-Q (Marian et al., 2007). Together, the data from these two parts revealed that participants experienced more TOTs in their less dominant L2 English relative to their dominant L1 Norwegian. Furthermore, we found that participants experienced less TOTs for high-frequency words relative to low-frequency words. We also found that participants experienced more TOTs for cognates relative to non-cognates and that, within proper nouns, there were again significantly more TOTs for cognates relative to non-cognates, but this distinction was not found within common nouns. Lastly, we found that the only predictor of TOTs among factors of bilingual profile was English proficiency.

In summary, the results of our study are divided. While we were able to replicate previous findings of frequency facilitation and language dominance on TOT occurrences, we were unsuccessful in replicating a positively correlating cognate effect. The latter is quite surprising in that not only did we not get the expected effect, or no effect at all, but rather an effect going in the opposite direction. This means that, while there is an observed effect of cognate status on TOT occurrences, the nature of this effect is unclear and in need of further research. In contrast, the observed effects of language dominance and frequency in our study further supports previous research in suggesting that language dominance and frequency are important factors in TOT occurrences. Although a new addition to current research and thus not a subject of replication, our observation that English proficiency negatively correlated with TOT occurrences is in line with the literature reviewed in this thesis. Also new to our study were the crossing of noun type and cognate status. The finding

that participants experienced significantly more TOTs for cognates than non-cognates, while this distinction was not present for common nouns is unexpected and thus inviting for further research.

While our results on frequency and language dominance further strengthens the assumption of their decreasing effects on TOT occurrences, the aspect of cognate status and noun type were diverging from our predictions based on literature review and previous findings, and thus requires further investigation. Our investigation of bilingual profile as a TOT inducing factor were promising and are a compelling subject for further research to map exactly how individual differences like language experience, proficiency and usage affects spoken word production.

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7. Appendices

REMEMBER TO '<u>SAVE AS</u>' Y + SUBJECT NUMBER (E.G., Pp_01) <u>FIRST</u>!!

General note: cells are locked to prevent formula being changed (you can unlock if necessary by removing the worksheet protection).

Participant number: _____ **Date of testing:** _____

<u>SCREENING QUESTIONNAIRE</u>

Experimenter: Ask participant the following questions and fill in the yellow boxes with their responses.

1	What is your age? (in years)			
2	What is your gender?			
3	Are you a native speaker of Norwegian?			
4	Is Norwegian the only language you speak at home (aside from English)?		*If no, please specify other home language*	
5	Are you a reasonably good speaker of English?			
6	Do you have normal vision or vision that is corrected to normal with glasses or contact lenses?			
7	Can you confirm that you have no language impairments such as dyslexia, stuttering etc.?			
8	Do you have normal hearing or hearing that is corrected to normal?			
9	Are you left or right handed?			
10	What is your country of birth?			
11	What is your current country of residence?			
12	How many years of education do you have?			
13	What is the highest education level you have? (Select from the drop-down options)		*If other, please specify*	
14	Have you participated in any experiments here before?			

2. LANGUAGE BACKGROUND

Participant: please answer these questions below about the different languages you speak.
Please fill in your responses in the appropriate yellow boxes, and ask the experimenter if you have any questions.

Q1 Please list all the languages you speak in order of DOMINANCE (up to 5).

1	
2	
3	
4	
5	

Q2 Please list all the languages you speak in order of ACQUISITION (up to 5).

1	
2	
3	
4	
5	

Q3 Please list what percentage of the time you are on average exposed to each language (e.g. exposure in terms of talking, listening, and reading, including TV, films and music).
(All your answers should add up to 100%)

	Language	**%**
1		
2		
3		
4		
5		
	Total:	0

Please make sure your answer adds up to 100%

Q4 Please list what percentage of the time you spend speaking each language.
(All your answers should add up to 100%)

	Language	**%**
1		
2		
3		
4		
5		
	Total:	0

Please make sure your answer adds up to 100%

Q5 Please list what percentage of the time you typically spend reading in each language.
(All your answers should add up to 100%)

	Language	**%**
1		
2		
3		
4		
5		
	Total:	0

Please make sure your answer adds up to 100%

Q6 When choosing a language to speak, with a person who is equally fluent in all your languages, what percentage of time would you choose to speak each language? Please report percentage of total time.
(All your answers should add up to 100%)

	Language	**%**
1		
2		
3		
4		
5		
	Total:	0

Please make sure your answer adds up to 100%

Q7 What cultures do you identify with (e.g., Norwegian, British, American, etc)? Please list each culture below (up to 5) and use the scale from 0-10 to rate the degree of identification, whereby 0 = no identification, 5 = moderate identification, 10 = complete identification.

	Culture	**Identification**
1		
2		
3		
4		
5		

Q8 Do you feel that you were once better in one of your languages and that you have become less fluent?

If yes, which one? *And at what age did you become less fluent?*

Q9 In which language do you usually do the following tasks?

Task	**Language**
Simple maths (count, add)	
Dream	
Express anger or affection	
Talk to yourself	

Appendix 1.3: NORWEGIAN AND ENGLISH PROFIENCY

3. NORWEGIAN AND ENGLISH PROFICIENCY

Participant: please answer these questions below about your experience with Norwegian and English.
Please fill in your responses in the appropriate yellow boxes, and ask the experimenter if you have any questions.

Q1 Please list the number of years and months you have spent in each language environment.

	Norwegian		English	
	Years	Months	Years	Months
A country where this language is spoken				
A family where this language is spoken				
A school where this language is spoken ALL of the time				
A school where this language is spoken SOME of the time				
A workplace where this language is spoken ALL of the time				
A workplace where this language is spoken SOME of the time				

Q2 Please rate how much the following factors contributed to your learning of each language on a scale of 0-10 whereby 0 = not a contributor, 5 = moderate contributor and 10 = most important contributor.

	Norwegian	English
Interacting with friends / colleagues		
Interacting with family		
Reading (e.g., books, magazines, online material)		
School and education		
Self-instruction (e.g., language learning videos or apps)		
Watching TV / streaming		
Listening to music/media		

Q3 Please rate to what extent you are currently (e.g. in the last month or so) exposed to each language on a scale of 0-10 whereby 0 = never, 5 = half of the time and 10 = almost always.

	Norwegian	English
Interacting with friends		
Interacting with family		
Reading (e.g., books, magazines, online material)		
Self-instruction (e.g., language learning videos or apps)		
Watching TV / streaming		
Listening to music/media		

Q4 Please rate your level of proficiency in the following aspects of each language on a scale of 0-10 whereby: 0 = none; 1 = very low; 2 = low; 3 = fair; 4 = slightly less than adequate; 5 = adequate; 6 = slightly more than adequate; 7 = good; 8 = very good; 9 = excellent; 10 = perfect.

	Norwegian	English
Speaking (general fluency)		
Pronunciation (accent)		
Listening (understanding spoken language)		
Reading		
Writing		
Grammar		
Vocabulary		
Spelling		

Q5 Please list the AGE (in years) you were when the following occurred for each language.

	Norwegian	English
Started hearing this language on a regular basis		
Became fluent in speaking this language		
Started learning to read in this language		
Became fluent in reading this language		

Q6 Please rate your level of proficiency in switching between your languages when you need to, on a scale of 0-10 whereby: 0 = none; 1 = very low; 2 = low; 3 = fair; 4 = slightly less than adequate; 5 = adequate; 6 = slightly more than adequate; 7 = good; 8 = very good; 9 = excellent; 10 = perfect.

Q7 When you are speaking do you ever find yourself accidentally mixing words or sentences from Norwegian and English?

(a) If yes, how often does English accidentally intrude in your Norwegian on a scale of 0-10 (whereby 0 = never, 5 = half of the time, 10 = all of the time)?

(b) And how often does Norwegian accidentally intrude into your English on a scale of 0-10 (whereby 0 = never, 5 = half of the time, 10 = all of the time)?

Q8 When you are speaking with a person who also knows both Norwegian and English do you ever find yourself intentionally mixing words or sentences from Norwegian and English?

(a) If yes, how often do you intentionally use English words when speaking Norwegian on a scale of 0-10 (whereby 0 = never, 5 = half of the time, 10 = all of the time)?

(b) And how often do you intentionally use Norwegian words when speaking English on a scale of 0-10 (whereby 0 = never, 5 = half of the time, 10 = all of the time)?

END OF QUESTIONNAIRE - THANK YOU FOR YOUR TIME!

Appendix 1.4: SUMMARY PAGE FOR EXPERIMENTER USE

SUMMARY PAGE FOR EXPERIMENTER USE

All of the participant's responses for each part of the questionnaire is stored here.
For each response, there is the corresponding variable name and the question number (if applicable).
If the participant did not provide a response, it will be listed as NA.
To copy the information elsewhere (i.e., to another excel file) you should:
1) Highlight the appropriate boxes
2) Press Control-C or right-click and select 'Copy'
3) Paste the cells in the desired location using the 'PASTE VALUES ONLY OPTION' (the second paste option when you right click)
It is important that you only paste the values/text and not the formula that the cells are based (otherwise you likely encounter problems!)

DESCRIPTIVE INFO

Variable	Response
Pp_No	0
Age	0
Gender	0
Handedne	0
Birth_Cou	0
Resident_	0
Education	0
Education	0

LANG_BACKGROUND

Quest	Variable	Response
	Pp_No	0
	L1	NA
	L2	NA
	L3	NA
	L4	NA
	L5	NA
Q1a	Dom_1	NA
Q1b	Dom_2	NA
Q1c	Dom_3	NA
Q1d	Dom_4	NA
Q1e	Dom_5	NA
Q2a	Acq_1	NA
Q2b	Acq_2	NA
Q2c	Acq_3	NA
Q2d	Acq_4	NA
Q2e	Acq_5	NA
Q3a	Exposure_	NA
Q3b	Exposure_	NA
Q3c	Exposure_	NA
Q3d	Exposure_	NA
Q3e	Exposure_	NA
Q4a	Speaking_	NA
Q4b	Speaking_	NA
Q4c	Speaking_	NA
Q4d	Speaking_	NA
Q4e	Speaking_	NA
Q5a	Read_L1	NA
Q5b	Read_L2	NA
Q5c	Read_L3	NA
Q5d	Read_L4	NA
Q5e	Read_L5	NA
Q6a	Choice_L1	NA
Q6b	Choice_L2	NA
Q6c	Choice_L3	NA
Q6d	Choice_L4	NA
Q6e	Choice_L5	NA
Q7a	Culture_1	NA
Q7b	Culture_2	NA
Q7c	Culture_3	NA
Q7d	Culture_4	NA
Q7e	Culture_5	NA
Q7f	Ident_Cul	NA
Q7g	Ident_Cul	NA
Q7h	Ident_Cul	NA
Q7i	Ident_Cul	NA
Q7j	Ident_Cul	NA
Q8	Once_Bet	NA
Q8a	Better_W	NA
Q8b	Better_Ag	NA
Q9a	Maths_La	NA
Q9b	Dream_La	NA
Q9c	Anger_Lat	NA
Q9d	Selftask_L	NA

NORSK_ENG_PROF

Quest	Variable	Response
	Pp_No	0
Q1a	Country_N	:
Q1b	Family_No	:
Q1c	School_ALL	:
Q1d	School_SO	:
Q1e	Work_ALL_	:
Q1f	Work_SOM	:
Q1g	Country_En	:
Q1h	Family_Eng	:
Q1i	School_ALL	:
Q1j	School_SO	:
Q1k	Work_ALL_	:
Q1l	Work_SOM	:
Q2a	Contrib_Int	NA
Q2b	Contrib_Int	NA
Q2c	Contrib_Re	NA
Q2d	Contrib_Sc	NA
Q2e	Contrib_Se	NA
Q2f	Contrib_TV	NA
Q2g	Contrib_M	NA
Q2h	Contrib_Int	NA
Q2i	Contrib_Int	NA
Q2j	Contrib_Re	NA
Q2k	Contrib_Sc	NA
Q2l	Contrib_Se	NA
Q2m	Contrib_TV	NA
Q2n	Contrib_M	NA
Q3a	Expos_Inte	NA
Q3b	Expos_Inte	NA
Q3c	Expos_Rea	NA
Q3d	Expos_Self	NA
Q3e	Expos_TV_	NA
Q3f	Expos_Mus	NA
Q3g	Expos_Inte	NA
Q3h	Expos_Inte	NA
Q3i	Expos_Rea	NA
Q3j	Expos_Self	NA
Q3k	Expos_TV_	NA
Q3l	Expos_Mus	NA
Q4a	Speaking_N	NA
Q4b	Pronoucing	NA
Q4c	Listening_N	NA
Q4d	Reading_N	NA
Q4e	Writing_No	NA
Q4f	Grammar_	NA
Q4g	Vocab_Nor	NA
Q4h	Spelling_N	NA
Q4i	Speaking_E	NA
Q4j	Pronoucing	NA
Q4k	Listening_E	NA
Q4l	Reading_En	NA
Q4m	Writing_En	NA
Q4n	Grammar_	NA
Q4o	Vocab_Eng	NA
Q4p	Spelling_En	NA
Q5a	StartHearin	NA
Q5b	FluentSpea	NA
Q5c	StartReadin	NA
Q5d	FluentRead	NA
Q5e	StartHearin	NA
Q5f	FluentSpea	NA
Q5g	StartReadin	NA
Q5h	FluentRead	NA
Q6	Switch_Pro	NA
Q7	Accient_M	NA
Q7a	Accident_N	NA
Q7b	Accident_N	NA
Q8	Intentional	NA
Q8a	Intentional	NA
Q8b	Intentional	NA

Appendix (p. 1 of 2). Language Experience and Proficiency Questionnaire.

Last Name		First Name		Today's Date	
Age		Date of Birth		Male ☐	Female ☐

(1) Please list all the languages you know in order of dominance:

1 Language A	2 Language B	3 Language C	4 Language D	5 Language E

(2) Please list all the languages you know **in order of acquisition** (your native language first):

1 Language A	2 Language B	3 Language C	4 Language D	5 Language E

(3) Please list what percentage of the time you are *currently* and *on average* exposed to each language.
(*Your percentages should add up to 100%*):

List language here:	Language A	Language B	Language C	Language D	Language E
List percentage here:					

(4) When choosing to read a text available in all your languages, in what percentage of cases would you choose to read it in each of your languages? Assume that the original was written in another language, which is unknown to you.
(*Your percentages should add up to 100%*):

List language here	Language A	Language B	Language C	Language D	Language E
List percentage here:					

(5) When choosing a language to speak with a person who is equally fluent in all your languages, what percentage of time would you choose to speak each language? Please report percent of total time.
(*Your percentages should add up to 100%*):

List language here	Language A	Language B	Language C	Language D	Language E
List percentage here:					

(6) Please name the cultures with which you identify. On a scale from zero to ten, please rate the extent to which you identify with each culture. (Examples of possible cultures include US-American, Chinese, Jewish-Orthodox, etc.):

List cultures here	Culture A (click here for scale)	Culture B (click here for scale)	Culture C (click here for scale)	Culture D (click here for scale)	Culture E (click here for scale)

(7) How many years of formal education do you have?_____
Please check your highest education level (or the approximate U.S. equivalent to a degree obtained in another country):

☐ Less than High School
☐ High School
☐ Professional Training
☐ Some College
☐ College
☐ Some Graduate
☐ Masters
☐ PhD/MD/JD
☐ Other:

(8) Date of immigration to the United States, if applicable: _____
If you have ever lived in another country, please provide name of country and dates of residence:
_____

(9) Have you ever had a vision problem ☐, hearing impairment ☐, language disability ☐, or learning disability ☐? (Check all applicable).
If yes, please explain (including any corrections): _____

Appendix (p. 2 of 2). Language Experience and Proficiency Questionnaire.

Language: Language X

This is my (please select from scroll-down menu: First, Second, Third, etc.) language.
All questions below refer to your knowledge of Language X.

(1) Age when you…:

began acquiring Language X:	*became fluent* in Language X:	*began reading* in Language X:	*became fluent reading* in Language X:

(2) Please list the number of years and months you spent in each language environment:

	Years	Months
A country where Language X is spoken		
A family where Language X is spoken		
A school and/or working environment where Language X is spoken		

(3) On a scale from zero to ten, please select your *level of proficiency* in speaking, understanding, and reading Language X from the scroll-down menus:

Speaking	(click here for scale)	Understand spoken language	(click here for scale)	Reading	(click here for scale)

(4) On a scale from zero to ten, please select how much the following factors contributed to you learning Language X:

Interacting with friends	(click here for scale)	Language tapes/self instruction	(click here for scale)
Interacting with family	(click here for scale)	Watching TV	(click here for scale)
Reading	(click here for scale)	Listening to the radio	(click here for scale)

(5) Please rate to what extent you are currently exposed to Language X in the following contexts:

Interacting with friends	(click here for scale)	Listening to radio/music	(click here for scale)
Interacting with family	(click here for scale)	Reading	(click here for scale)
Watching TV	(click here for scale)	Language-lab/self-instruction	(click here for scale)

(6) In your perception, how much of a foreign accent do you have in Language X?
(click here for scale)

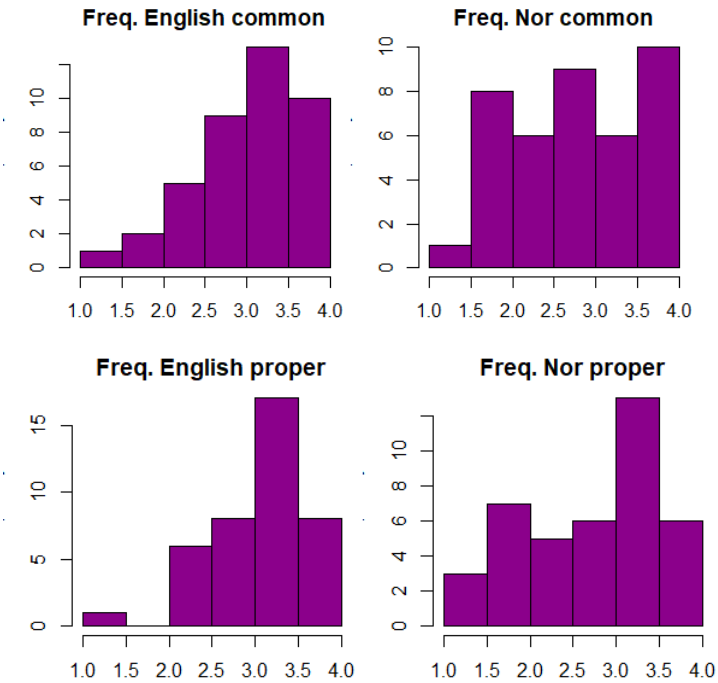
(7) Please rate how frequently others identify you as a non-native speaker based on your accent in Language X:
(click here for scale)

Appendix 3: TARGET WORD FREQUENCY DATA

Data from 2021, collected on 49 participants. Each completed 40 trials (10 items by condition crossing Type of Name and Cognate status), either in list 1 or list 2 (25 list 1, 24 list2)

Mean frequencies (Zipf, i.e., log transformed frequencies per billion) by language and condition

	CommonN_Cognate	CommonN_NonCognate	ProperN_Cognate	ProperN_NonCognate
EN	3.05	2.96	3.11	3.02
NO	2.88	2.65	2.91	2.62



Low frequency English common nouns (17):"eavesdropper" "inauguration" "omnivore" "municipality" "centaur" "taxidermist" "hypochondriac" "talon" "agnostic" "eulogy" "lacrosse" "placebo" "antler" "cherub" "mannequin" "alchemy" "amnesia"
High frequent common nouns English (23)"escalator" "mutiny" "embryo" "phobia" "sloth" "ladle" "urn" "martyr" "nemesis" "saliva" "pedestrian" "skunk" "duvet" "premiere" "apartheid" "astronomy" "binoculars" "famine" "hedgehog" "venison" "ruins" "chimney" "constitution"
Low frequent proper nouns English (15) "Heyerdahl" "Dobby" "Sigmund" "Squarepants" "Odie" "Dumbledore" "Cumberbatch" "Dolittle" "Gollum" "Ghostbusters" "Corden" "Chernobyl" "Garfield" "Goofy" "Woodstock"
High frequent proper nouns English (25): "Fidel" "Dion" "Judaism" "Estonia" "Aurora" "Hepburn" "Belarus" "Streep" "Piglet" "Tinker" "Coco" "Prague" "Recess" "Tangled" "Monroe" "Stonehenge" "Freeman" "Tramp" "Cinderella" "Cowell" "Mandela" "Jaws" "Wallace" "Andrews" "Donkey"

Low frequency Norwegian common nouns (25): "sausenebb" "balsamering" "simle" "tandemsykkel" "giljotin" "sentrifuge" "staffeli" "gamasjer" "stett" "almanakk" "hieroglyf" "snerk" "molte" "markise" "hovmester" "gurkemeie" "etikette" "korsett" "dromedar" "palett" "isopor" "disippel" "panser" "kardemomme"
High frequency Norwegian common nouns (16):"korallrev" "rogn" "ingefær" "testament" "astrologi" "parodi" "lyng" "orkester" "jerv" "tragedie" "paradoks" "atmosfære" "forurensning" "inflasjon" "spark" "mandat"
Low frequency Norwegian proper nouns (21): "Dødslekene" "Barnepiken" "Snusmumrikken" "Bagheera" "Dagboken" "Baloo" "Hufsa" "Brumund" "Thunberg" "Pence" "Karlsvogna" "Skippern" "Attenborough" "Modig" "Hundremeterskogen" "Åberg" "Tussi" "Solan" "Flåklypa" "Tornerose" "Tolkien"
High frequency Norwegian proper nouns (19):"Kon-Tiki" "Almaas" "Bonaparte" "Knerten" "Reynolds" "Mussolini" "Walt" "Degeneres" "Angela" "Winston" "Lisboa" "Stillehavet" "Watson" "Middelhavet" "Bruntland" "Ludvig" "Willy" "Albert" "Patrick"

Appendix 4.1: FULL STIMULI SET - NorL1a

Pause	block	trial	item	Condition	List	Lang	Definition	Target	Foil1	Foil2	Foil3	None of the above	Syllables	Phonemes	Letters	NoWac	FreqPM
		1	1	25	3	1	1	Etternavnet til den Amerikanske talkshow-vertinnen som sto frem som homofil i 1997 i sitt eget humor-talkshow, kjent for sitt korte blonde hår.	Degeneres	Winfrey	Degrassi	Banks	None of the above	4	9	9	1554	2,22
		1	2	5	1	1	1	Læren om forestilte forbindelser mellom himmellegemene og jorden og kunsten å spå fremtidige hendelser og skjebner ut fra stjernenes stilling	astrologi	astronomi	analogi	horoskop	None of the above	4	8	8	1189	1,7
		1	3	31	4	1	1	En amerikansk romantisk dramafilm basert på en roman av Nicholas Sparks med Ryan Gosling og Rachel McAdams i hovedrollene.	Dagboken	Titanic	Dagsturen	Inferno		3	8	8	53	0,07
		1	4	14	2	1	1	En rot brukt som smakstilsetning i mat og drikke, ofte i frisk, tørket, malt eller syltet form. Blir også brukt til å lindre sår hals og mageproblemer	ingefær	anis	ginseng	lakris	None of the above	3	6	7	1227	1,61
		1	5	15	2	1	1	Skål med spiss tut til å ha middagstilbehør av den flytende typen i.	sausenebb	mugge	Flauseredd	øse	None of the above	3	9	9	7	0,01
		1	6	29	3	1	1	Den rosa sjøstjernevennen til Svampebob	Patrick	Bleke	Henrik	Sandy	None of the above	2	6	7	5876	8,39
		1	7	8	1	1	1	Et dyr i kamelslekten med én pukkel	dromedar	kamel	dromund	gazelle	None of the above	3	8	8	295	0,42
		1	8	21	3	1	1	Etternavnet på verdenskjente den britiske BBC naturprogramlederen spesielt kjent for dokumentarene "Our planet" og "Blue Planet".	Attenborough	Irwin	Battenburg	McGraw	None of the above	4	7	12	127	0,18
		1	9	35	4	1	1	Den snakkende trefigurvennen til Lillebror i bøkene til Anne-Cath Vestly	Knerten	Karoline	Kvisten	Tretyting	None of the above	2	6	7	896	1,28
		1	10	28	3	1	1	Etternavnet til den norske programlederen og komikeren kjent fra blant annet Nytt på Nytt og Side om Side.	Almaas	Tufte	Vesaas	Lyngbø	None of the above	2	5	6	835	1,19
		1	11	11	2	1	1	Spredningen av stoffer til luft, vann eller jord som fører til ulempe eller skade på helse eller trivsel for mennesker, dyr og planter	forurensning	utslipp	forutsetning	tilsetning	None of the above	4	10	11	5458	7,8
		1	12	34	4	1	1	Havet mellom Europa, Afrika og Asia	Middelhavet	Rødehavet	Alanterhaver	Dødehavet	None of the above	4	10	11	2243	3,49
		1	13	9	1	1	1	regler for skikk og bruk i selskapslivet, særlig ved hoffet og i diplomatiet	etikette	manerer	sukett	etymologi	None of the above	4	7	8	252	0,36
		1	14	19	2	1	1	Samlebetegnelse på små, buskformede planter i skogen hvor det vokser blant annet blåbær og tyttebær.	lyng	mose	lav	kvae	None of the above	1	3	4	2456	3,5
		1	15	4	1	1	1	Gammel, egyptisk bildeskrift	hieroglyf	helleristninger	hiragana	sanskrit	None of the above	3	8	9	101	0,14
		1	16	24	3	1	1	Fornavnet til Storbritannias statsminister under andre verdenskrig. Han var kjent for å bruke begrepet "jernteppet" for å referere til delingen av Europa under den kalde krigen	Winston	Chamberlain	Wilson	Windsor	None of the above	2	6	7	1772	2,53
		1	17	18	2	1	1	Den hinnen som danner seg på varme, ofte melkeholdige væsker som får stå i ro uten å bli rørt i eller ristet på under nedkjøling	snerk	hinne	skurk	verk	None of the above	1	5	5	104	0,15
		1	18	39	4	1	1	Navnet på et stjernemønster som utgjør en del av stjernebildet Store Bjørn	Karlsvogna	Orion	Kavalragnar	Lillebjørn	None of the above	3	9	10	92	0,13
		1	19	38	4	1	1	Eselvennen til Ole Brum	Tussi	Kristoffer	Tassen	Tralte	None of the above	2	4	5	399	0,57
pause		1	20	1	1	1	1	Betegnelsen på en person som er nominert av et politisk parti til å representere partiet ved valg	mandat	representant	kandidat	tjenestemann	None of the above	2	6	6	6007	8,58
		2	1	10	1	1	1	En maskin som skiller væsker med forskjellig massetetthet eller skiller væske fra faste stoffer ved hjelp av rask rotasjon.	sentrifuge	sentralmål	sugekopp	fugemasse	None of the above	4	10	10	54	0,08
		2	2	2	1	1	1	Navnet på luftlaget som omgir jorden	atmosfære	stratosfære	atmometer	ozonlag	None of the above	4	9	9	5385	7,69
		2	3	22	3	1	1	Hovedstaden i Portugal.	Lisboa	Porto	Libya	Ankara	None of the above	3	6	6	1804	2,58
		2	4	27	3	1	1	kake og en krig oppkalt etter seg	Bonaparte	DeGaulle	Beauport	Bernadotte	None of the above	3	8	9	891	1,27
		2	5	36	4	1	1	Fornavnet til den snakkende, svarte skjæra som bor sammen med Reodor Felgen, og som er kjent for frasen "Dra meg baklengs inn i fuglekassa"	Solan	Mysil	Sonny	Simon	None of the above	2	5	5	450	0,64
		2	6	7	1	1	1	En lærling som i religiøs sammenheng ble regnet som en religionsstifters tilhenger. Feks: Jesu 12 tilhengere.	disippel	tilhenger	disiplin	apostel	None of the above	3	7	8	489	0,7
		2	7	30	3	1	1	Mowglis bjørnevenn i Jungelboken	Baloo	Shere Kahn	Balto	Kaa	None of the above	2	4	5	57	0,08
		2	8	17	2	1	1	Et støtteapparat eller stativ til å holde bilder eller annet flatt materiale stødig, særlig under arbeid med malerier	staffeli	canvas	stafett	stimuli	None of the above	3	6	7	62	0,09
		2	9	23	3	1	1	Etternavnet til den kanadiske skuespilleren kjent for roller i filmer som "Deadpool", "The Proposal" or "Detective Pikachu".	Reynolds	Gosling	Randalls	Harris	None of the above	2	7	8	961	1,34
		2	10	16	2	1	1	En tynn treskive som en kunstmaler bruker til å blande og tynne ut malerfarger på	palett	skala	paljett	polet	None of the above	2	5	6	314	0,45
		2	11	37	4	1	1	Norsk stop-motionfilm om Reodor Felgen, hans venner og byggingen av Il Tempo Gigante	Flåklypa	Biler	Flokern	Rotfløyta	None of the above	3	8	8	536	0,77
		2	12	40	4	1	1	Prinsessen som sov i hundre år etter å ha stukket seg i fingeren på en rokk	Tornerose	Snøhvit	Rapunzel	Ariel	None of the above	3	8	9	556	0,79
		2	13	3	1	1	1	Betegnelsen på en større gruppe instrumentalmusikere (inkludert strykere, blåseinstrumenter, og slagverk), vanligvis innenfor klassisk musikk	orkester	korps	orkan	band	None of the above	3	8	8	2799	4
		2	14	12	2	1	1	Stramt plagg til å bruke omkring anklene for å forhindre for eksempel å få snø i skoen.	gamasjer	anklets	masjete	pulsvanter	None of the above	3	6	7	69	0,09
		2	15	26	3	1	1	Fornavnet til broren til Gaus og Roms Dal Fra NRK-serien Brødrene Dal	Brumund	Nitte	Bernard	Gudbrand	None of the above	2	6	7	67	0,1
		2	16	20	2	1	1	Frontlokket på en bil	panser	dashbord	pinsett	støtfanger	None of the above	2	6	6	620	0,89
		2	17	32	4	1	1	Fornavnet på barnebok-karakter som er kjent for bo sammen med faren sin og fantasivennen, Skybert	Albert	Åge	Alfred	Petter	None of the above	2	5	6	5198	7,42
		2	18	33	4	1	1	Navnet på Disneyfilmen om den skotske prinsessen Merida	Modig	Rømmen	Mathilda	Havfruen	None of the above	2	4	5	146	0,2
		2	19	13	2	1	1	Betegnelse på fiskeegg	rogn	kaviar	tegn	selje	None of the above	1	3	4	998	1,42
		2	20	6	1	1	1	En sykkel laget for mer enn én person hvor man sitter etter hverandre	tandemsykkel	trehjulssykkel	tannhjulssykkel	terrengsykkel	None of the above	4	11	12	39	0,06

Appendix 4.2: FULL STIMULI SET - NorL1b

Pause	block	trial	item	Condition	List	Lang	Definition	Target	Foil1	Foil2	Foil3	None of the above	Syllables	Phonemes	Letters	NoWac	FreqPM
		1	10	1	1	1	En maskin som skiller væsker med forskjellig massetetthet eller skiller væske fra faste stoffer ved hjelp av rask rotasjon.	sentrifuge	sentralmål	sugekopp	fugemasse	None of the above	4	10	10	54	0,08
		1	2	1	1	1	Navnet på luftlaget som omgir jorden	atmosfære	stratosfære	atmometer	ozonlag	None of the above	4	9	9	5385	7,69
		1	22	3	1	1	Hovedstaden i Portugal.	Lisboa	Porto	Libya	Ankara	None of the above	3	6	6	1804	2,58
		1	27	3	1	1	kake og en krig oppkalt etter seg	Bonaparte	DeGaulle	Beauport	Bernadotte	None of the above	3	8	9	891	1,27
		1	36	4	1	1	Fornavnet til den snakkende, svarte skjæra som bor sammen med Reodor Felgen, og som er kjent for frasen "Dra meg baklengs inn i fuglekassa"	Solan	Mysil	Sonny	Simon	None of the above	2	5	5	450	0,64
		1	7	1	1	1	En lærling som i religiøs sammenheng ble regnet som en religionsstifters tilhenger. Feks: Jesu 12 tilhengere.	disippel	tilhenger	disiplin	apostel	None of the above	3	7	8	489	0,7
		1	30	3	1	1	Mowglis bjørnevenn i Jungelboken	Baloo	Shere Kahn	Balto	Kaa	None of the above	2	4	5	57	0,08
		1	17	2	1	1	Et støtteapparat eller stativ til å holde bilder eller annet flatt materiale stødig, særlig under arbeid med malerier	staffeli	canvas	stafett	stimuli	None of the above	3	6	7	62	0,09
		1	23	3	1	1	Etternavnet til den kanadiske skuespilleren kjent for roller i filmer som "Deadpool", "The Proposal" or "Detective Pikachu".	Reynolds	Gosling	Randalls	Harris	None of the above	2	7	8	961	1,34
		1	16	2	1	1	En tynn treskive som en kunstmaler bruker til å blande og tynne ut malerfarger på	palett	skala	paljett	polet	None of the above	2	5	6	314	0,45
		1	37	4	1	1	Norsk stop-motionfilm om Reodor Felgen, hans venner og byggingen av Il Tempo Gigante	Flåklypa	Biler	Flokern	Rotfløyta	None of the above	3	8	8	536	0,77
		1	40	4	1	1	Prinsessen som sov i hundre år etter å ha stukket seg i fingeren på en rokk	Tornerose	Snøhvit	Rapunzel	Ariel	None of the above	3	8	9	556	0,79
		1	3	1	1	1	Betegnelsen på en større gruppe instrumentalmusikere (inkludert strykere, blåseinstrumenter, og slagverk), vanligvis innenfor klassisk musikk	orkester	korps	orkan	band	None of the above	3	8	8	2799	4
		1	12	2	1	1	Stramt plagg til å bruke omkring anklene for å forhindre for eksempel å få snø i skoen.	gamasjer	anklets	masjete	pulsvanter	None of the above	3	6	7	69	0,09
		1	26	3	1	1	Fornavnet til broren til Gaus og Roms Dal Fra NRK-serien Brødrene Dal	Brumund	Nitte	Bernard	Gudbrand	None of the above	2	6	7	67	0,1
		1	20	2	1	1	Frontlokket på en bil	panser	dashbord	pinsett	støtfanger	None of the above	2	6	6	620	0,89
		1	32	4	1	1	Fornavnet på barnebok-karakter som er kjent for bo sammen med faren sin og fantasivennen, Skybert	Albert	Åge	Alfred	Petter	None of the above	2	5	6	5198	7,42
		1	33	4	1	1	Navnet på Disneyfilmen om den skotske prinsessen Merida	Modig	Rømmen	Mathilda	Havfruen	None of the above	2	4	5	146	0,2
		1	13	2	1	1	Betegnelse på fiskeegg	rogn	kaviar	tegn	selje	None of the above	1	3	4	998	1,42
pause		1	6	1	1	1	En sykkel laget for mer enn én person hvor man sitter etter hverandre	tandemsykkel	trehjulssykkel	tannhjulsykkel	terrengsykkel	None of the above	4	11	12	39	0,06
		2	25	3	1	1	Etternavnet til den Amerikanske talkshow-vertinnen som sto frem som homofil i 1997 i sitt eget humor-talkshow, kjent for sitt korte blonde hår.	Degeneres	Winfrey	Degrassi	Banks	None of the above	4	9	9	1554	2,22
		2	5	1	1	1	Læren om forestilte forbindelser mellom himmellegemene og jorden og kunsten å spå fremtidige hendelser og skjebner ut fra stjernenes stilling	astrologi	astronomi	analogi	horoskop	None of the above	4	8	8	1189	1,7
		2	31	4	1	1	En amerikansk romantisk dramafilm basert på en roman av Nicholas Sparks med Ryan Gosling og Rachel McAdams i hovedrollene.	Dagboken	Titanic	Dagsturen	Inferno		3	8	8	53	0,07
		2	14	2	1	1	En rot brukt som smakstilsetning i mat og drikke, ofte i frisk, tørket, malt eller syltet form. Blir også brukt til å lindre sår hals og mageproblemer	ingefær	anis	ginseng	lakris	None of the above	3	6	7	1227	1,61
		2	15	2	1	1	Skål med spiss tut til å ha middagstilbehør av den flytende typen i.	sausenebb	mugge	Flauseredd	øse	None of the above	3	9	9	7	0,01
		2	29	3	1	1	Den rosa sjøstjernevennen til Svampebob	Patrick	Bleke	Henrik	Sandy	None of the above	2	6	7	5876	8,39
		2	8	1	1	1	Et dyr i kamelslekten med én pukkel	dromedar	kamel	dromund	gazelle	None of the above	3	8	8	295	0,42
		2	21	3	1	1	Etternavnet på verdenskjente den britiske BBC naturprogramlederen spesielt kjent for dokumentarene "Our planet" og "Blue Planet".	Attenborough	Irwin	Battenburg	McGraw	None of the above	4	7	12	127	0,18
		2	35	4	1	1	Den snakkende trefigurvennen til Lillebror i bøkene til Anne-Cath Vestly	Knerten	Karoline	Kvisten	Tretyting	None of the above	2	6	7	896	1,28
		2	28	3	1	1	Etternavnet til den norske programlederen og komikeren kjent fra blant annet Nytt på Nytt og Side om Side.	Almaas	Tufte	Vesaas	Lyngbø	None of the above	2	5	6	835	1,19
		2	11	2	1	1	Spredningen av stoffer til luft, vann eller jord som fører til ulempe eller skade på helse eller trivsel for mennesker, dyr og planter	forurensning	utslipp	forutsetning	tilsetning	None of the above	4	10	11	5458	7,8
		2	34	4	1	1	Havet mellom Europa, Afrika og Asia	Middelhavet	Rødehavet	Alanterhaver	Dødehavet	None of the above	4	10	11	2243	3,49
		2	9	1	1	1	regler for skikk og bruk i selskapslivet, særlig ved hoffet og i diplomatiet	etikette	manerer	sukett	etymologi	None of the above	4	7	8	252	0,36
		2	19	2	1	1	Samlebetegnelse på små, buskformede planter i skogen hvor det vokser blant annet blåbær og tyttebær.	lyng	mose	lav	kvae	None of the above	1	3	4	2456	3,5
		2	4	1	1	1	Gammel, egyptisk bildeskrift	hieroglyf	helleristninger	hiragana	sanskrit	None of the above	3	8	9	101	0,14
		2	24	3	1	1	Fornavnet til Storbritannias statsminister under andre verdenskrig. Han var kjent for å bruke begrepet "jernteppet" for å referere til delingen av Europa under den kalde krigen	Winston	Chamberlain	Wilson	Windsor	None of the above	2	6	7	1772	2,53
		2	18	2	1	1	Den hinnen som danner seg på varme, ofte melkeholdige væsker som får stå i ro uten å bli rørt i eller ristet på under nedkjøling	snerk	hinne	skurk	verk	None of the above	1	5	5	104	0,15
		2	39	4	1	1	Navnet på et stjernemønster som utgjør en del av stjernebildet Store Bjørn	Karlsvogna	Orion	Kavalragnar	Lillebjørn	None of the above	3	9	10	92	0,13
		2	38	4	1	1	Eselvennen til Ole Brum	Tussi	Kristoffer	Tassen	Tralte	None of the above	2	4	5	399	0,57
		2	1	1	1	1	Betegnelsen på en person som er nominert av et politisk parti til å representere partiet ved valg	mandat	representant	kandidat	tjenestemann	None of the above	2	6	6	6007	8,58

Appendix 4.3: FULL STIMULI SET - NorL2a

Pause	block	trial	Condition	List	Lang	Definition	Target	Foil1	Foil2	Foil3	None of the above	Syllables	Phonemes	Letters	NoWac	FreqPM
	1	1	3	2	1	Panteren som finner og redder Mowgli i Jungelboken	Bagheera	Akela	Balenciaga	Scar	None of the above	3	6	8	27	0,04
	1	2	2	2	1	Indisk krydder i pulverform med sterk gulfarge, som for mange er billigversjonen av safran	gurkemeie	karri	ginseng	enebær	None of the above	4	8	9	227	0,32
	1	3	1	2	1	Årlig kalender som utgis i bokform og innerholder informasjon om et eller flere emner for de ulike dagene	almanakk	notisbok	anorakk	almisse	None of the above	3	7	8	91	0,13
	1	4	4	2	1	Den første boka i Suzanne Collins triologi om Katniss Everdeen og Peeta Mellark	Dødslekene	Panem	Dødslagene	Konkurransen	None of the above	4	10	10	20	0,02
	1	5	3	2	1	Etternavnet til den britiske forfatteren som særlig er kjent for å ha skrevet Ringenes herre-trilogien og	Tolkien	Rowling	Token	Meyer	None of the above	2	7	7	638	0,91
	1	6	4	2	1	Tegneseriefiguren som blir sterk av å spise spinat	Skippern	Stomperud	Skoppum	Kipster	None of the above	2	6	8	115	0,16
	1	7	3	2	1	Fornavnet til Tysklands forbundskansler (statsminister)	Angela	Erna	Angelika	Heidi	None of the above	3	6	6	1727	2,47
	1	8	4	2	1	Barnebokkarakter kledd i blå bukse,briller og rød og hvit-stripet genser og lue som er gjemt på boksidene	Willy	Frans	Waldo	Finn	None of the above	2	4	5	4450	6,36
	1	9	4	2	1	Jordklodens største hav, som dekker nesten en tredjedel av jordens overflate	Stillehavet	Atlanterhavet	Stormhavet	Indiahavet	None of the above	4	10	11	1940	2,77
	1	10	1	2	1	Fransk gjenstand tidligere brukt til å utføre henrettelse av dødsdømte ved halshogging	giljotin	bøddel	gelatin	bue	None of the above	3	8	8	44	0,06
	1	11	2	2	1	Svært produktive økosystemer i havet bygd opp av kalksjeletter, som er kjent for sine rike og varierte dyreliv. Verdens største ligger utenfor østkysten av Australia	korallrev	anemone	kalkrev	krystall	None of the above	3	8	9	827	1,18
	1	12	3	2	1	Etternavnet til den unge svenske klimaaktivisten og skoleeleven som ble kjent da hun satt utenfor Riksdagshuset i Stockholm med plakaten «Skolstrejk för klimatet»	Thunberg	Ernman	Tumkrans	Andersson	None of the above	2	7	8	69	0,1
	1	13	2	2	1	Små guloransje bær som vokser i høyfjellet, regnet som en delikatesse.	molte	krekling	svartsurbær	aronia	None of the above	2	5	5	123	0,18
	1	14	3	2	1	Etternavnet til Sherlock Holmes' venn, assistent og biograf	Watson	John	Watergate	Philips	None of the above	2	6	6	2166	3,09
	1	15	4	2	1	Lilla spøkelse fra Mummidalen	Hufsa	Hattifnatten	Hufflepuff	Casper	None of the above	2	5	5	62	0,09
	1	16	1	2	1	behandlingen av et lik med urter for å forhindre at det råtner. Spesielt kjent fra det gamle Egypt.	balsamering	konservering	balsamine	kremering	None of the above	4	10	11	33	0,04
	1	17	1	2	1	En latterliggjørende etterligning hvor man gjør narr av originalen, men som er mindre kritiserende enn satire	parodi	herming	melodi	ironi	None of the above	3	6	6	2084	2,98
	1	18	2	2	1	Fremkomstmiddel som ligner på en stol med skinner som brukes på is og hardpakket snø	spark	kjelke	spor	slede	None of the above	1	5	5	5824	8,32
	1	19	1	2	1	En vedvarende vekst i det generelle prisnivået som resulterer i et fall i verdien av penger	inflasjon	priskrig	inkubasjon	infiltrering	None of the above	3	8	9	5477	7,82
pause	1	20	2	2	1	En utendørs solskjerm som kan rulles opp og ned	markise	persienne	marsjandise	verandadør	None of the above	3	7	7	124	0,18
	2	1	1	2	1	Et plagg som benyttes for å gi overkroppen en ønsket form av estetiske eller medisinske grunner (enten mens det bæres eller med mer varig virkning)	korsett	midje	mansjett	akvedukt	None of the above	2	5	7	285	0,41
	2	2	1	2	1	En gjenkallelig viljeserklæring hvor en person bestemmer fordelingen av sin formue etter sin død	testament	arv	arrangement	miljø	None of the above	3	9	9	2490	1,63
	2	3	4	2	1	Fornavnet til det pessimistiske pinnsvinet i Flåklypa, kjent for frasen "Det er farlig det"	Ludvig	Reodor	Lukas	Molo	None of the above	2	6	6	3542	5,06
	2	4	4	2	1	Hjemstedet til Ole Brum og vennene hans	Hundremeterskogen	Bøkeskogen	Hakkebakkeskogen	Sherwoodskogen	None of the above	6	17	17	159	0,22
	2	5	2	2	1	Det største medlemmet av mårfamilien, som kan ligne en liten bjørn i fargen og den kraftige kroppsbygning	jerv	grevling	ulv	oter	None of the above	1	4	4	2866	4,09
	2	6	3	2	1	Etternavnet til Donald Trumps visepresident	Pence	Nickle	Spencer	Johnson	None of the above	1	4	5	67	0,1
	2	7	2	2	1	Fotstykke på vinglass.	stett	kropp	stativ	krakk	None of the above	1	4	5	70	0,1
	2	8	2	2	1	Typisk materiale brukt til emballering av takeaway-mat og elektronikkartikler	isopor	papp	isotop	plastikk	None of the above	3	6	6	472	0,67
	2	9	3	2	1	Etternavnet til Norges første kvinnelige statsminister	Bruntland	Solberg	Brunstad	Jensen	None of the above	2	8	10	3332	4,76
	2	10	3	2	1	Etternavnet til den italienske politikeren som grunnla fascismen	Mussolini	Fanco	Missouri	Rossi	None of the above	4	8	9	1188	1,7
	2	11	4	2	1	Etternavnet til gutten som bor alene med faren sin og den usynlige vennen Skybert. Kjent for frasen "Jeg skal bare"	Åberg	Atkins	Borg	Alfred	None of the above	2	5	5	341	0,49
	2	12	1	2	1	Lysebrunt krydder i pulverform som brukes til å gi den karakteristiske smaken til boller og vafler.	kardemomme	kanel	kommode	nellik	None of the above	4	9	10	669	0,96
	2	13	1	2	1	En skuespillsjanger av alvorlig karakter med en sørgelig utgang, hvor hendelsesforløpet ofte leder til heltens undergang	tragedie	dramaserie	tragus	torget	None of the above	4	8	8	3464	4,95
	2	14	3	2	1	Fornavnet til skaperen av kjente karakterer som Donald Duck og Mikke Mus	Walt	John	Whit	Hank	None of the above	1	4	4	1305	1,86
	2	15	3	2	1	Navnet på flåten som Thor Heyerdahl brukte på sin ferd fra Sør-Amerika til Polynesia	Kon-Tiki	Ra	Kentucky	Titanic	None of the above	3	8	8	812	1,16
	2	16	1	2	1	En påstand eller uttalelse som er virkelig eller sann, men som innebærer to motsatte trekk og derfor virker selvmotsigende, urimelig eller absurd, for eksempel ordet kjempeliten	paradoks	motsetning	parafin	ortodoks	None of the above	3	8	8	3671	5,25
	2	17	2	2	1	Betegnelse på hunnrein.	simle	søye	gimle	lemen	None of the above	2	5	5	27	0,04
	2	18	2	2	1	En person som har overoppsyn med serveringen og behandlingen av gjestene på et hotell eller en restaurant (Opprinnelig i et herskaplig hus eller en hoffhusholdning)	hovmester	tjener	hovmod	byggmester	None of the above	3	9	9	189	0,27
	2	19	4	2	1	Vennen til mummitrollet med grønn hatt og frakk som liker å fiske og røyke pipe	Snusmumrikken	Sniff	Stinkesnufs	Hemulen	None of the above	4	12	13	22	0,03
	2	20	4	2	1	Boken som handler om en ung, hvit kvinne og hennes forhold til to svarte hushjelper i USA på begynnelsen av 60-tallet.	Barnepiken	Butler	Bondepike	Gjøkeredet	None of the above	4	10	11	18	0,02

Appendix 4.4: FULL STIMULI SET - NorL2b

Pause	block	trial	Condition	List	Lang	Definition	Target	Foil1	Foil2	Foil3	None of the above	Syllables	Phonemes	Letters	NoWac	FreqPM
	1	1	1	2	1	Et plagg som benyttes for å gi overkroppen en ønsket form av estetiske eller medisinske grunner (enten mens det bæres eller med mer varig virkning)	korsett	midje	mansjett	akvedukt	None of the above	2	5	7	285	0,41
	1	2	1	2	1	En gjenkallelig viljeserklæring hvor en person bestemmer fordelingen av sin formue etter sin død	testament	arv	arrangement	miljø	None of the above	3	9	9	2490	1,63
	1	3	4	2	1	Fornavnet til det pessimistiske pinnsvinet i Flåklypa, kjent for frasen "Det er farlig det"	Ludvig	Reodor	Lukas	Molo	None of the above	2	6	6	3542	5,06
	1	4	4	2	1	Hjemstedet til Ole Brum og vennene hans	Hundremeterskogen	Bøkeskogen	Hakkebakkeskogen	Sherwoodskogen	None of the above	6	17	17	159	0,22
	1	5	2	2	1	Det største medlemmet av mårfamilien, som kan ligne en liten bjørn i fargen og den kraftige kroppsbygning	jerv	grevling	ulv	oter	None of the above	1	4	4	2866	4,09
	1	6	3	2	1	Etternavnet til Donald Trumps visepresident	Pence	Nickle	Spencer	Johnson	None of the above	1	4	5	67	0,1
	1	7	2	2	1	Fotstykke på vinglass.	stett	kropp	stativ	krakk	None of the above	1	4	5	70	0,1
	1	8	2	2	1	Typisk materiale brukt til emballering av takeaway-mat og elektronikkartikler	isopor	papp	isotop	plastikk	None of the above	3	6	6	472	0,67
	1	9	3	2	1	Etternavnet til Norges første kvinnelige statsminister	Bruntland	Solberg	Brunstad	Jensen	None of the above	2	8	10	3332	4,76
	1	10	3	2	1	Etternavnet til den italienske politikeren som grunnla fascismen	Mussolini	Fanco	Missouri	Rossi	None of the above	4	8	9	1188	1,7
	1	11	4	2	1	Etternavnet til gutten som bor alene med faren sin og den usynlige vennen Skybert. Kjent for frasen "Jeg skal bare"	Åberg	Atkins	Borg	Alfred	None of the above	2	5	5	341	0,49
	1	12	1	2	1	Lysebrunt krydder i pulverform som brukes til å gi den karakteristiske smaken til boller og vafler.	kardemomme	kanel	kommode	nellik	None of the above	4	9	10	669	0,96
	1	13	1	2	1	En skuespillsjanger av alvorlig karakter med en sørgelig utgang, hvor hendelsesforløpet ofte leder til heltens undergang	tragedie	dramaserie	tragus	torget	None of the above	4	8	8	3464	4,95
	1	14	3	2	1	Fornavnet til skaperen av kjente karakterer som Donald Duck og Mikke Mus	Walt	John	Whit	Hank	None of the above	1	4	4	1305	1,86
	1	15	3	2	1	Navnet på flåten som Thor Heyerdahl brukte på sin ferd fra Sør-Amerika til Polynesia	Kon-Tiki	Ra	Kentucky	Titanic	None of the above	3	8	8	812	1,16
	1	16	1	2	1	En påstand eller uttalelse som er virkelig eller sann, men som innebærer to motsatte trekk og derfor virker selvmotsigende, urimelig eller absurd, for eksempel ordet kjempeliten	paradoks	motsetning	parafin	ortodoks	None of the above	3	8	8	3671	5,25
	1	17	2	2	1	Betegnelse på hunnrein.	simle	søye	gimle	lemen	None of the above	2	5	5	27	0,04
	1	18	2	2	1	En person som har overoppsyn med serveringen og behandlingen av gjestene på et hotell eller en restaurant (Opprinnelig i et herskaplig hus eller en hoffhusholdning)	hovmester	tjener	hovmod	byggmester	None of the above	3	9	9	189	0,27
	1	19	4	2	1	Vennen til mummitrollet med grønn hatt og frakk som liker å fiske og røyke pipe	Snusmumrikken	Sniff	Stinkesnufs	Hemulen	None of the above	4	12	13	22	0,03
pause	1	20	4	2	1	Boken som handler om en ung, hvit kvinne og hennes forhold til to svarte hushjelper i USA på begynnelsen av 60-tallet.	Barnepiken	Butler	Bondepike	Gjøkeredet	None of the above	4	10	11	18	0,02
	2	1	3	2	1	Panteren som finner og redder Mowgli i Jungelboken	Bagheera	Akela	Balenciaga	Scar	None of the above	3	6	8	27	0,04
	2	2	2	2	1	Indisk krydder i pulverform med sterk gulfarge, som for mange er billigversjonen av safran	gurkemeie	karri	ginseng	enebær	None of the above	4	8	9	227	0,32
	2	3	1	2	1	Årlig kalender som utgis i bokform og innerholder informasjon om et eller flere emner for de ulike dagene	almanakk	notisbok	anorakk	almisse	None of the above	3	7	8	91	0,13
	2	4	4	2	1	Den første boka i Suzanne Collins triologi om Katniss Everdeen og Peeta Mellark	Dødslekene	Panem	Dødslagene	Konkurransen	None of the above	4	10	10	20	0,02
	2	5	3	2	1	Etternavnet til den britiske forfatteren som særlig er kjent for å ha skrevet Ringenes herre-trilogien og Hobbiten	Tolkien	Rowling	Token	Meyer	None of the above	2	7	7	638	0,91
	2	6	4	2	1	Tegneseriefiguren som blir sterk av å spise spinat	Skippern	Stomperud	Skoppum	Kipster	None of the above	2	6	8	115	0,16
	2	7	3	2	1	Fornavnet til Tysklands forbundskansler (statsminister)	Angela	Erna	Angelika	Heidi	None of the above	3	6	6	1727	2,47
	2	8	4	2	1	Barnebokkarakter kledd i blå bukse,briller og rød og hvit-stripet genser og lue som er gjemt på boksidene	Willy	Frans	Waldo	Finn	None of the above	2	4	5	4450	6,36
	2	9	4	2	1	Jordklodens største hav, som dekker nesten en tredjedel av jordens overflate	Stillehavet	Atlanterhavet	Stormhavet	Indiahavet	None of the above	4	10	11	1940	2,77
	2	10	1	2	1	Fransk gjenstand tidligere brukt til å utføre henrettelse av dødsdømte ved halshogging	giljotin	bøddel	gelatin	bue	None of the above	3	8	8	44	0,06
	2	11	2	2	1	Svært produktive økosystemer i havet bygd opp av kalksjeletter, som er kjent for sine rike og varierte dyreliv. Verdens største ligger utenfor østkysten av Australia	korallrev	anemone	kalkrev	krystall	None of the above	3	8	9	827	1,18
	2	12	3	2	1	Etternavnet til den unge svenske klimaaktivisten og skoleeleven som ble kjent da hun satt utenfor Riksdagshuset i Stockholm med plakaten «Skolstrejk för klimatet»	Thunberg	Ernman	Tumkrans	Andersson	None of the above	2	7	8	69	0,1
	2	13	2	2	1	Små guloransje bær som vokser i høyfjellet, regnet som en delikatesse.	molte	krekling	svartsurbær	aronia	None of the above	2	5	5	123	0,18
	2	14	3	2	1	Etternavnet til Sherlock Holmes' venn, assistent og biograf	Watson	John	Watergate	Philips	None of the above	2	6	6	2166	3,09
	2	15	4	2	1	Lilla spøkelse fra Mummidalen	Hufsa	Hattifnatten	Hufflepuff	Casper	None of the above	2	5	5	62	0,09
	2	16	1	2	1	behandlingen av et lik med urter for å forhindre at det råtner. Spesielt kjent fra det gamle Egypt.	balsamering	konservering	balsamine	kremering	None of the above	4	10	11	33	0,04
	2	17	1	2	1	En latterliggjørende etterligning hvor man gjør narr av originalen, men som er mindre kritiserende enn satire	parodi	herming	melodi	ironi	None of the above	3	6	6	2084	2,98
	2	18	2	2	1	Fremkomstmiddel som ligner på en stol med skinner som brukes på is og hardpakket snø	spark	kjelke	spor	slede	None of the above	1	5	5	5824	8,32
	2	19	1	2	1	En vedvarende vekst i det generelle prisnivået som resulterer i et fall i verdien av penger	inflasjon	priskrig	inkubasjon	infiltrering	None of the above	3	8	9	5477	7,82
	2	20	2	2	1	En utendørs solskjerm som kan rulles opp og ned	markise	persienne	marsjandise	verandadør	None of the above	3	7	7	124	0,18

Appendix 4.5: FULL STIMULI SET - EngL1a

Pause	block	trial	item	Condition	List	Lang	Definition	Target	Foil1	Foil2	Foil3	None of the above	Syllables	Phonemes	Letters	NoWac	FreqPM
		1	1	18	2	3	2	A town or district that has local government. Norway's lowest administrative level below the county and the state	municipality	community	multiplicity	metropolis	None of the above	6	13	12	24	0,12
		1	2	9	1	3	2	a fake drug that people think is real but that doesn't have any active ingredients	placebo	panacea	gazebo	folio	None of the above	3	7	7	106	0,52
		1	3	31	4	3	2	The last name of the doctor in a series of children's novels who learns to talk to animals and becomes their champion around the world.	Dolittle	Popper	Delamotte	Littleborough	None of the above	3	7	8	66	0,33
		1	4	25	3	3	2	A pre-historic monument in Wiltshire, England. Consisting of big, upright stones positioned in a circle	Stonehenge	Rushmore	Strasbourg	Avebury	none of the above	2	8	10	602	2,99
		1	5	19	2	3	2	A deep-bowled, long-handled spoon used for serving soup.	ladle	colander	meddle	lever	None of the above	2	4	5	329	1,63
		1	6	38	4	3	2	Last name of the headmaster of Hogwarts in the Harry Potter franchise	Dumbledore	Slughorn	Dimbledork	Pampledore	None of the above	3	9	10	55	0,27
		1	7	4	1	3	2	The first performance of a musical or theatrical work or the first showing of a film	premiere	debut	premium	investigation	None of the above	3	6	8	681	3,38
		1	8	24	3	3	2	Last name of English television personality, most known for being a hard-to-impress judge on song contests in both Britain and America	Cowell	Mendel	Corell	Jones	none of the above	2	4	6	817	4,06
		1	9	31	4	3	2	The 1975 American thriller film about killer sharks, directed by Steven Spielberg	Jaws	Underwater	Jagged	Chops	None of the above	1	3	4	1286	6,38
		1	10	11	2	3	2	The ceremony or formal admission of someone to office.	inauguration	accolade	incubation	graduation	None of the above	5	10	12	12	0,06
		1	11	21	3	3	2	Capital and largest city of the Czech Republic	Prague	Kiev	Perugia	Munich	None of the above	1	4	6	401	1,99
		1	12	8	1	3	2	A person who neither believes or disbelieves in a god or religious doctrine	agnostic	atheist	antagonist	apathy	None of the above	3	8	8	66	0,33
		1	13	29	3	3	2	Last name of the Norwegian experimental archaeologist most known for sailing on an expedition in 1947 on a self-made boat from South America to Polynesia	Heyerdahl	Erikson	Nytterdal	Amundsen	None of the above	3	6	9	5	0,02
		1	14	35	4	3	2	The country on the eastern coast of the Baltic Sea in Northern Europe, with the capital city of Tallinn.	Estonia	Pretoria	Sedonia	Estland	None of the above	4	7	7	270	1,34
		1	15	14	2	3	2	a tall, rounded vase used for storing the ashes of a cremated person	urn	casket	urim	crate	None of the above	1	3	3	331	1,64
		1	16	34	4	3	2	Winnie the Pooh's pink friend	Piglet	Tigger	Pinker	Jiggler	None of the above	2	6	6	316	1,56
		1	17	5	1	3	2	An extreme or irrational fear of or aversion to a particular object or situation	phobia	anxiety	phoneme	repulsion	None of the above	3	5	6	315	1,56
		1	18	1	1	3	2	A person who prepares, stuffs, and mounts the skins of animals with lifelike effect.	taxidermist	embalmer	tamoxifen	taxonomy	None of the above	4	12	11	45	0,22
		1	19	28	3	3	2	The worst nucelar disaster in history, caused by an explorsion at a nuclear power plant in Ukraine in 1986	Chernobyl	Hiroshima	Chernabog	Pribyl	none of the above	3	7	9	139	0,69
pause		1	20	15	2	3	2	a soft quilt filled with down, feathers, or a synthetic fibre, used instead of a blanket	duvet	comforter	dove	cover	None of the above	2	5	5	498	2,42
		2	1	26	3	3	2	Sleeping Beauty's first name	Aurora	Ariel	Leona	Alana	None of the above	3	5	6	275	1,37
		2	2	27	3	3	2	First name of the founder of the fashion brand Chanel	Coco	Betty	Cora	Carola	none of the above	2	4	4	400	1,99
		2	3	3	1	3	2	The branch of science which deals with celestial objects, space, and the physical universe as a whole	astronomy	physics	astrology	aquarius	None of the above	4	9	9	716	3,56
		2	4	40	4	3	2	The ancient Hebrew religion defined as belief in one God based on the laws and teachings of the Holy Scripture and the	Judaism	Christianity	Juxism	Islam	None of the above	3	7	7	269	1,33
		2	5	36	4	3	2	The large fat orange cartoon cat who loves lasagna	Garfield	Heathcliff	Ginger	Felix	None of the above	2	7	8	147	0,73
		2	6	33	4	3	2	The American Disney cartoon about six elementary school students, featuring characters such as TJ Detweiler, Vince LaSalle, and Gretchen Grundler	Recess	Simpsons	Rugrats	Filmore	None of the above	2	5	6	487	2,41
		2	7	6	1	3	2	An open rebellion against the proper authorities, especially by soldiers or sailors against their officers	mutiny	revolution	matinee	mutation	None of the above	3	7	6	269	1,34
		2	8	30	3	3	2	The last name of the British actor who played Sherlock Holmest in the recent BBC series and starred in the movies "The Imitation Game" and "Doctor Strange"	Cumberbatch	Bale	Bumbercrotch	Hoult	none of the above	3	11	8	62	0,31
		2	9	7	1	3	2	the medieval forerunner of chemistry, concerned with the transmutation of matter, such base metals into gold.	alchemy	algebra	alcove	chemistry	None of the above	3	6	7	164	0,81
		2	10	17	2	3	2	a type of claw, especially one belonging to a bird of prey	talon	paw	tarot	crook	None of the above	2	5	5	51	0,25
		2	11	16	2	3	2	a slow-moving tropical mammal that hangs upside down from the branches of threes using its long limbs and hooked claws	sloth	mammoth	slob	scythe	None of the above	1	4	5	303	1,57
		2	12	10	1	3	2	A mythical creature with the head, arms, and torso of a man and the body and legs of a horse	centaur	hybrid	centurian	avatar	None of the above	2	5	7	37	0,18
		2	13	12	2	3	2	A vertical channel or pipe which conducts smoke up from a fire or furnace, typically through the roof of a building	chimney	furnace	chimenia	grate	None of the above	2	5	7	1609	7,99
		2	14	20	2	3	2	A secret listener to private conversations, for instance outside someones door	eavesdropper	sleuth	earworm	auditor	None of the above	3	8	11	6	0,03
		2	15	13	2	3	2	The meat from a deer	venison	pork	venom	vision	None of the above	3	7	7	1224	5,58
		2	16	22	3	3	2	Last name of the British singer and actress most famous for starrring in the original "The Sound of Music" and "Mary Poppins"	Andrews	Hepburn	Anderson	Garbot	None of the above	2	6	7	1785	8,86
		2	17	37	4	3	2	First part of the name of the fairy friend of Peter Pan	Tinker	Adelina	Timper	Bella	None of the above	2	5	6	369	1,83
		2	18	23	3	3	2	Last name of American actress often described as the best of her generation, most famous for roles in The Devil Wears Prada and Mamma Mia	Streep	Fonda	Streuss	Mirren	None of the above	1	5	6	311	1,54
		2	19	2	1	3	2	The remains of a building, city, etc., that has been destroyed or that is in a state of decay	ruins	wreckage	driuds	remnants	None of the above	2	5	5	1363	6,77
		2	20	32	4	3	2	The disney movie about the adventures of Rapunzel	Tangled	Snarled	Target	Braids	None of the above	2	6	7	504	2,5

Appendix 4.6: FULL STIMULI SET - EngL1b

Pause	block	trial	item	Condition	List	Lang	Definition	Target	Foil1	Foil2	Foil3	None of the above	Syllables	Phonemes	Letters	NoWac	FreqPM
	1	1	26	3	3	2	Sleeping Beauty's first name	Aurora	Ariel	Leona	Alana	None of the above	3	5	6	275	1,37
	1	2	27	3	3	2	First name of the founder of the fashion brand Chanel	Coco	Betty	Cora	Carola	none of the above	2	4	4	400	1,99
	1	3	3	1	3	2	The branch of science which deals with celestial objects, space, and the physical universe as a whole	astronomy	physics	astrology	aquarius	None of the above	4	9	9	716	3,56
	1	4	40	4	3	2	The ancient Hebrew religion defined as belief in one God based on the laws and teachings of the Holy Scripture and the	Judaism	Christianity	Juxism	Islam	None of the above	3	7	7	269	1,33
	1	5	36	4	3	2	The large fat orange cartoon cat who loves lasagna	Garfield	Heathcliff	Ginger	Felix	None of the above	2	7	8	147	0,73
	1	6	33	4	3	2	The American Disney cartoon about six elementary school students, featuring characters such as TJ Detweiler, Vince LaSalle, and Gretchen Grundler	Recess	Simpsons	Rugrats	Filmore	None of the above	2	5	6	487	2,41
	1	7	6	1	3	2	An open rebellion against the proper authorities, especially by soldiers or sailors against their officers	mutiny	revolution	matinee	mutation	None of the above	3	7	6	269	1,34
	1	8	30	3	3	2	The last name of the British actor who played Sherlock Holmest in the recent BBC series and starred in the movies "The Imitation Game" and "Doctor Strange"	Cumberbatch	Bale	Bumbercrotch	Hoult	none of the above	3	11	8	62	0,31
	1	9	7	1	3	2	The medieveval forerunner of chemistry, concerned with the transmutation of matter, such base metals into gold.	alchemy	algebra	alcove	chemistry	None of the above	3	6	7	164	0,81
	1	10	17	2	3	2	a type of claw, especially one belonging to a bird of prey	talon	paw	tarot	crook	None of the above	2	5	5	51	0,25
	1	11	16	2	3	2	a slow-moving tropical mammal that hangs upside down from the branches of threes using its long limbs and hooked claws	sloth	mammoth	slob	scythe	None of the above	1	4	5	303	1,57
	1	12	10	1	3	2	A mythical creature with the head, arms, and torso of a man and the body and legs of a horse	centaur	hybrid	centurian	avatar	None of the above	2	5	7	37	0,18
	1	13	12	2	3	2	A vertical channel or pipe which conducts smoke up from a fire or furnace, typically through the roof of a building	chimney	furnace	chimenia	grate	None of the above	2	5	7	1609	7,99
	1	14	20	2	3	2	A secret listener to private conversations, for instance outside someones door	eavesdropper	sleuth	earworm	auditor	None of the above	3	8	11	6	0,03
	1	15	13	2	3	2	The meat from a deer	venison	pork	venom	vision	None of the above	3	7	7	1224	5,58
	1	16	22	3	3	2	Last name of the British singer and actress most famous for starrring in the original "The Sound of Music" and "Mary Poppins"	Andrews	Hepburn	Anderson	Garbot	None of the above	2	6	7	1785	8,86
	1	17	37	4	3	2	First part of the name of the fairy friend of Peter Pan	Tinker	Adelina	Timper	Bella	None of the above	2	5	6	369	1,83
	1	18	23	3	3	2	Last name of American actress often described as the best of her generation, most famous for roles in The Devil Wears Prada and Mamma Mia	Streep	Fonda	Streuss	Mirren	None of the above	1	5	6	311	1,54
	1	19	2	1	3	2	The remains of a building, city, etc., that has been destroyed or that is in a state of decay	ruins	wreckage	driuds	remnants	None of the above	2	5	5	1363	6,77
pause	1	20	32	4	3	2	The disney movie about the adventures of Rapunzel	Tangled	Snarled	Target	Braids	None of the above	2	6	7	504	2,5
	2	1	18	2	3	2	A town or district that has local government. Norway's lowest administrative level below the county and the state	municipality	community	multiplicity	metropolis	None of the above	6	13	12	24	0,12
	2	2	9	1	3	2	a fake drug that people think is real but that doesn't have any active ingredients	placebo	panacea	gazebo	folio	None of the above	3	7	7	106	0,52
	2	3	31	4	3	2	The last name of the doctor in a series of children's novels who learns to talk to animals and becomes their champion around the world.	Dolittle	Popper	Delamotte	Littleborough	None of the above	3	7	8	66	0,33
	2	4	25	3	3	2	A pre-historic monument in Wiltshire, England. Consisting of big, upright stones positioned in a circle	Stonehenge	Rushmore	Strasbourg	Avebury	none of the above	2	8	10	602	2,99
	2	5	19	2	3	2	A deep-bowled, long-handled spoon used for serving soup.	ladle	colander	meddle	lever	None of the above	2	4	5	329	1,63
	2	6	38	4	3	2	Last name of the headmaster of Hogwarts in the Harry Potter franchise	Dumbledore	Slughorn	Dimbledork	Pampledore	None of the above	3	9	10	55	0,27
	2	7	4	1	3	2	The first performance of a musical or theatrical work or the first showing of a film	premiere	debut	premium	investigation	None of the above	3	6	8	681	3,38
	2	8	24	3	3	2	Last name of English television personality, most known for being a hard-to-impress judge on song contests in both Britain and America	Cowell	Mendel	Corell	Jones	none of the above	2	4	6	817	4,06
	2	9	31	4	3	2	The 1975 American thriller film about killer sharks, directed by Steven Spielberg	Jaws	Underwater	Jagged	Chops	None of the above	1	3	4	1286	6,38
	2	10	11	2	3	2	The ceremony or formal admission of someone to office.	inauguration	accolade	incubation	graduation	None of the above	5	10	12	12	0,06
	2	11	21	3	3	2	Capital and largest city of the Czech Republic	Prague	Kiev	Perugia	Munich	None of the above	1	4	6	401	1,99
	2	12	8	1	3	2	A person who neither believes or disbelieves in a god or religious doctrine	agnostic	atheist	antagonist	apathy	None of the above	3	8	8	66	0,33
	2	13	29	3	3	2	Last name of the Norwegian experimental archaeologist most known for sailing on an expedition in 1947 on a self-made boat from South America to Polynesia	Heyerdahl	Erikson	Nytterdal	Amundsen	None of the above	3	6	9	5	0,02
	2	14	35	4	3	2	The country on the eastern coast of the Baltic Sea in Northern Europe, with the capital city of Tallinn.	Estonia	Pretoria	Sedonia	Estland	None of the above	4	7	7	270	1,34
	2	15	14	2	3	2	a tall, rounded vase used for storing the ashes of a cremated person	urn	casket	urim	crate	None of the above	1	3	3	331	1,64
	2	16	34	4	3	2	Winnie the Pooh's pink friend	Piglet	Tigger	Pinker	Jiggler	None of the above	2	6	6	316	1,56
	2	17	5	1	3	2	An extreme or irrational fear of or aversion to a particular object or situation	phobia	anxiety	phoneme	repulsion	None of the above	3	5	6	315	1,56
	2	18	1	1	3	2	A person who prepares, stuffs, and mounts the skins of animals with lifelike effect.	taxidermist	embalmer	tamoxifen	taxonomy	None of the above	4	12	11	45	0,22
	2	19	28	3	3	2	The worst nucelar disaster in history, caused by an explorsion at a nuclear power plant in Ukraine in 1986	Chernobyl	Hiroshima	Chernabog	Pribyl	none of the above	3	7	9	139	0,69
	2	20	15	2	3	2	a soft quilt filled with down, feathers, or a synthetic fibre, used instead of a blanket	duvet	comforter	dove	cover	None of the above	2	5	5	498	2,42

Appendix 4.7: FULL STIMULI SET - EngL2a

Pause	block	trial	item	Condition	List	Lang	Definition	Target	Foil1	Foil2	Foil3	None of the abov	Syllables	Phonemes	Letters	NoWac	FreqPM
	1	1	34	4	4	2	Country bordered by Russia, Ukraine, Poland, Lithuania and Latvia. Its capital and most populous city is Minsk	Belarus	Belize	Benin	Lebanon	None of the abov	3	7	7	292	1,45
	1	2	14	2	4	2	The watery liquid secreted into the mouth by glands, aiding chewing digestion processes	saliva	urine	cylinder	sliver	None of the abov	3	6	6	386	1,92
	1	3	8	1	4	2	A game played by two teams of players using a long stick with a net at the end to catch, carry, and throw a small ball into the opponents goal	lacrosse	rugby	lactose	carousel	None of the abov	2	6	8	87	0,43
	1	4	1	1	4	2	The basic principles and laws of a nation that determine the powers and duties of the government and guarantee the rights of the people.	constitution	legislation	constipation	continuance	None of the abov	4	12	12	1711	8,77
	1	5	18	2	4	2	Each of the branched horns on the head of a male adult from the deer family	antler	beak	mantle	altar	None of the abov	2	5	6	105	0,52
	1	6	29	3	4	2	Last name of the British film star and humanitarian who starred in Breakfast at Tiffany's and My Fair Lady	Hepburn	Carroll	Napburn	Hepford	none of the abov	2	6	7	281	1,4
	1	7	39	4	4	2	The name of Garfield's dog	Odie	Nermal	Odo	Dio	None of the abov	2	3	4	48	0,24
	1	8	28	3	4	2	Famous outdoor rock festival held in the US in 1969. It was originally arranged as a protest against the Vietnam war	Woodstock	Stonewall	Woodruff	Rostock	None of the abov	2	7	9	157	0,78
	1	9	25	3	4	2	Last name of the female French Canadian singer. Famous for songs such as "My Heart Will Go On" and "Power of Love"	Dion	Lavigne	Dina	Winslet	None of the abov	2	4	4	237	1,18
	1	10	19	2	4	2	An animal or person that eats a variety of food of both plant and animal origin	omnivore	herbivore	carnival	omnious	None of the abov	3	6	8	17	0,08
	1	11	11	2	4	2	A person walking on a pavement rather than travelling in a vehicle	pedestrian	gallivanter	pedestal	wanderer	None of the abov	4	10	10	394	1,95
	1	12	38	4	4	2	The name of the 1984 film that centers on a group of eccentric New York City scientists who investigate and capture paranormal creatures for a living.	Ghostbusters	Scooby-Doo	Ghosted	Gremlins	None of the abov	3	11	12	122	0,6
	1	13	21	3	4	2	Last name of the South African anti-apartheid activist who was imprisoned in Robben Island Prison from 1964-82	Mandela	Freeman	Mandala	Nelson	none of the abov	3	7	7	1015	5,04
	1	14	9	1	4	2	An angel that is represented in art as a beautiful, fat, naked child with small wings	cherub	cupid	chinook	seraph	None of the abov	2	5	6	107	0,53
	1	15	39	4	4	2	Name of the house elf who becomes Harry Potters friend	Dobby	Hedwig	Buddy	Hagrid	None of the abov	2	4	5	25	0,12
	1	16	5	1	4	2	A person who is killed because of their religion or other beliefs	martyr	scapegoat	martian	mormon	None of the abov	2	4	6	334	1,66
	1	17	35	4	4	2	The name of the tough but loveable stray dog who falls in love with a wealthy house dog in one of the classic Disney movies.	Tramp	Pongo	Trump	Tripp	None of the abov	1	5	5	651	3,23
	1	18	24	3	4	2	First name of the influential thinker of the early twentieth century considered the father of psychoanalysis, famous for his theories about sexual repression.	Sigmund	Immanuel	Sigurd	Siegfried	None of the abov	2	7	7	98	0,14
	1	19	15	2	4	2	An optical instrument with a lens for each eye, used for viewing distant objects	binoculars	telescope	binomial	magnifier	None of the abov	4	9	10	777	3,86
pause	1	20	4	1	4	2	The mammal known for its ability to spray a liquid with a strong, unpleasant smell	skunk	possum	stink	porcupine	None of the abov	1	5	5	416	2,2
	2	1	33	4	4	2	The name of the orphan girl who lives with her evil step mother and step sisters, famous for losing her glass slipper on the steps of the castle	Cinderella	Belle	Salmonella	Candace	None of the abov	4	9	10	706	3,51
	2	2	6	1	4	2	A human egg during the period from approximately week 2 to week 8 after fertilization	embryo	nucleus	embroidery	brioche	None of the abov	3	6	6	261	1,5
	2	3	3	1	4	2	A system of institutionalised racial segregation that existed in South Africa and South West Africa from 1948 until the early 1990s	apartheid	discrimination	apathy	halocaust	None of the abov	3	7	9	715	3,55
	2	4	17	2	4	2	A time in which there is not enough food for a great number of people, causing illness and death	famine	drought	forrage	harvest	None of the abov	2	5	6	834	4,14
	2	5	2	1	4	2	A dummy used to display clothes in a shop window.	mannequin	model	ramekin	manifold	None of the abov	3	7	9	127	0,63
	2	6	7	1	4	2	A long-standing rival or an arch-enemy that cannot be conquered	nemesis	feud	menestrel	anomaly	None of the abov	3	7	7	361	1,79
	2	7	22	3	4	2	British claymotion character who is a cheese-loving inventor living with his intelligent dog	Wallace	Homer	Willis	Walter	None of the abov	2	5	7	1731	8,6
	2	8	23	3	4	2	Last name of African American actor known for his distinctive deep voice. He has contributed in the movies: Batman, Invictus, Shawshank Redemption	Freeman	Jackson	Foreman	Nelson	None of the abov	2	6	7	618	3,07
	2	9	12	2	4	2	A speech that praises someone or something highly, especially a tribute at a funeral of someone who has just died.	eulogy	obituary	eunuch	etymology	None of the abov	3	5	6	70	0,34
	2	10	36	4	4	2	Mickey Mouse's tall and clumsy dog friend	Goofy	Donald	Gruffy	Foggy	None of the abov	2	4	5	155	0,77
	2	11	13	2	4	2	A small woodland animal with a coat of sharp spines on its back that curls into a spikey ball as defence if threatened	hedgehog	groundhog	fledgling	penguin	None of the abov	2	6	8	1061	5,2
	2	12	16	2	4	2	Refers to general loss of memory, such as facts, information and experiences. Often caused by head injuries	amnesia	dementia	amnesty	anesthesia	None of the abov	3	6	7	191	0,95
	2	13	30	3	4	2	Last name of the British host of American talkshow The Late Late Show, most famous for his Carpool Karaoke episodes	Corden	Colbert	Gorden	Kimmel	None of the abov	2	6	6	133	0,66
	2	14	10	1	4	2	A person who is excessively and unduly worried about having serious illnessness	hypochondriac	arachnophobia	mitochandria	hypocrite	None of the abov	5	12	13	47	0,23
	2	15	40	4	4	2	Last name of a cartoon character who lives in a pineapple under the sea	Squarepants	Plankton	Squareface	Patrick	None of the abov	2	9	10	40	0,19
	2	16	37	4	4	2	Name of the creature in Lord of the Rings who refers to the one ring as his precious	Gollum	Bilbo	Gurran	Gandalf	None of the abov	2	5	6	97	0,48
	2	17	20	2	4	2	A moving staircase consisting of an endlessly circulating belt of steps driven by a motor.	escalator	elevator	accelerator	scallion	None of the abov	4	8	9	261	1,3
	2	18	27	3	4	2	First name of the Cuban revolutionary and politician who served as prime minister of Cuba between 1959 to 1976 and as president between 1976 to 2008	Fidel	Marrero	Fido	Delfo	None of the abov	2	5	5	232	1,15
	2	19	26	3	4	2	Last name of American actress and cultural icon from the 50s/60s who sang "diamonds are a girls best friend".	Monroe	Patula	Myrna	Medusa	none of the abov	2	5	6	522	2,59
	2	20	32	4	4	2	The four-legged animal who talks non-stop in the Shrek-movies	Donkey	Mule	Dinker	Jackass	None of the abov	2	5	6	1966	9,76

Appendix 4.8: FULL STIMULI SET - EngL2b

Pause	block	trial	item	Condition	List	Lang	Definition	Target	Foil1	Foil2	Foil3	None of the abov	Syllables	Phonemes	Letters	NoWac	FreqPM
	1	1	33	4	4	2	The name of the orphan girl who lives with her evil step mother and step sisters, famous for losing her glass slipper on the steps of the castle	Cinderella	Belle	Salmonella	Candace	None of the abov	4	9	10	706	3,51
	1	2	6	1	4	2	A human egg during the period from approximately week 2 to week 8 after fertilization	embryo	nucleus	embroidery	brioche	None of the abov	3	6	6	261	1,5
	1	3	3	1	4	2	A system of institutionalised racial segregation that existed in South Africa and South West Africa from 1948 until the early 1990s	apartheid	discrimination	apathy	halocaust	None of the abov	3	7	9	715	3,55
	1	4	17	2	4	2	A time in which there is not enough food for a great number of people, causing illness and death	famine	drought	forrage	harvest	None of the abov	2	5	6	834	4,14
	1	5	2	1	4	2	A dummy used to display clothes in a shop window.	mannequin	model	ramekin	manifold	None of the abov	3	7	9	127	0,63
	1	6	7	1	4	2	A long-standing rival or an arch-enemy that cannot be conquered	nemesis	feud	menestrel	anomaly	None of the abov	3	7	7	361	1,79
	1	7	22	3	4	2	British claymotion character who is a cheese-loving inventor living with his intelligent dog	Wallace	Homer	Willis	Walter	None of the abov	2	5	7	1731	8,6
	1	8	23	3	4	2	Last name of African American actor known for his distinctive deep voice. He has contributed in the movies: Batman, Invictus, Shawshank Redemption	Freeman	Jackson	Foreman	Nelson	None of the abov	2	6	7	618	3,07
	1	9	12	2	4	2	A speech that praises someone or something highly, especially a tribute at a funeral of someone who has just died.	eulogy	obituary	eunuch	etymology	None of the abov	3	5	6	70	0,34
	1	10	36	4	4	2	Mickey Mouse's tall and clumsy dog friend	Goofy	Donald	Gruffy	Foggy	None of the abov	2	4	5	155	0,77
	1	11	13	2	4	2	A small woodland animal with a coat of sharp spines on its back that curls into a spikey ball as defence if threatened	hedgehog	groundhog	fledgling	penguin	None of the abov	2	6	8	1061	5,2
	1	12	16	2	4	2	Refers to general loss of memory, such as facts, information and experiences. Often caused by head injuries	amnesia	dementia	amnesty	anesthesia	None of the abov	3	6	7	191	0,95
	1	13	30	3	4	2	Last name of the British host of American talkshow The Late Late Show, most famous for his Carpool Karaoke episodes	Corden	Colbert	Gorden	Kimmel	None of the abov	2	6	6	133	0,66
	1	14	10	1	4	2	A person who is excessively and unduly worried about having serious illnessness	hypochondriac	arachnophobia	mitochandria	hypocrite	None of the abov	5	12	13	47	0,23
	1	15	40	4	4	2	Last name of a cartoon character who lives in a pineapple under the sea	Squarepants	Plankton	Squareface	Patrick	None of the abov	2	9	10	40	0,19
	1	16	37	4	4	2	Name of the creature in Lord of the Rings who refers to the one ring as his precious	Gollum	Bilbo	Gurran	Gandalf	None of the abov	2	5	6	97	0,48
	1	17	20	2	4	2	A moving staircase consisting of an endlessly circulating belt of steps driven by a motor.	escalator	elevator	accelerator	scallion	None of the abov	4	8	9	261	1,3
	1	18	27	3	4	2	First name of the Cuban revolutionary and politician who served as prime minister of Cuba between 1959 to 1976 and as president between 1976 to 2008	Fidel	Marrero	Fido	Delfo	None of the abov	2	5	5	232	1,15
	1	19	26	3	4	2	Last name of American actress and cultural icon from the 50s/60s who sang "diamonds are a girls best friend".	Monroe	Patula	Myrna	Medusa	none of the abov	2	5	6	522	2,59
pause	1	20	32	4	4	2	The four-legged animal who talks non-stop in the Shrek-movies	Donkey	Mule	Dinker	Jackass	None of the abov	2	5	6	1966	9,76
	2	1	34	4	4	2	Country bordered by Russia, Ukraine, Poland, Lithuania and Latvia. Its capital and most populous city is Minsk	Belarus	Belize	Benin	Lebanon	None of the abov	3	7	7	292	1,45
	2	2	14	2	4	2	The watery liquid secreted into the mouth by glands, aiding chewing digestion processes	saliva	urine	cylinder	sliver	None of the abov	3	6	6	386	1,92
	2	3	8	1	4	2	A game played by two teams of players using a long stick with a net at the end to catch, carry, and throw a small ball into the opponents goal	lacrosse	rugby	lactose	carousel	None of the abov	2	6	8	87	0,43
	2	4	1	1	4	2	The basic principles and laws of a nation that determine the powers and duties of the government and guarantee the rights of the people.	constitution	legislation	constipation	continuance	None of the abov	4	12	12	1711	8,77
	2	5	18	2	4	2	Each of the branched horns on the head of a male adult from the deer family	antler	beak	mantle	altar	None of the abov	2	5	6	105	0,52
	2	6	29	3	4	2	Last name of the British film star and humanitarian who starred in Breakfast at Tiffany's and My Fair Lady	Hepburn	Carroll	Napburn	Hepford	none of the abov	2	6	7	281	1,4
	2	7	39	4	4	2	The name of Garfield's dog	Odie	Nermal	Odo	Dio	None of the abov	2	3	4	48	0,24
	2	8	28	3	4	2	Famous outdoor rock festival held in the US in 1969. It was originally arranged as a protest against the Vietnam war	Woodstock	Stonewall	Woodruff	Rostock	None of the abov	2	7	9	157	0,78
	2	9	25	3	4	2	Last name of the female French Canadian singer. Famous for songs such as "My Heart Will Go On" and "Power of Love"	Dion	Lavigne	Dina	Winslet	None of the abov	2	4	4	237	1,18
	2	10	19	2	4	2	An animal or person that eats a variety of food of both plant and animal origin	omnivore	herbivore	carnival	omnious	None of the abov	3	6	8	17	0,08
	2	11	11	2	4	2	A person walking on a pavement rather than travelling in a vehicle	pedestrian	gallivanter	pedestal	wanderer	None of the abov	4	10	10	394	1,95
	2	12	38	4	4	2	The name of the 1984 film that centers on a group of eccentric New York City scientists who investigate and capture paranormal creatures for a living.	Ghostbusters	Scooby-Doo	Ghosted	Gremlins	None of the abov	3	11	12	122	0,6
	2	13	21	3	4	2	Last name of the South African anti-apartheid activist who was imprisoned in Robben Island Prison from 1964-82	Mandela	Freeman	Mandala	Nelson	none of the abov	3	7	7	1015	5,04
	2	14	9	1	4	2	An angel that is represented in art as a beautiful, fat, naked child with small wings	cherub	cupid	chinook	seraph	None of the abov	2	5	6	107	0,53
	2	15	39	4	4	2	Name of the house elf who becomes Harry Potters friend	Dobby	Hedwig	Buddy	Hagrid	None of the abov	2	4	5	25	0,12
	2	16	5	1	4	2	A person who is killed because of their religion or other beliefs	martyr	scapegoat	martian	mormon	None of the abov	2	4	6	334	1,66
	2	17	35	4	4	2	The name of the tough but loveable stray dog who falls in love with a wealthy house dog in one of the classic Disney movies.	Tramp	Pongo	Trump	Tripp	None of the abov	1	5	5	651	3,23
	2	18	24	3	4	2	First name of the influential thinker of the early twentieth century considered the father of psychoanalysis, famous for his theories about sexual repression.	Sigmund	Immanuel	Sigurd	Siegfried	None of the abov	2	7	7	98	0,14
	2	19	15	2	4	2	An optical instrument with a lens for each eye, used for viewing distant objects	binoculars	telescope	binomial	magnifier	None of the abov	4	9	10	777	3,86
	2	20	4	1	4	2	The mammal known for its ability to spray a liquid with a strong, unpleasant smell	skunk	possum	stink	porcupine	None of the abov	1	5	5	416	2,2

Appendix 5: EXPERIMENT SAMPLES

Norwegian sample

I denne oppgaven skal du finne frem til ord. Først leser du definisjoner av vanskelige ord og navn og så spør vi deg om du vet hvilket ord eller navn det er. Det kan hende du vet hvilket ord det er snakk om, men at du ikke kommer på det. Altså, at du har det på tunga.

Når vi spør deg om du kjenner til ordet er det tre svaralternativer.
1 for Ja, 2 for Nei og 3 for ToT.
ToT svarer du hvis du har det på tunga. Hvis du velger alternativ 3
kommer vi til å stille noen oppfølgingsspørsmål.

Det er forventet at flere av ordene kan være vanskelige å finne. Det er derfor ingen grunn til bekymring hvis det er mange ukjente ord.

Etternavnet på den verdenskjente britiske BBC naturprogramlederen spesielt kjent for dokumentarene "Our planet" og "Blue Planet".

Kan du dette ordet?

1 Ja
2 Nei
3 ToT

Kan du gjette noen bokstaver eller lyder i dette ordet?

Hvis ja, si det, ellers si 'nei'

^

Vet du hvor i ordet denne lyden er?

1=begynnelse 2=midt 3=slutt 0=nei

^

Kan du gjette antall stavelser?

Hvis ja, si antall stavelser. Si 'NEI' hvis ikke.

^

Var det ett av disse ordene du tenkte på?

1 Attenborough
2 Battenburg
3 Irwin
4 McGraw
5 Ingen av de ovennevnte

English sample

This is a word finding study. You will read definitions of difficult words and names and we will ask you if you know what the word or name is or not. Sometimes you may think you know the word or name but you are unable to say it, i.e. it's on the tip of your tongue.

When we ask whether you know the word or not there are three possible responses.
1 for Yes, 2 for No and 3 for ToT (Tip of the Tongue).
If you choose option 3 we will ask you some further questions about this item.

Please do not worry if you do not know many of the items. Many are things you would hear very rarely so we expect them to be difficult.

First name of the founder of the fashion brand Chanel

Do you know this word?

1 Yes
2 No
3 ToT

Can you guess any letters or sounds in this word?

if yes please say it otherwise say 'NO' no=0.

^

Do you know where in the word this sound is?

1=begin 2=middle 3=end 0=no

^

Can you guess the number of syllables?

If yes say it, otherwise say 'NO'.

^

Is the word you were thinking of one of these?

1 Betty
2 Coco
3 Cora
4 Carola
5 None of the above

Appendix 6: FULL DATA SET

file_name	date_of_test	subject_number	Age	Gender	Handedness	Birth_Country	Resident_Country	Education_years	Education_level	L1	L2	L3	L4	L5
LEAP-Q_MA2021_S44.xlsx	25/1/2021	44	27	Female	Right	Norway	Norway	16	BA completed	Norwegian	English	nan	nan	nan
LEAP-Q_MA2021_S41.xlsx	nan	41	33	Female	Right	Norway	Norway	17	BA completed	Norwegian	English	German	nan	nan
MA2021_S51.xlsx	2021-01-19 00:00:00	51	24	Female	Left	Norway	Norway	17	MA current	English	Norwegian	French	nan	nan
MA2021_S50 .xlsx	2021-01-19 00:00:00	50	25	Female	Right	Norway	Norway	16	BA completed	Norwegian	English	nan	nan	nan
LEAP-Q MA2021_S31 - Filled in.xlsx	2021-01-27 00:00:00	31	28	Female	Right	Norway	Norway	16	BA completed	Norwegian	English	nan	nan	nan
MA2021_S16.xlsx	12.01.2021	16	24	Female	Right	Norway	Norway	18	MA current	Norwegian	English	nan	nan	nan
LEAP-Q_MA2021_S38.xlsx	2021-01-27 00:00:00	38	21	Female	Right	Norway	Norway	15,5	BA current	Norwegian	English	German	nan	nan
LEAP-Q_MA2021_S14.xlsx	2021-01-22 00:00:00	14	24	Male	Right	Norway	Norway	18	BA current	Norwegian	English	nan	nan	nan
LEAP-Q_MA2021_S42.xlsx	25/1/2021	42	30	Male	Right	Norway	Norway	17	BA completed	Norwegian	English	Spanish	nan	nan
MA2021_S30.xlsx	2021-01-18 00:00:00	30	22	Female	Left	Norway	Norway	16	BA completed	Norwegian	English	Spanish	nan	nan
MA2021_S24.xlsx	2021-02-05 00:00:00	24	26	Male	Right	Norway	Norway	17	BA completed	Norwegian	English	nan	nan	nan
LEAP-Q MA2021_S49 - Filled in.xlsx	2021-01-27 00:00:00	49	22	Male	Right	Norway	Norway	15,5	BA current	Norwegian	English	French	nan	nan
LEAP-Q MA2021_S33 - Filled in.xlsx	2021-01-26 00:00:00	33	24	Female	Right	Norway	Norway	18,5	BA completed	Norwegian	English	nan	nan	nan
LEAP-Q MA2021_S47 - Filled in.xlsx	2021-01-28 00:00:00	47	25	Male	Right	Norway	Norway	17	BA current	Norwegian	English	German	nan	nan
LEAP-Q_MA2021_S39.xlsx	2021-01-25 00:00:00	39	22	Female	Right	Norway	Norway	16,5	MA current	Norwegian	English	French	nan	nan
MA2021_S53.xlsx	nan	53	23	Female	Right	Norway	Norway	17,5	MA current	Norwegian	English	nan	nan	nan
MA2021_S26.xlsx	2021-01-25 00:00:00	26	23	Female	Right	Norway	Norway	17	BA current	Norwegian	English	nan	nan	nan
LEAP-Q MA2021_S32 - Filled in.xlsx	27.01.2021	32	26	Female	Right	Norway	Norway	18	MA completed	Norwegian	English	nan	nan	nan
LEAP-Q_MA2021_S10.xlsx	2021-02-02 00:00:00	10	20	Female	Right	Norway	Norway	15	BA current	Norwegian	English	nan	nan	nan
LEAP-Q_MA2021_S13.xlsx	nan	13	26	Female	Right	Norway	Norway	20	MA completed	Norwegian	English	nan	nan	nan
MA2021_S17.xlsx	2021-01-18 00:00:00	17	23	Female	Right	Norway	Norway	17	BA current	Norwegian	English	nan	nan	nan
LEAP-Q MA2021_S06 - Filled in.xlsx	25.01.2021	6	34	Male	Right	USA	Norway	23	MA completed	Norwegian	English	nan	nan	nan
MA2021_S54.xlsx	08.02.2021	54	22	Female	Right	Norway	Norway	16	BA current	Norwegian	English	nan	nan	nan
LEAP-Q_MA2021_S03.xlsx	25.01.2021	3	31	Female	Right	Norway	Norway	16,5	Other	Norwegian	English	German	nan	nan
LEAP-Q MA2021_S45 - Filled in.xlsx	2021-01-25 00:00:00	45	32	Female	Right	Norway	Norway	18	BA completed	Norwegian	English	nan	nan	nan
MA2021_S28.xlsx	nan	28	24	Female	Right	Norway	Norway	18	MA completed	Norwegian	English	nan	nan	nan
LEAP-Q_MA2021_S19.xlsx	nan	19	25	Female	Right	Norway	Norway	18	BA current	Norwegian	English	nan	nan	nan
MA2021_S23.xlsx	2021-01-26 00:00:00	23	19	Male	Right	Norway	Norway	13	BA current	Norwegian	English	Spanish	nan	nan
LEAP-Q_MA2021_S40.xlsx	2021-01-25 00:00:00	40	22	Female	Right	Norway	Norway	16	MA current	Norwegian	English	nan	nan	nan
LEAP-Q_MA2021_S58.xlsx	23/01/2021	58	27	Female	Right	Norway	Norway	14	High school	Norwegian	English	nan	nan	nan
LEAP-Q_MA2021_S43.xlsx	nan	43	27	Female	Right	Norway	Norway	19	BA completed	Norwegian	English	nan	nan	nan
MA2021_S29.xlsx	nan	29	21	Male	Right	Norway	Norway	13,5	Other	Norwegian	English	nan	nan	nan
LEAP-Q_MA2021_S18.xlsx	2021-01-30 00:00:00	18	22	Female	Right	Norway	Norway	15	BA current	Norwegian	English	nan	nan	nan
LEAP-Q_MA2021_S55.xlsx	21/1/2021	55	33	Female	Right	Norway	Norway	15	BA completed	Norwegian	English	nan	nan	nan
LEAP-Q MA2021_S36 - Filled in.xlsx	2021-01-28 00:00:00	36	22	Male	Right	Norway	Norway	15	BA current	Norwegian	English	nan	nan	nan
MA2021_S21.xlsx	2021-01-28 00:00:00	21	27	Female	Right	Norway	Norway	18	BA current	Norwegian	English	Japanese	NSL	nan
MA2021_S22.xlsx	2021-01-25 00:00:00	22	34	Female	Right	Norway	Norway	17	MA current	Norwegian	English	Swedish	nan	nan
LEAP-Q MA2021_S37 - Filled in.xlsx	2021-01-25 00:00:00	37	32	Female	Right	Norway	Norway	18	BA completed	Norwegian	English	nan	nan	nan
LEAP-Q MA2021_S08 - Filled in.xlsx	2021-01-26 00:00:00	8	22	Female	Right	Norway	Norway	15,5	BA current	Norwegian	English	nan	nan	nan
LEAP-Q_MA2021_S12.xlsx	2021-01-21 00:00:00	12	24	Male	Right	Norway	Norway	18	BA current	English	Norwegian	nan	nan	nan
LEAP-Q MA2021_S48 - Filled in.xlsx	2021-01-25 00:00:00	48	27	Male	Right	Norway	Norway	19	BA completed	Norwegian	English	Spanish	nan	nan
LEAP-Q_MA2021_S05.xlsx	25/01/2021	5	29	Female	Right	Norway	Norway	16	BA completed	Norwegian	English	nan	nan	nan
LEAP-Q MA2021_S07 - Filled in.xlsx	2021-01-26 00:00:00	7	23	Male	Right	Norway	Norway	20	MA current	Norwegian	English	Danish	nan	nan
LEAP-Q_MA2021_S56.xlsx	23/01/2021	56	23	Female	Right	Norway	Norway	16,5	BA current	Norwegian	English	German	nan	nan
LEAP-Q MA2021_S35 - Filled in.xlsx	2021-01-27 00:00:00	35	25	Female	Right	Norway	Norway	18	MA current	Norwegian	English	nan	nan	nan
LEAP-Q_MA2021_S11.xlsx	2021-01-23 00:00:00	11	24	Male	Right	Norway	Norway	15,5	BA current	Norwegian	English	nan	nan	nan
LEAP-Q_MA2021_S02.xlsx	22.01.2021	2	26	Male	Right	Norway	Norway	16	BA completed	Norwegian	English	German	nan	nan
LEAP-Q_MA2021_S09.xlsx	2021-01-20 00:00:00	9	18	Female	Right	Norway	Norway	12,5	Other	English	Norwegian	nan	nan	nan
LEAP-Q_MA2021_S04.xlsx	nan	4	22	Male	Right	Norway	Norway	16	BA current	Norwegian	English	German	nan	nan
LEAP-Q_MA2021_S20.xlsx	2021-01-21 00:00:00	20	26	Female	Right	Norway	Norway	18	BA current	Norwegian	English	nan	nan	nan
LEAP-Q_MA2021_S01.xlsx	2021-01-25 00:00:00	1	23	Female	Left	Norway	Norway	17	BA current	Norwegian	English	Danish	nan	nan

FULL DATA SET

Q1a Dom_1	Q1b Dom_2	Q1c Dom_3	Q1d Dom_4	Q1e Dom_5	Q2a Acq_1	Q2b Acq_2	Q2c Acq_3	Q2d Acq_4	Q2e Acq_5	Q3a Exposure_L1	Q3b Exposure_L2	Q3c Exposure_L3	Q3d Exposure_L4
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	80	20	0	0
Norwegian	English	German	nan	nan	Norwegian	English	German	nan	nan	70	29	1	0
English	Norwegian	French	nan	nan	Norwegian	English	French	nan	nan	50	50	0	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	50	50	0	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	70	30	0	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	70	30	0	0
Norwegian	English	German	nan	nan	Norwegian	English	German	nan	nan	70	30	0	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	60	40	0	0
Norwegian	English	Spanish	nan	nan	Norwegian	English	Spanish	nan	nan	70	30	0	0
Norwegian	English	Spanish	nan	nan	Norwegian	English	Spanish	nan	nan	45	50	5	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	70	30	0	0
Norwegian	English	French	nan	nan	Norwegian	English	French	nan	nan	60	39	1	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	50	50	0	0
Norwegian	English	German	nan	nan	Norwegian	English	German	nan	nan	40	50	10	0
Norwegian	English	French	nan	nan	Norwegian	English	French	nan	nan	75	24	1	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	85	15	0	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	80	20	0	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	60	40	0	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	60	40	0	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	60	40	0	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	30	70	0	0
Norwegian	English	nan	nan	nan	English	Norwegian	nan	nan	nan	40	60	0	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	40	58	2	0
Norwegian	English	German	nan	nan	Norwegian	English	German	nan	nan	70	28	2	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	50	50	0	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	75	25	0	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	60	40	0	0
Norwegian	English	Spanish	nan	nan	Norwegian	English	Spanish	nan	nan	64	35	1	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	60	40	0	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	90	10	0	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	70	30	0	0
nan	nan	nan	nan	nan	Norwegian	English	nan	nan	nan	50	50	nan	nan
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	50	50	0	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	85	15	0	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	25	75	0	0
Norwegian	English	Japanese	NSL	nan	Norwegian	English	Japanese	NSL (Norwegian Sign Language)	nan	70	25	5	0
Norwegian	English	Swedish	nan	nan	Norwegian	English	Swedish	nan	nan	50	40	10	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	40	60	0	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	60	40	0	0
English	Norwegian	nan	nan	nan	Norwegian	English	nan	nan	nan	40	60	0	0
Norwegian	English	Spanish	nan	nan	Norwegian	English	Spanish	nan	nan	54	45	1	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	70	30	0	0
Norwegian	English	Danish	nan	nan	Norwegian	English	Danish	nan	nan	50	45	5	0
Norwegian	English	German	nan	nan	Norwegian	English	German	nan	nan	95	5	0	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	30	70	0	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	40	60	0	0
Norwegian	English	German	nan	nan	Norwegian	English	German	nan	nan	49	50	1	0
English	Norwegian	nan	nan	nan	Norwegian	English	nan	nan	nan	55	35	10	0
Norwegian	English	German	nan	nan	Norwegian	English	German	nan	nan	90	10	10	0
Norwegian	English	nan	nan	nan	Norwegian	English	nan	nan	nan	50	50	0	0
Norwegian	English	Danish	nan	nan	Norwegian	English	Danish	nan	nan	65	30	5	0

FULL DATA SET

Q3e Exposure_L5	Q4a Speaking_L1	Q4b Speaking_L2	Q4c Speaking_L3	Q4d Speaking_L4	Q4e Speaking_L5	Q5a Read_L1	Q5b Read_L2	Q5c Read_L3	Q5d Read_L4	Q5e Read_L5	Q6a Choice_L1	Q6b Choice_L2
0	90	10	0	0	0	95	5	0	0	0	100	0
0	90	9	1	0	0	80	20	0	0	0	100	0
0	20	80	0	0	0	80	20	0	0	0	50	50
0	70	30	0	0	0	50	50	0	0	0	50	50
0	80	20	0	0	0	60	40	0	0	0	100	0
0	99	1	0	0	0	70	30	0	0	0	100	0
0	80	20	0	0	0	50	50	0	0	0	95	5
0	70	30	0	0	0	50	50	0	0	0	70	30
0	90	10	0	0	0	80	20	0	0	0	70	30
0	60	35	5	0	0	40	58	2	0	0	80	20
0	80	20	0	0	0	30	70	0	0	0	100	0
0	85	15	0	0	0	40	60	0	0	0	90	10
0	90	10	0	0	0	15	85	0	0	0	100	0
0	60	20	20	0	0	60	30	10	0	0	100	0
0	90	9	1	0	0	80	18	2	0	0	100	0
0	90	10	0	0	0	80	20	0	0	0	100	0
0	95	5	0	0	0	50	50	0	0	0	90	10
0	75	25	0	0	0	40	60	0	0	0	95	5
0	90	10	0	0	0	70	30	0	0	0	95	5
0	95	5	0	0	0	60	40	0	0	0	95	5
0	90	10	0	0	0	10	90	0	0	0	90	10
0	50	50	0	0	0	25	75	0	0	0	50	50
0	40	60	0	0	0	99	1	0	0	0	98	2
0	90	9	1	0	0	40	58	2	0	0	50	50
0	90	10	0	0	0	70	30	0	0	0	80	20
0	95	5	0	0	0	60	40	0	0	0	100	0
0	80	20	0	0	0	40	60	0	0	0	90	10
0	89	10	1	0	0	50	50	0	0	0	97	2
0	90	10	0	0	0	90	10	0	0	0	90	10
0	90	10	0	0	0	50	50	0	0	0	100	0
0	90	10	0	0	0	10	90	0	0	0	90	10
nan	70	30	nan	nan	nan	20	80	nan	nan	nan	100	0
0	90	10	0	0	0	70	30	0	0	0	95	5
0	100	0	0	0	0	80	20	0	0	0	98	2
0	25	75	0	0	0	35	65	0	0	0	50	50
0	70	20	7	3	0	20	75	5	0	0	50	35
0	80	10	10	0	0	80	15	5	0	0	100	0
0	70	30	0	0	0	10	90	0	0	0	80	20
0	70	30	0	0	0	40	60	0	0	0	60	40
0	80	20	0	0	0	20	80	0	0	0	10	90
0	60	40	0	0	0	55	45	0	0	0	90	10
0	70	30	0	0	0	90	10	0	0	0	70	30
0	70	28	2	0	0	28	70	2	0	0	70	30
0	90	9	1	0	0	60	39	1	0	0	95	5
0	80	20	0	0	0	10	90	0	0	0	70	30
0	65	35	0	0	0	40	60	0	0	0	80	20
0	95	5	0	0	0	40	60	0	0	0	95	5
0	45	55	0	0	0	80	15	5	0	0	35	65
0	80	20	0	0	0	50	50	0	0	0	80	15
0	75	25	0	0	0	40	60	0	0	0	60	40
0	90	10	0	0	0	90	10	0	0	0	90	10

Q6c Choice_L3	Q6d Choice_L4	Q6e Choice_L5	Q7a Culture_1	Q7b Culture_2	Q7c Culture_3	Q7d Culture_4	Q7e Culture_5	Q7f Ident_Cult_1	Q7g Ident_Cult_2	Q7h Ident_Cult_3	Q7i Ident_Cult_4	Q7j Ident_Cult_5
0	0	0	Norwegian	Canadian	nan	nan	nan	10	2	0	0	0
0	0	0	Norwegian	nan	nan	nan	nan	10	0	0	0	0
0	0	0	Norwegian	British	French	nan	nan	8	7	3	0	0
0	0	0	Norwegian	American	Australian	nan	nan	7	6	4	0	0
0	0	0	British	Norwegian	nan	nan	nan	8	7	0	0	0
0	0	0	Norwegian	nan	nan	nan	nan	10	0	0	0	0
0	0	0	Norwegian	German	American	nan	nan	10	2	3	0	0
0	0	0	Norwegian	American	British	nan	nan	10	6	4	0	0
0	0	0	Norwegian	American	nan	nan	nan	10	3	0	0	0
0	0	0	Norwegian	American	nan	nan	nan	10	3	0	0	0
0	0	0	Norwegian	nan	nan	nan	nan	10	0	0	0	0
0	0	0	Norwegian	British	American	French	nan	9	6	5	1	0
0	0	0	Norwegian	nan	nan	nan	nan	10	0	0	0	0
0	0	0	Norwegian	nan	nan	nan	nan	10	0	0	0	0
0	0	0	Norwegian	nan	nan	nan	nan	10	0	0	0	0
0	0	0	Norwegian	nan	nan	nan	nan	10	0	0	0	0
0	0	0	Norwegian	American	nan	nan	nan	10	5	0	0	0
0	0	0	Norewgian	nan	nan	nan	nan	10	0	0	0	0
0	0	0	Norwegian	nan	nan	nan	nan	10	0	0	0	0
0	0	0	Norwegian	Australian	nan	nan	nan	10	4	0	0	0
0	0	0	Norwegian	nan	nan	nan	nan	10	0	0	0	0
0	0	0	American	Norwegian	nan	nan	nan	8	8	0	0	0
0	0	0	Norwegian	British	nan	nan	nan	7	3	0	0	0
0	0	0	Norwegian	Australian	nan	nan	nan	7	3	0	0	0
0	0	0	Norwegian	nan	nan	nan	nan	10	0	0	0	0
0	0	0	Norwegian	nan	nan	nan	nan	10	0	0	0	0
0	0	0	Norwegian	nan	nan	nan	nan	10	0	0	0	0
1	0	0	Norwegian	nan	nan	nan	nan	10	0	0	0	0
0	0	0	Norwegian	nan	nan	nan	nan	10	0	0	0	0
0	0	0	Norwegian	nan	nan	nan	nan	10	0	0	0	0
0	0	0	Norwegian	nan	nan	nan	nan	10	0	0	0	0
nan	nan	nan	Norewgian	British	American	nan	nan	10	0	5	nan	nan
0	0	0	Norwegian	American	nan	nan	nan	9	1	0	0	0
0	0	0	Norwegian	nan	nan	nan	nan	10	0	0	0	0
0	0	0	Norway	American	nan	nan	nan	7	3	0	0	0
10	5	0	Norwegian	Sámi	nan	nan	nan	9	1	0	0	0
0	0	0	Norwegian	nan	nan	nan	nan	8	0	0	0	0
0	0	0	Norwegian	nan	nan	nan	nan	10	0	0	0	0
0	0	0	Norwegian	nan	nan	nan	nan	10	0	0	0	0
0	0	0	Norwegian	British	American	nan	nan	9	3	4	0	0
0	0	0	Norwegian	nan	nan	nan	nan	10	0	0	0	0
0	0	0	Norwegian	American	nan	nan	nan	9	3	0	0	0
0	0	0	Norwegian	Birtish	American	Danish	nan	9	2	4	7	0
0	0	0	Norwegian	nan	nan	nan	nan	10	0	0	0	0
0	0	0	Norwegian	British	American	nan	nan	10	5	5	0	0
0	0	0	Norwegian	British	American	nan	nan	10	3	6	0	0
0	0	0	Norwegian	American	British	German	Swiss	9	6	3	1	2
0	0	0	Norwegian	British	American	nan	nan	8	5	2	0	0
5	0	0	Norwegian	American	German	Korean	British	7	3	4	3	1
0	0	0	Norwegian	American	nan	nan	nan	10	2	0	0	0
0	0	0	Norwegian	nan	nan	nan	nan	10	0	0	0	0

FULL DATA SET

Q8 Once_Better	Q8a Better_Which	Q8b Better_Age	Q9a Maths_Lang	Q9b Dream_Lang	Q9c Anger_Lang	Q9d Selftask_Lang	Q1a Country_Norsk	Q1b Family_Norsk	Q1c School_ALL_Norsk	Q1d School_SOME_Norsk
Yes	English	23	Norwegian	Norwegian	Norwegian	Norwegian	26:0	26:0	16:0	0:0
Yes	english	19	norwegian	norwegian	norwegian	Norwegian	32:7	33:7	17:0	0:0
Yes	French	20	Norwegian	Norwegian	Norwegian	Norwegian	23:	24:	13:	4:
Yes	Norwegian	18	Norwegian	nan	nan	nan	23:0	23:6	13:	:
Yes	English	26	Norwegian	English	English	English	27:10	28:10	13:0	2:0
No	nan	nan	Norwegian	Norwegian	Norwegian	Norwegian	24:1	24:4	:	15:
Yes	English	18	Norwegian	Norwegian	Norwegian	English	20:0	20:4	14:6	0:0
Yes	English	22	Norwegian	Norwegian	Norwegian	Norwegian	24:5	24:6	13:0	0:0
Yes	Spanish	30	Norwegian	Norwegian	Norwegian	Norwegian	30:10	30:11	15:11	15:11
Yes	Spanish	17	Norwegian	English	English	English	22:1	22:	10:	:
Yes	Norwegian	14	Norwegian	Norwegian	Norwegian	Norwegian	26:	26:	17:	0:
Yes	French	19	Norwegian	Norwegian	Norwegian	Norwegian	22:10	22:10	15:6	0:0
Yes	English	24	Norwegian	Norwegian	Norwegian	Norwegian	22:6	22:6	17:5	0:0
Yes	English	24	Norwegian	Norwegian	Norwegian	Norwegian	25:	25:	17:0	1:6
Yes	French	18	Norwegian	Norwegian	Norwegian	Norwegian	22:2	22:2	16:5	0:0
No	nan	nan	Norwegian	Norwegian	Norwegian	Norwegian	23:	23:	6:	17:
No	nan	nan	Norwegian	Norwegian	Norwegian	Norwegian	23:6	23:6	16:6	0:0
No	nan	nan	Norwegian	Norwegian	Norwegian	Norwegian	26:5	26:5	13:0	5:6
No	nan	nan	Norwegian	Norwegian	Norwegian	English	20:2	20:2	13:0	0:0
No	nan	nan	Norwegian	Norwegian	Norwegian	Norwegian	26:9	26:9	20:	:
Yes	Norwegian	17	Norwegian	Norwegian	English	English	23:4	23:4	17:	17:
No	nan	nan	English	English	English	English	17:9	34:11	5:	8:
Yes	Norwegian	16	Norwegian	Norwegian	English	Norwegian	22:	22:8	16:3	3:3
Yes	German	19	Norwegian	Norwegian	Norwegian	English	28:6	28:6	16:0	0:0
No	nan	nan	Norwegian	Norwegian	Norwegian	Norwegian	31:	32:	17:6	:
Yes	English	19	Norwegian	Norwegian	Norwegian	Norwegian	24:	24:	23:	0:
No	nan	nan	Norwegian	Norwegian	English	Norwegian	25:1	25:1	10:	3:
No	nan	nan	Norwegian	Norwegian	Norwegian	Norwegian	19:6	19:10	12:0	0:0
Yes	English	18	Norwegian	Norwegian	English	Norwegian	22:11	22:11	16:5	0:0
No	nan	nan	Norwegian	Norwegian	Norwegian	Norwegian	26:6	26:6	14:0	0:0
No	nan	nan	Norwegian	Norwegian	Norwegian	English	26:6	26:6	18:0	0:0
No	nan	nan	Norwegian	Norwegian	Norwegian	Norwegian	21:00	21:00	21:	21:
No	nan	nan	Norwegian	Norwegian	Norwegian	English	22:1	22:1	15:5	0:0
Yes	English	25	nan	Norwegian	English	Norwegian	32:7	33:3	12:0	4:0
Yes	Norwegian	21	Norwegian	English	English	English	22:5	22:2	14:0	0:0
Yes	Japanese	23	Norwegian	Norwegian	English	Norwegian	27:	27:6	18:	:
Yes	English	30	Norwegian	Norwegian	Norwegian	Norwegian	29:	34:	17:	0:
No	nan	nan	Norwegian	English	Norwegian	English	30:11	30:11	12:	:
Yes	English	19	Norwegian	Norwegian	English	English	21:3	21:3	16:5	15:0
Yes	English	22	Norwegian	English	English	English	22:0	23:2	13:0	0:0
No	nan	nan	Norwegian	Norwegian	Norwegian	Norwegian	26:6	27:	27:	27:
No	nan	nan	Norwegian	Norwegian	Norwegian	Norwegian	29:0	29:0	16:0	16:0
Yes	Danish	18	Norwegian	Norwegian	Norwegian	English	20:1	23:7	20:1	23:7
Yes	German	21	Norwegian	Norwegian	Norwegian	Norwegian	23:4	23:4	13:0	3:5
Yes	English	21	Norwegian	Norwegian	English	English	24:6	24:6	1:0	18:1
Yes	Norwegian	17 or 18	Norwegian	Both	Both	Both	24:11	24:11	0:	15:4
Yes	German	20	Norwegian	Norwegian	German	Norwegian	26:9	26:9	13:0	16:0
No	nan	nan	Norwegian	English	English	English	18:8	18:8	10:0	0:0
Yes	German	19	English	Norwegian	Norwegian	Norwegian	22:4	22:4	16:4	16:4
Yes	English	10	Norwegian	Norwegian	Norwegian	Norwegian	24:2	26:0	16:0	0:0
No	nan	nan	Norwegian	Norwegian	Norwegian	Norwegian	23:	23:	17:	:

FULL DATA SET

Q1e Work_ALL_Norsk	Q1f Work_SOME_Norsk	Q1g Country_Eng	Q1h Family_Eng	Q1i School_ALL_Eng	Q1j School_SOME_Eng	Q1k Work_ALL_Eng	Q1l Work_SOME_Eng	Q2a Contrib_Interact	Friend_Nors
11:0	0:0	1:0	1:0	0:0	0:0	1:0	0:0		10
4:0	1:0	0:3	0:2	0:0	13:0	0:0	1:0		10
2:	:	1:	:	1:	4:	:	:3		7
10:	:	2:0	1:6	1:6	1:	:	5:		8
10:0	0:0	1:0	0:0	1:0	2:0	0:0	3:0		6
3:	5:	:3	:	:	15:	:	5:		9
1:5	0:0	1:2	0:10	0:10	11:0	0:0	0:0		3
5:0	5:0	0:2	0:1	0:0	14:0	0:0	0:0		0
12:11	12:11	0:1	0:0	0:0	0:0	0:0	1:6		5
2:4	:4	:8	:4	:4	6:	:	:4		10
:17	2:	:	:	:	:	:	2:		9
7:0	0:0	0:0	0:0	0:0	13:0	0:0	0:0		8
9:0	0:0	1:6	1:6	1:6	17:5	0:0	1:0		10
1:6	0:0	0:0	0:0	0:0	1:6	0:0	0:0		8
3:2	4:0	0:0	0:0	0:0	10:0	0:0	4:0		5
9:	0:	:3	:1	:2	0:0	0:0	0:0		9
1:0	0:0	0:0	0:0	1:0	0:0	0:0	0:0		10
0:0	1:6	0:1	0:0.75	0:0	5:6	0:0	1:6		5
0:4	0:6	0:0	0:1	0:0	13:0	0:0	0:6		7
10:	:	1:6	:	1:6	:	:	:		10
2:	2:	:	:	:	2:	:	:		5
5:10	:	17:3	34:11	13:	8:	:5	:8		7
2:0	2:0	:7	22:8	0:0	3:3	0:0	2:0		6
0:0	0:0	2:6	2:6	1:0	0:0	1:0	1:0		10
13:	:	1:	0:	:6	:	:6	:		10
5:	0:	0:	0:	0:	12:	0:	0:		10
3:	:	:	:	:	3:	:	:1,5		8
2:0	0:0	0:1	0:0	0:0	12:0	0:0	0:0		7
2:9	0:0	1:6	11:0	0:0	11:0	0:0	2:9		10
5:0	5:0	0:0	0:0	0:0	14:0	0:0	2:3		5
8:6	8:6	0:0	0:0	0:9	0:0	0:0	1:0		6
5:1	1:11	1:	0:	0:	0:	0:	0:		10
2:1	0:0	0:1	0:1	0:0	12:0	0:0	1:0		7
6:0	3:6	0:5	2:0	0:0	4:0	0:0	3:6		9
2:0	0:0	0:0	0:3	0:6	1:0	0:0	0:6		8
2:	:	:6	:	:4	:6	:	:		3
10:	0:	3:	:	:6	:	3:	0:		8
14:	:	1:4	:	1:2	4:6	:	:		7
3:1	0:10	0:10	0:10	0:10	2:3	0:0	0:10		6
1:0	7:0	2:0	0:10	2:0	17:0	0:0	6:0		9
:	:	:	:	:	6:	:	:6		10
9:0	9:0	0:3	0:3	0:0	0:0	0:0	1:6		10
5:1	1:11	15:7	0:0	0:0	15:7	0:0	3:0		9
8:0	0:0	0:0	0:0	0:0	3:5	0:0	1:0		5
9:8	9:8	0:6	0:0	0:4	18:1	0:2	0:0		10
0:	4:	17:X	17:X	0:	14:4	0:	4:		5
2:6	2:6	0:0	0:0	3:0	9:0	0:0	2:6		10
2:0	0:4	0:0	0:0	2:6	12:5	0:0	0:4		10
6:4	6:4	0:0	0:0	0:0	16:4	0:0	1:1		8
10:0	0:0	2:0	0:0	2:0	16:0	0:0	10:0		8
7:	1:	:	:	:	:	:	1:4		10

FULL DATA SET

Q2b Contrib_InteractFamily_Nors	Q2c Contrib_Reading_Nors	Q2d Contrib_School_Nors	Q2e Contrib_SelfInstruct_Nors	Q2f Contrib_TV_Norsk	Q2g Contrib_Music_Nors	Q2h Contrib_InteractFriend_En
10	8	9	0	3	3	10
10	5	5	1	1	1	8
10	10	9	0	5	1	7
10	6	7	5	8	6	9
6	8	10	3	4	3	5
10	8	4	2	6	7	8
8	9	8	0	3	1	5
10	7	5	0	2	3	10
7	3	8	6	4	4	4
10	8	10	1	4	6	10
9	10	10	0	9	9	2
10	8	8	6	7	6	3
10	5	4	0	1	0	8
10	5	3	0	1	0	8
10	5	5	0	5	5	5
10	8	5	0	0	0	1
10	10	10	0	5	10	10
10	8	5	0	0	1	5
10	6	8	0	4	1	2
10	10	10	3	5	4	7
10	6	10	0	0	0	7
10	6	5	0	5	5	8
10	8	8	0	8	6	10
10	10	10	0	10	10	9
10	10	10	10	10	10	10
10	5	10	0	5	5	0
9	10	8	0	4	6	6
10	6	6	0	2	0	5
7	6	10	5	3	0	5
8	9	10	0	1	1	4
8	10	9	2	0	0	3
10	0	5	0	0	0	3
9	5	8	2	3	2	3
10	9	10	0	2	1	10
9	7	7	0	0	0	2
8	5	10	0	6	4	8
10	8	8	2	9	7	9
8	5	8	0	3	4	5
10	8	7	4	5	3	9
9	3	6	1	4	2	4
10	2	2	3	5	3	5
10	4	7	0	5	2	6
10	9	10	0	5	2	3
5	2	3	0	0	0	4
10	5	5	0	5	5	5
9	5	5	6	1	4	5
8	7	9	0	1	2	6
10	8	9	0	8	4	10
10	8	7	0	4	2	2
9	8	9	0	4	0	9
10	8	10	3	5	5	8

FULL DATA SET

Q2i Contrib_InteractFamily_En	Q2j Contrib_Reading_En	Q2k Contrib_School_En	Q2l Contrib_SelfInstruct_En	Q2m Contrib_TV_Eng	Q2n Contrib_Music_En	Q3a Expos_InteractFriend_Nors
0	2	1	0	7	7	10
1	5	8	1	8	8	10
4	10	9	0	5	3	10
10	6	9	2	5	5	10
2	7	7	8	10	10	10
9	7	10	6	7	7	10
7	7	7	2	10	3	7
1	7	7	0	10	8	10
2	6	8	9	6	6	5
8	9	10	7	7	5	8
2	10	4	0	9	9	10
6	8	7	4	7	7	10
0	5	10	5	5	5	10
0	5	10	0	7	0	7
0	5	8	1	5	5	10
0	2	0	0	2	6	10
2	10	8	5	10	10	10
2	8	9	1	5	5	10
1	7	8	0	10	6	9
0	10	10	3	5	6	10
0	10	10	0	7	10	10
10	9	10	0	8	8	8
7	9	2	5	9	9	4
0	7	4	0	3	2	8
0	10	10	5	10	10	10
0	5	10	0	5	5	10
2	8	7	1	10	10	10
1	8	10	0	6	3	10
2	6	8	7	8	4	10
0	10	8	0	9	9	10
0	10	8	6	9	6	10
0	5	5	10	10	10	10
6	7	9	6	7	7	10
0	8	8	0	9	8	10
1	5	8	0	9	8	5
2	7	9	0	7	6	8
0	6	6	0	10	8	10
0	8	6	0	9	7	5
2	10	6	4	8	7	10
4	8	10	4	9	5	9
2	5	7	7	5	6	10
6	3	7	0	8	4	10
0	8	7	3	8	8	8
0	4	4	0	4	3	9
10	10	10	10	10	5	10
0	8	5	10	9	10	9
2	10	5	0	9	7	9
1	5	10	1	7	5	8
7	7	7	0	7	5	10
5	8	10	0	7	7	10
0	7	10	5	9	2	10

FULL DATA SET

Q3b Expos_InteractFamily_Norsl	Q3c Expos_Reading_Norsl	Q3d Expos_SelfInstruct_Norsl	Q3e Expos_TV_Norsk	Q3f Expos_Music_Norsk	Q3g Expos_InteractFriend_En	Q3h Expos_InteractFamily_Eng
10	5	0	5	5	2	0
10	10	10	2	5	1	1
10	2	0	0	2	0	0
10	4	4	4	4	7	3
10	9	0	8	7	5	0
10	6	0	5	5	0	0
10	5	0	2	1	3	0
10	8	0	0	3	5	0
3	6	5	4	4	2	0
10	9	0	0	1	8	1
10	0	0	4	5	0	0
10	8	0	6	3	8	4
10	10	10	5	5	3	0
10	5	0	2	1	3	0
10	10	0	8	5	0	0
10	8	0	6	3	0	0
10	5	0	5	3	3	2
10	10	0	10	8	10	2
10	5	0	4	6	1	0
10	10	3	10	10	5	0
10	3	0	3	3	10	0
7	3	0	1	2	5	7
9	0	0	0	1	6	1
10	2	0	4	2	2	0
10	10	10	5	5	5	0
10	5	0	3	4	0	0
10	4	0	3	2	2	2
10	5	0	1	2	3	0
10	6	0	4	5	2	1
10	6	0	5	5	3	1
10	4	0	4	3	3	2
10	0	5	0	0	5	0
10	6	3	4	3	2	2
10	8	0	5	5	2	4
5	3	0	1	0	5	5
10	2	0	0	0	7	0
10	7	0	7	7	2	0
8	3	0	2	0	5	0
5	7	0	2	3	10	0
10	2	0	2	3	1	1
10	5	2	4	2	8	1
10	8	0	5	3	2	9
10	1	0	1	1	6	0
10	5	0	4	5	1	0
10	5	0	0	0	10	5
0	0	2	1	2	7	0
10	1	0	0	0	1	0
10	4	0	2	2	8	0
10	6	0	3	6	0	0
10	7	0	3	3	1	0
10	8	3	5	5	2	2

FULL DATA SET

Q3i Expos_Reading_Eng	Q3j Expos_SelfInstruct_Eng	Q3k Expos_TV_Eng	Q3l Expos_Music_Eng	Q4a Speaking_Norsk	Q4b Pronoucing_Norsk	Q4c Listening_Norsk	Q4d Reading_Norsk	Q4e Writing_Norsk
5	0	5	5	10	9	10	9	7
1	4	9	5	10	9	10	10	10
9	0	10	9	10	10	10	10	10
8	3	10	10	10	10	10	10	10
7	0	10	10	10	10	10	10	10
4	0	5	5	10	10	10	10	10
5	0	8	9	9	10	9	9	9
4	0	10	10	10	10	8	8	9
4	8	7	8	10	10	10	10	10
9	0	10	10	10	10	10	10	10
10	0	9	8	10	10	10	10	10
10	0	10	10	9	9	10	9	8
10	10	10	10	10	10	10	10	10
5	0	8	9	9	10	10	9	8
4	0	8	7	10	10	10	10	10
2	0	4	7	10	10	10	10	10
7	0	10	10	10	10	10	10	9
10	0	10	9	10	10	10	10	10
5	0	7	4	10	10	10	10	10
10	1	10	10	10	10	10	10	10
10	0	5	10	10	10	10	10	10
9	0	9	5	10	10	10	10	7
10	10	10	9	9	8	9	9	9
8	0	6	8	10	10	10	10	10
5	5	10	10	10	10	10	10	10
5	0	7	6	9	7	9	9	9
9	0	9	10	9	9	10	10	9
5	0	9	8	10	10	10	10	10
2	0	4	5	10	9	10	10	10
5	4	8	8	9	10	10	10	9
10	0	10	10	9	9	9	10	9
10	0	10	10	10	10	10	10	10
8	3	7	9	10	10	10	9	9
5	5	10	5	10	10	10	10	10
7	0	9	10	6	6	10	8	9
10	0	7	4	10	9	10	10	10
3	0	8	7	10	10	10	10	10
7	0	8	7	10	10	10	10	9
8	2	9	7	8	7	9	9	6
6	2	10	8	8	7	9	9	7
9	8	4	7	9	8	10	9	8
6	0	5	8	10	10	10	9	10
10	0	9	9	10	10	10	10	8
5	0	6	5	10	10	10	10	9
10	0	10	10	8	10	10	9	8
5	3	8	8	5	8	6	3	5
9	10	10	10	10	10	10	10	8
9	0	9	8	10	10	10	10	10
10	0	5	5	10	9	10	10	7
3	0	8	9	10	10	10	10	10
7	8	6	8	10	10	10	10	10

FULL DATA SET

Q4f Grammar_Norsk	Q4g Vocab_Norsk	Q4h Spelling_Norsk	Q4i Speaking_Eng	Q4j Pronoucing_Eng	Q4k Listening_Eng	Q4l Reading_Eng	Q4m Writing_Eng	Q4n Grammar_Eng	Q4o Vocab_Eng	Q4p Spelling_Eng
7	8	7	7	5	10	9	4	3	6	3
10	8	10	4	3	7	5	5	5	4	5
9	10	9	8	8	9	10	10	8	10	9
7	8	7	9	9	8	9	7	6	8	6
7	9	9	8	8	10	9	8	7	6	8
9	9	9	7	6	6	8	8	7	6	6
7	7	8	8	8	8	7	7	7	7	7
8	9	9	10	6	7	8	8	6	7	7
10	9	10	10	7	9	10	9	8	7	8
10	10	10	9	8	10	10	10	10	9	9
9	10	9	7	6	10	10	10	9	9	9
8	8	8	7	7	9	9	9	8	8	8
8	9	9	8	7	9	9	9	6	8	6
9	9	9	7	6	7	7	6	5	7	6
10	9	10	4	3	6	6	6	6	5	5
9	9	10	7	6	8	8	7	6	5	8
9	9	9	8	8	9	8	8	8	8	8
10	10	10	9	8	9	9	9	9	8	8
9	9	10	9	9	9	9	9	7	8	8
10	10	10	9	7	10	10	10	10	8	9
9	10	10	10	8	10	10	10	9	10	10
7	8	6	10	10	10	10	10	8	10	7
10	9	8	9	7	9	8	8	9	7	8
9	10	10	9	8	9	9	8	7	8	7
9	9	9	8	8	8	8	8	8	8	8
9	9	9	5	2	7	7	5	5	5	5
10	9	10	8	8	9	8	8	8	7	8
10	9	9	8	7	7	8	7	8	7	8
9	8	9	7	6	8	7	7	7	6	7
8	8	8	7	7	9	9	6	6	7	6
9	9	9	8	7	9	10	9	7	8	7
10	10	10	5	8	10	10	10	5	5	5
9	9	8	8	8	9	8	7	6	6	4
9	9	9	7	5	8	8	7	5	7	5
6	7	7	8	8	9	8	7	6	8	8
9	9	9	9	8	9	10	9	8	9	10
7	9	9	7	6	6	5	5	5	6	6
8	8	9	9	7	9	9	9	8	7	8
5	7	5	9	8	8	9	7	6	6	6
8	6	7	8	8	9	8	8	6	9	6
7	9	7	8	7	8	8	7	7	8	7
9	8	9	8	7	8	6	7	6	5	5
6	7	9	7	7	8	9	10	7	9	7
9	9	9	7	7	8	7	6	6	6	7
8	7	8	9	9	10	10	9	8	9	8
4	6	4	5	5	6	3	5	4	6	4
9	9	9	8	7	8	9	7	7	5	7
9	10	10	10	8	10	9	8	8	8	8
5	7	6	6	6	8	8	7	7	7	7
9	9	10	8	9	10	9	9	9	7	8
10	10	10	7	7	7	7	7	6	6	6

FULL DATA SET

Q5a StartHearing_Age_Nors	Q5b FluentSpeaking_Age_Nors	Q5c StartReading_Age_Nors	Q5d FluentReading_Age_Nors	Q5e StartHearing_Age_Eng	Q5f FluentSpeaking_Age_Eng
0	3	7	8	13	18
0	4	5	6	8	17
0	12	6	13	6	15
1	5	6	8	14	17
0	2	5	8	8	15
0	2	6	8	12	16
0	2	3	6	6	10
0	6	5	10	7	13
0	3	7	9	7	10
0	16	5	13	7	21
0	2	6	7	7	13
0	4	5	7	6	11
0	2	4	8	5	11
0	4	4	7	8	23
0	4	5	6	8	13
1	8	6	8	6	16
0	3	5	8	5	12
0	3	4	7	6	15
0	5	4	8	6	10
0	3	4	6	8	12
0	3	5	7	7	11
0	15	7	19	0	9
0	4	4	5	0	13
0	2	5	8	13	19
0	4,5	6	8	10	15
0	4	8	8	6	13
0	4	4	6	5	12
0	3	6	9	10	12
0	3	5	6	7	13
0	4	6	7	7	15
0	6	6	12	8	19
0	4,5	4	7	8	12
0	4	4	10	5	13
0	2	6	6	8	13
1	4	4	7	8	12
0	8	6	10	5	13
0	2	6	8	8	15
0	4	6	8	12	14
0	7	6	10	6	16
0	3	4	8	7	12
0	3	6	10	5	10
0	3	5	8	6	15
3	4	4	7	8	20
0	2	5	6	6	15
0	10	6	11	4	17
0	4	6	8	7	14
0	4	3	5	6	11
0	4	3	7	6	12
0	6	5	9	6	19
0	3	6	7	6	6
0	2	5	7	7	11

FULL DATA SET

Q5g StartReading_Age_Eng	Q5h FluentReading_Age_Eng	Q6 Switch_Proficiency	Q7 Accient_Mix_Words	Q7a Accident_Mix_Words_Freq	Q7b Accident_Norsk_Intrude_En	Q8 Intentional_Mix_Words
10	18	7	No	0	0	No
8	10	4	No	0	0	No
6	15	9	Yes	4	0	No
11	17	8	Yes	5	0	No
8	15	9	Yes	4	7	No
12	16	5	No	0	0	Yes
8	11	8	Yes	2	1	Yes
9	13	10	Yes	2	1	Yes
9	12	7	No	0	0	Yes
7	16	10	Yes	8	2	Yes
11	15	10	Yes	3	0	Yes
6	9	8	Yes	7	2	Yes
9	12	8	Yes	4	2	Yes
8	17	8	Yes	3	1	Yes
8	12	7	Yes	3	1	Yes
6	20	6	Yes	2	4	Yes
6	12	7	Yes	4	4	Yes
8	15	9	Yes	2	1	Yes
6	11	7	Yes	4	1	Yes
7	12	10	Yes	5	1	Yes
7	12	9	Yes	3	3	Yes
5	9	9	Yes	5	3	Yes
6	11	10	Yes	1	1	Yes
10	22	8	Yes	2	2	Yes
10	15	8	Yes	2	1	Yes
8	15	5	Yes	2	2	Yes
7	12	9	Yes	6	0	Yes
6	12	7	Yes	3	1	Yes
7	13	7	Yes	3	1	Yes
8	12	8	Yes	2	0	Yes
8	14	8	Yes	4	1	Yes
6	8	10	Yes	2	5	Yes
7	14	9	Yes	7	2	Yes
9	13	8	Yes	5	0	Yes
6	12	9	Yes	8	2	Yes
13	14	8	Yes	8	4	Yes
9	12	8	No	0	0	Yes
10	14	8	Yes	3	2	Yes
12	14	8	Yes	7	4	Yes
7	10	9	Yes	4	1	Yes
9	12	8	Yes	8	5	Yes
7	14	8	Yes	3	4	Yes
8	14	8	Yes	8	3	Yes
6	13	6	No	0	0	Yes
7	17	10	Yes	5	0	Yes
7	12	8	Yes	5	5	Yes
7	12	8	Yes	1	1	Yes
6	13	10	Yes	2	1	Yes
6	14	8	Yes	8	3	Yes
6	7	10	Yes	8	3	Yes
7	11	7	No	0	0	Yes

Q8a Intentional_SubIn_Eng	Q8b Intentional_SubIn_Norsk
0	0
0	0
0	0
0	0
0	0
2	0
2	0
2	0
3	0
3	0
4	0
7	0
8	0
3	1
3	1
3	1
3	1
4	1
5	1
5	1
5	1
8	1
10	1
1	2
2	2
2	2
3	2
4	2
4	2
5	2
5	2
5	2
8	2
9	2
9	2
9	2
3	3
3	3
4	3
5	3
8	3
3	4
8	4
2	5
5	5
5	5
7	5
8	6
8	6
8	6
2	9

Appendix 7: ANALYSIS INPUT

sub	Q3a Exposure_L1	Q3b Exposure_L2	Q4a Speaking_L1	Q4b Speaking_L2	Q5a Read_L1	Q5b Read_L2	Q6a Choice_L1	Q6b Choice_L2	Q2a Contrib_InteractFriend_Nors	Q2c Contrib_Reading_Norsl
1	65	30	90	10	90	10	90	10	10	8
2	49	50	95	5	40	60	95	5	10	7
3	70	28	90	9	40	58	50	50	10	10
4	90	10	80	20	50	50	80	15	8	8
5	70	30	70	30	90	10	70	30	10	4
6	40	60	50	50	25	75	50	50	7	6
7	50	45	70	28	28	70	70	30	9	9
8	60	40	70	30	40	60	60	40	6	8
9	55	35	45	55	80	15	35	65	10	8
10	60	40	90	10	70	30	95	5	7	6
11	40	60	65	35	40	60	80	20	5	5
12	40	60	80	20	20	80	10	90	9	3
13	60	40	95	5	60	40	95	5	10	10
14	60	40	70	30	50	50	70	30	0	7
16	70	30	99	1	70	30	100	0	9	8
17	30	70	90	10	10	90	90	10	5	6
18	50	50	90	10	70	30	95	5	7	5
19	60	40	80	20	40	60	90	10	8	10
20	50	50	75	25	40	60	60	40	8	8
21	70	25	70	20	20	75	50	35	3	5
22	50	40	80	10	80	15	100	0	8	8
23	64	35	89	10	50	50	97	2	7	6
24	70	30	80	20	30	70	100	0	9	10
26	80	20	95	5	50	50	90	10	10	10
28	75	25	95	5	60	40	100	0	10	5
29	50	50	70	30	20	80	100	0	10	0
30	45	50	60	35	40	58	80	20	10	8
31	70	30	80	20	60	40	100	0	6	8
32	60	40	75	25	40	60	95	5	5	8
33	50	50	90	10	15	85	100	0	10	5
35	30	70	80	20	10	90	70	30	10	5
36	25	75	25	75	35	65	50	50	8	7
37	40	60	70	30	10	90	80	20	7	5
38	70	30	80	20	50	50	95	5	3	9
39	75	24	90	9	80	18	100	0	5	5
40	60	40	90	10	90	10	90	10	10	6
41	70	29	90	9	80	20	100	0	10	5
42	70	30	90	10	80	20	70	30	5	3
43	70	30	90	10	10	90	90	10	6	10
44	80	20	90	10	95	5	100	0	10	8
45	50	50	90	10	70	30	80	20	10	10
47	40	50	60	20	60	30	100	0	8	5
48	54	45	60	40	55	45	90	10	10	2
49	60	39	85	15	40	60	90	10	8	8
50	50	50	70	30	50	50	50	50	8	6
51	50	50	20	80	80	20	50	50	7	10
53	85	15	90	10	80	20	100	0	9	8
54	40	58	40	60	99	1	98	2	6	8
55	85	15	100	0	80	20	98	2	9	9
56	95	5	90	9	60	39	95	5	5	2
58	90	10	90	10	50	50	100	0	5	9

Q2d Contrib_School_Norsl	Q2f Contrib_TV_Norsk	Q2g Contrib_Music_Norsl	Q2h Contrib_InteractFriend_En	Q2i Contrib_InteractFamily_Eng	Q2j Contrib_Reading_Eng	Q2k Contrib_School_Eng
10	5	5	8	0	7	10
9	1	2	6	2	10	5
10	10	10	9	0	7	4
7	4	2	2	7	7	7
7	5	2	6	6	3	7
5	5	5	8	10	9	10
10	5	2	3	0	8	7
7	5	3	9	2	10	6
9	8	4	10	1	5	10
8	4	1	2	1	7	8
5	1	4	5	0	8	5
6	4	2	4	4	8	10
10	5	4	7	0	10	10
5	2	3	10	1	7	7
4	6	7	8	9	7	10
10	0	0	7	0	10	10
8	3	2	3	6	7	9
8	4	6	6	2	8	7
9	4	0	9	5	8	10
10	6	4	8	2	7	9
8	9	7	9	0	6	6
6	2	0	5	1	8	10
10	9	9	2	2	10	4
10	5	10	10	2	10	8
10	5	5	0	0	5	10
5	0	0	3	0	5	5
10	4	6	10	8	9	10
10	4	3	5	2	7	7
5	0	1	5	2	8	9
4	1	0	8	0	5	10
5	5	5	5	10	10	10
7	0	0	2	1	5	8
8	3	4	5	0	8	6
8	3	1	5	7	7	7
5	5	5	5	0	5	8
10	3	0	5	2	6	8
5	1	1	8	1	5	8
8	4	4	4	2	6	8
9	0	0	3	0	10	8
9	3	3	10	0	2	1
10	10	10	10	0	10	10
3	1	0	8	0	5	10
2	5	3	5	2	5	7
8	7	6	3	6	8	7
7	8	6	9	10	6	9
9	5	1	7	4	10	9
5	0	0	1	0	2	0
8	8	6	10	7	9	2
10	2	1	10	0	8	8
3	0	0	4	0	4	4
10	1	1	4	0	10	8

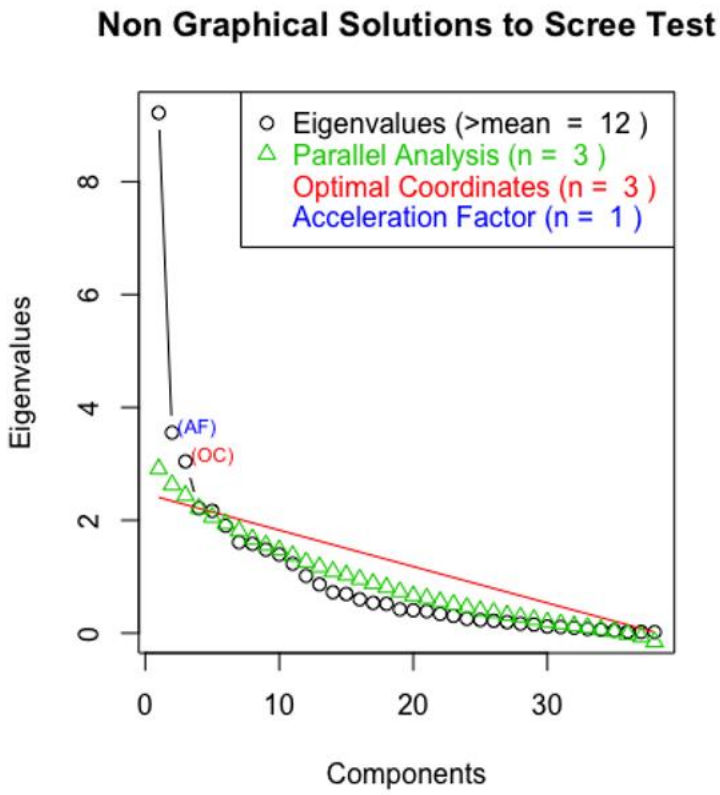
Q2l Contrib_SelfInstruct_En	Q2m Contrib_TV_Eng	Q2n Contrib_Music_Eng	Q3c Expos_Reading_Norsk	Q3e Expos_TV_Norsk	Q3f Expos_Music_Norsk	Q3g Expos_InteractFriend_En	Q3i Expos_Reading_Eng
5	9	2	8	5	5	2	7
0	9	7	1	0	0	1	9
0	3	2	2	4	2	2	8
0	7	5	6	3	6	0	10
0	8	4	8	5	3	2	6
0	8	8	3	1	2	5	9
3	8	8	1	1	1	6	10
4	8	7	7	2	3	10	8
1	7	5	4	2	2	8	9
0	10	6	5	4	6	1	5
10	9	10	0	1	2	7	5
4	9	5	2	2	3	1	6
3	5	6	10	10	10	5	10
0	10	8	8	0	3	5	4
6	7	7	6	5	5	0	4
0	7	10	3	3	3	10	10
6	7	7	6	4	3	2	8
1	10	10	4	3	2	2	9
0	7	7	7	3	3	1	3
0	7	6	2	0	0	7	10
0	10	8	7	7	7	2	3
0	6	3	5	1	2	3	5
0	9	9	0	4	5	0	10
5	10	10	5	5	3	3	7
0	5	5	5	3	4	0	5
10	10	10	0	0	0	5	10
7	7	5	9	0	1	8	9
8	10	10	9	8	7	5	7
1	5	5	10	10	8	10	10
5	5	5	10	5	5	3	10
10	10	5	5	0	0	10	10
0	9	8	3	1	0	5	7
0	9	7	3	2	0	5	7
2	10	3	5	2	1	3	5
1	5	5	10	8	5	0	4
7	8	4	6	4	5	2	2
1	8	8	10	2	5	1	1
9	6	6	6	4	4	2	4
6	9	6	4	4	3	3	10
0	7	7	5	5	5	2	5
5	10	10	10	5	5	5	5
0	7	0	5	2	1	3	5
7	5	6	5	4	2	8	9
4	7	7	8	6	3	8	10
2	5	5	4	4	4	7	8
0	5	3	2	0	2	0	9
0	2	6	8	6	3	0	2
5	9	9	0	0	1	6	10
0	9	8	8	5	5	2	5
0	4	3	5	4	5	1	5
0	9	9	6	5	5	3	5

Q3k Expos_TV_Eng	Q3l Expos_Music_Eng	Q4i Speaking_Eng	Q4j Pronoucing_Eng	Q4k Listening_Eng	Q4l Reading_Eng	Q4m Writing_Eng	Q4n Grammar_Eng	Q4o Vocab_Eng	Q4p Spelling_Eng
6	8	7	7	7	7	7	6	6	6
10	10	8	7	8	9	7	7	5	7
6	8	9	8	9	9	8	7	8	7
5	5	6	6	8	8	7	7	7	7
5	8	8	7	8	6	7	6	5	5
9	5	10	10	10	10	10	8	10	7
9	9	7	7	8	9	10	7	9	7
9	7	9	8	8	9	7	6	6	6
9	8	10	8	10	9	8	8	8	8
7	4	9	9	9	9	9	7	8	8
8	8	5	5	6	3	5	4	6	4
10	8	8	8	9	8	8	6	9	6
10	10	9	7	10	10	10	10	8	9
10	10	10	6	7	8	8	6	7	7
5	5	7	6	6	8	8	7	6	6
5	10	10	8	10	10	10	9	10	10
7	9	8	8	9	8	7	6	6	4
9	10	8	8	9	8	8	8	7	8
8	9	8	9	10	9	9	9	7	8
7	4	9	8	9	10	9	8	9	10
8	7	7	6	6	5	5	5	6	6
9	8	8	7	7	8	7	8	7	8
9	8	7	6	10	10	10	9	9	9
10	10	8	8	9	8	8	8	8	8
7	6	5	2	7	7	5	5	5	5
10	10	5	8	10	10	10	5	5	5
10	10	9	8	10	10	10	10	9	9
10	10	8	8	10	9	8	7	6	8
10	9	9	8	9	9	9	9	8	8
10	10	8	7	9	9	9	6	8	6
10	10	9	9	10	10	9	8	9	8
9	10	8	8	9	8	7	6	8	8
8	7	9	7	9	9	9	8	7	8
8	9	8	8	8	7	7	7	7	7
8	7	4	3	6	6	6	6	5	5
4	5	7	6	8	7	7	7	6	7
9	5	4	3	7	5	5	5	4	5
7	8	10	7	9	10	9	8	7	8
10	10	8	7	9	10	9	7	8	7
5	5	7	5	10	9	4	3	6	3
10	10	8	8	8	8	8	8	8	8
8	9	7	6	7	7	6	5	7	6
4	7	8	7	8	8	7	7	8	7
10	10	7	7	9	9	9	8	8	8
10	10	9	9	8	9	7	6	8	6
10	9	8	8	9	10	10	8	10	9
4	7	7	6	8	8	7	6	5	8
10	9	9	7	9	8	8	9	7	8
10	5	7	5	8	8	7	5	7	5
6	5	7	7	8	7	6	6	6	7
8	8	7	7	9	9	6	6	7	6

Q5b FluentSpeaking_Age_Norsl	Q5d FluentReading_Age_Nors	Q5e StartHearing_Age_Eng	Q5f FluentSpeaking_Age_Eng	Q5g StartReading_Age_Eng	Q5h FluentReading_Age_Eng
2	7	7	11	7	11
4	5	6	11	7	12
2	8	13	19	10	22
6	9	6	19	6	14
3	8	6	15	7	14
15	19	0	9	5	9
4	7	8	20	8	14
7	10	6	16	12	14
4	7	6	12	6	13
5	8	6	10	6	11
4	8	7	14	7	12
3	8	7	12	7	10
3	6	8	12	7	12
6	10	7	13	9	13
2	8	12	16	12	16
3	7	7	11	7	12
4	10	5	13	7	14
4	6	5	12	7	12
3	7	6	6	6	7
8	10	5	13	13	14
2	8	8	15	9	12
3	9	10	12	6	12
2	7	7	13	11	15
3	8	5	12	6	12
4	8	6	13	8	15
0	7	8	12	6	8
16	13	7	21	7	16
2	8	8	15	8	15
3	7	6	15	8	15
2	8	5	11	9	12
10	11	4	17	7	17
4	7	8	12	6	12
4	8	12	14	10	14
2	6	6	10	8	11
4	6	8	13	8	12
3	6	7	13	7	13
4	6	8	17	8	10
3	9	7	10	9	12
6	12	8	19	8	14
3	8	13	18	10	18
0	8	10	15	10	15
4	7	8	23	8	17
3	10	5	10	9	12
4	7	6	11	6	9
5	8	14	17	11	17
12	13	6	15	6	15
8	8	6	16	6	20
4	5	0	13	6	11
2	6	8	13	9	13
2	6	6	15	6	13
4	7	7	15	8	12
	8,1				

Q6 Switch_Proficiency	Q7a Accident_Mix_Words_Fre	Q7b Accident_Norsk_Intrude_En	Q8a Intentional_SubIn_Eng	Q8b Intentional_SubIn_Norsk
7	0	0	2	9
8	1	1	7	5
8	2	2	1	2
8	8	3	8	6
8	3	4	3	4
9	5	3	8	1
8	8	3	8	4
8	7	4	4	3
10	2	1	8	6
7	4	1	5	1
8	5	5	5	5
9	4	1	5	3
10	5	1	5	1
10	2	1	2	0
5	0	0	2	0
9	3	3	5	1
9	7	2	8	2
9	6	0	3	2
10	8	3	8	6
8	8	4	9	2
8	0	0	3	3
7	3	1	4	2
10	3	0	4	0
7	4	4	3	1
5	2	2	2	2
10	2	5	5	2
10	8	2	3	0
9	4	7	0	0
9	2	1	4	1
8	4	2	8	0
10	5	0	5	5
9	8	2	9	2
8	3	2	3	3
8	2	1	2	0
7	3	1	3	1
7	3	1	4	2
4	0	0	0	0
7	0	0	3	0
8	4	1	5	2
7	0	0	0	0
8	2	1	2	2
8	3	1	3	1
8	8	5	8	3
8	7	2	7	0
8	5	0	0	0
9	4	0	0	0
6	2	4	3	1
10	1	1	10	1
8	5	0	9	2
6	0	0	2	5
8	2	0	5	2

Appendix 8: GRAPH OF SUGGESTED FACTOR GROUPINGS



Appendix 9: ANALYSIS OF AMOUNT OF CORRECT PHONOLOGY

Mean Phon_Correct				
	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	1.68	0.12	14.23	<1e-04
language	0.15	0.20	0.75	0.46
typeName	-0.03	0.21	-0.14	0.89
Cognate	-0.08	0.21	-0.39	0.70
Nowac_Subtlex_Zipf	-0.18	0.16	-1.09	0.28
language:typeName	0.13	0.41	0.32	0.75
language:Cognate	-0.04	0.42	-0.10	0.92
typeName:Cognate	0.30	0.42	0.72	0.47
language:Nowac_Subtlex_Zipf	0.14	0.32	0.43	0.67
typeName:Nowac_Subtlex_Zipf	0.07	0.34	0.20	0.84
Cognate:Nowac_Subtlex_Zipf	0.31	0.35	0.89	0.37
language:typeName:Nowac_Subtlex_Zipf	-0.77	0.67	-1.14	0.25
language:Cognate:Nowac_Subtlex_Zipf	-0.11	0.69	-0.15	0.88
typeName:Cognate:Nowac_Subtlex_Zipf	0.12	0.66	0.18	0.85
language:typeName:Cognate	-0.78	0.84	-0.93	0.35

No effects

	Raw counts							
	= cognate common	= EN proper	= nonCognate common	= EN proper	= cognate common	= NO proper	= nonCognate common	= NO proper
0	7	22	10	4	7	11	11	6
1	6	9	4	6	5	11	3	5
2	4	4	4	7	2	3	5	2
3	11	6	4	4	3	6	4	5
4	1	8	2	1	5	9	5	3