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Bilingual speech comprehension in context

Predictive sentence processing in second language listening

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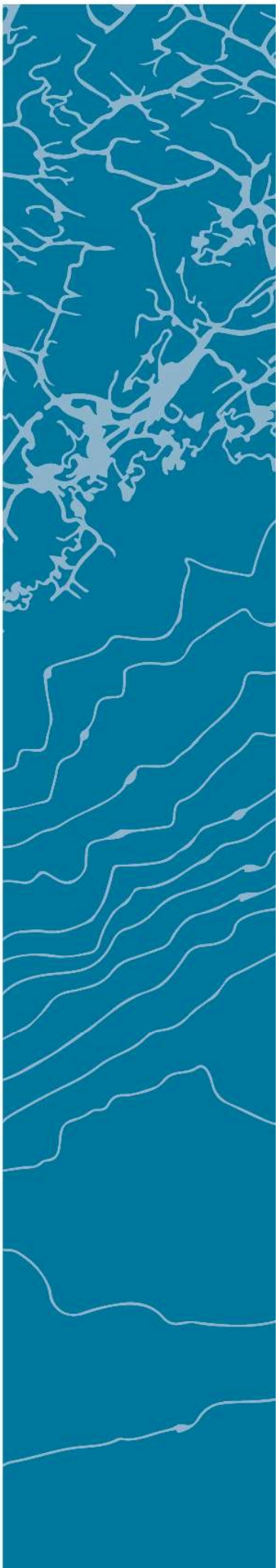

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Abstract

The project aims to extend our understanding of the relationship between language profile, proficiency and speech comprehension in English by investigating three-sentence contexts of mixed word order, low-constraint sentence and high-constraint sentence. Our concern in this study is whether context effects will behave differently in the first language (L1) than in the second language (L2). Norwegian natives with English as a second language (Norwegian-English bilinguals) performed in a word monitoring experiment which consisted of a within-language variable (mixed word order versus low-constraint versus high-constraint sentence conditions) with a between -participants language variable to see if the preceding context would have an effect on spoken word recognition in sentences. The same experiment occurred in both English and Norwegian on separate days. An amended version of the Language Proficiency and Background questionnaire (LEAP-Q) was also applied to unfold detailed bilingual background and self-rated L1 and L2 proficiency. In the within-language variable, the results showed that our bilinguals show efficient prediction competence in both languages. Mixed-effects linear regression showed that the participants were faster to recognise a target word when it was preceded by a sensible high constraint sentence in both their first and second language. Participants were also overall faster in recognising a target word in the low-constraint sentences compared to the mixed word order sentences. The between-participants language variable of the questionnaire assessment correlated with the factor analysis and showed a significant informal learning effect. The results indicate that highly proficient bilinguals can efficiently predict upcoming information with help from the preceding context and give support for a pre-access model of bilingual comprehension that claims that a preceding high-constraining context aids the recognition process by predicting a plausible upcoming word prior to encountering it.

Research scope and goals

Understanding speech in our native language (L1) seems like a simple task as we all perform it without hardly any effort. Speech comprehension in a second language (L2) appears more complicated as there are important aspects to consider, such as an individual's language background and proficiency level. Evidence has shown that in native language comprehension, people can predict upcoming information based on the preceding context (Altmann & Kamide, 1999; Martin et al., 2013; Dijkgraaf, Hartsuiker & Duyck, 2017). In efficient language processing, the use of context information to predict upcoming information is essential because it can help facilitate the process by speeding up the process and help to deal with ambiguities (Kutas, DeLong & Smith, 2011). For bilinguals, the facilitatory process is even more relevant since comprehension in the second language is considered to be slower and less efficient than native language processing (Hahne, 2001; Weber & Broersma, 2012). Kaan (2014) argues that L2 predictive processing is not that different from L1 predictive processing in that other factors such as language background may play a role in the efficiency of the prediction process. The focus of this thesis is the role of context in sentence prediction in English as a second language.

First, this thesis will briefly discuss the main differences between the auditory domain and the visual domain in speech comprehension for the reader to get a glimpse at similarities and differences between the two to understand that regardless of the similarities of the two domains, more challenges can occur when performing a study using auditory modalities than visual modalities.

Our study is concerned with the auditory modality, but much research has been conducted on the visual domain of speech comprehension (e.g. Martin, Thierry, Kuipers, Boutonnet, Foucart and Costa, 2013). The auditory domain may be more challenging because it is impossible to return to prior input or alter input rate as it is in reading. Secondly, the current study will discuss various models of spoken word recognition and top-down and bottom-up processing. To better understand how the mental architecture works in bilingual speech comprehension, it is necessary to assess how information flows between processing levels in the first language. Thirdly, this thesis will move on to bilingual speech comprehension and bilingual models. Language-selective and non-selective access will also be discussed since it concerns within-language competition and between-language competition in bilinguals. In selective access, only word candidates from the target language

are activated and predict that target word recognition is based on neighbourhood characteristics only (words that sound similar to the target word). In contrast, in a non-selective access model, both languages are activated, and the word recognition process receives neighbourhood effects of both languages (van Heuven, Dijkstra & Grainger, 1998). Since the current study is concerned with the relationship between language profile, proficiency and speech comprehension, the bilingual individual will be discussed, followed by proficiency, language background and language use. As we are testing Norwegian-bilinguals, the thesis will also discuss some cross-linguistics differences in English and Norwegian. The introduction section will finally ease into our main topic of concern, sentence prediction and processing, followed by the current study.

Spoken word recognition: how do we recognise spoken words?

Recognising spoken words is usually an automatic and effortless process that your mind performs by turning sounds into words you understand. Some studies even demonstrate that humans are fast comprehenders as they can identify spoken words in context from 200 ms after their onset (Marslen-Wilson, 1984). However, explaining how we accomplish speech recognition is more complex (e.g. Marslen-Wilson & Tyler, 1980; Weber & Scharenborg, 2012). Spoken word recognition involves a higher-level mechanism where your mind must map the auditory information onto your already existing mental lexicon, rather than only identifying the sounds of the language you hear (For an overview see, Harley, 2014). Researchers mostly agree that when a word is recognised, the speech wave is processed, and several candidates or "neighbours" are activated and then competing for the best match. One is eventually chosen as the most compatible candidate after all necessary information has been taken into account (Grosejan, 2018). Regardless of the consensus of activation and competition processes, there are still uncertainties regarding how word candidates are selected and to what extent context affects the process.

In the activation process, mechanisms such as segmentation cues (cues in the speech stream) help us identify the beginning and end of words. Information about phonotactic rules (which tells us what combinations of phonemes that are generally allowed) contributes to recognising and combining phonemes and acoustic-phonetic cues (syllable duration, word stress, allophonic variation, etc.) help us exclude and include possible candidates (Grosjean, 2018). Therefore, there are many elements in play when we take a

closer look at how many mechanisms need to be in place for a person to understand an utterance. Moreover, the speech recognition process is not always straightforward since certain factors in the speech perception identification process can hinder or speed up the process. It can depend on articulation quality, such as the speaker's coherence in speech, hence invariance, segmentation, and assimilation issues. The *invariance problem* occurs because a phoneme sounds different depending on the context; the *segmentation problem* occurs because sounds difficult to separate in time due to a*ssimilation,* which arises when phonemes take on some of their neighbours' acoustic features (e.g., the phoneme /ɪ/ is usually produced without a nasal feature, but in "pin" and "sing", it takes on a nasal quality) (Miller & Jusczyk, 1989). Another possible restricting or proactive factor that can affect spoken word recognition is word frequency. The high or low frequency of words can produce an advantage or disadvantage in speech recognition depending on the degree of familiarity and use. The temporal aspect of competing neighbours and the role of top-down information (syntax, pragmatic and semantics) and world knowledge are also aspects that need to be considered in spoken word recognition (Grosjean, 2018). The spoken word recognition process is efficient and fast, which makes it challenging to find a model or an organisational structure that can account for all components involved in this operation, and since spoken words consist of a series of online temporary acoustic events that immediately must be interpreted and assigned, not a great number of research has been conducted on this area of study as opposed to, i.e., spoken word production or even spoken word recognition in visual studies, in part because of convenience. (e.g.,Jacobs & Grainger 1994; Libben & Titone, 2009; Levelt, 1989; Hickok, 2014), (Jusczyk & Luce, 2002).

Spoken word versus visual word-recognition

Spoken word recognition by humans has had a short interval as it was not given much attention until the 1970s. Before then, the focus was primarily on visual word recognition (Frauenfelder & Tyler, 1987). Researchers eventually assumed that the recognition process for visual and spoken word was separate because models accounting for visual word recognition were inadequate as models of spoken word recognition. Still, spoken word and visual word recognition are not too far apart compared to how they process lexical accessing, such as a facilitation effect on semantically related words in word recognition (i.e., Jackson & Morton, 1984; Jakić, Durdevic & Kostic, 2011). A *facilitation effect* occurs due

to making processing faster and is usually seen in experiments involving priming tasks. Facilitation is a widely used term in research to describe an increase in efficiency instead of inhibition (Harley, 2014). Other similarities between the two recognition processes are the appearance of *the word frequency effect.* A word's frequency is a very significant factor in word recognition because high- frequent words are recognised faster than low-frequent words, which means that when conducting research, the effect of word frequency should be controlled for and matched across conditions as we will see in the current experiment(Monsell, Doyle & Haggard, 1989; Brysbaert, Andera & Keuleers, 2017).

In visual and spoken word recognition, you will find both semantic priming (two words that are connected in memory) and frequency effects but the most crucial difference between visual and spoken language is that spoken language is instant and only available for a short time, whilst a written text can exist on a paper for a remotely long time. What could seem like a trivial difference based on all the similarities is a highly significant change in our understanding of our mental lexicon. (Harley, 2014, p., 171). Visual and spoken word recognition as a comparison is relevant because there are still concerns about whether or not these two processes in the mental lexicon are aligned. In the present experiment, we are concerned with spoken word recognition, and to understand how lexical knowledge is stored in our mental lexicon and what processes occur when we need it for language use, there are psycholinguistics models that can provide us with insight into these matters.

Models of spoken word recognition

Spoken word recognition models are essential in research to understand how languages are being accessed and processed. All the words that we know exist in our mental lexicon, which also contains phonological, morphological, semantic, and syntactic information (Emmorey & Fromkin, 1988, p. 124). It can be challenging to find a reliable model that checks all the boxes of critical elements that need to be included in a model due to the dynamic aspects of language and because people are very different from each other. Most models, however, agree on the parallel activation of multiple word candidates and that these candidates engage in a competitive environment of a recognition process, and the word candidates differ in the degree of possible matches. There is still no clear-cut answer to how the flow of information behaves between processing levels, nor the organisation of lexical and prelexical representations (Weber, 2012). Since models include a complex

decoding mapping system, some aspects that can create obstacles for this process in developing sufficient spoken word recognition models are the similarity of words and how words are embedded within each other. Speech and the listener are ambiguous components that vary in acoustic realisation, and speech is both constant and immediate and lacks clear boundaries between words (Weber, 2012). These are only some of the issues that must be dealt with when discussing spoken word recognition models. Two earlier models that tried to explain access, selection and integration in spoken language comprehension, was the Cohort model (Marslen-Wilson & Tylerr, 1987) and the TRACE model (Mclelland & Elman, 1986).

The Cohort model

The Cohort model was one of the first models that were explicitly developed for spoken language comprehension by Marslen-Wilson & Tyler (1987), and it paved the way for other research and models. The Cohort theory includes three primary stages of spoken word recognition: *access*, selection and integration. In the access stage, the sensory input must map acoustic-phonetic information onto words in the mental lexicon, resulting in activation of the concurrent operating cohort. Thus, several candidates consisting of the compatible onset of the input are activated and competing for *selection*. Let us consider the word "February". If the input's onset was /fɛ/, all words starting with these two phonemes are activated. When the following phoneme is /b/ as in /fɛb/, all words that do not contain these phonemes are eliminated from the cohort. The process continues until only one candidate is left, which is referred to as *the uniqueness point*. In the integration stage, the word's syntactic and semantic features are retrieved and matched for suitability with higher levels where any mismatches with, i.e., contextual constraints can be eliminated from the cohort. Sentential context can affect the selection stage prior to eliminating all candidates by facilitating the selection (in the original version of The Cohort model) (Marslen-Wilson & Welsh, 1978; Marslen-Wilson & Tyler, 1987; Weber & Scharenborg, 2012). In sum, candidates are activated by the speech input of bottom-up processing, and the bottom-up processing has precedence in leading the word-recognition process (Marslen-Wilson & Tyler, 1980). Candidates from the word-initial cohort are then eliminated by top-down interactions and then eventually continued by bottom-up processing of acoustic-phonetic information down to the uniqueness point (Marslen-Wilson & Tyler, 1987). Marslen and

Wilson & Tyler have proposed two versions of The Cohort model (Marslen-Wilson & Tyler, 1987; Marslen-Wilson & Tyler, 1989) to account for behavioural findings that have arisen over the years. For instance, the model cannot recover from potential mismatches, and it cannot treat word frequencies effects which creates a challenge since high-frequency words are recognised more easily than low-frequency words (Monsell, Doyle, & Haggard, 1989). The model evolved from a partially interactive model to a bottom-up model where the role of context changes from the influence from form-based access and selection to an online mechanism that operates between higher-level representations and information producing semantic and syntactic characteristics of the candidates. The more recent version attempted to include a multiple access and assessment concept where maximal efficiency in the recognition process was in the centre. Regardless of these changes, The Cohort model keeps its fundamental characteristics (Marslen-Wilson & Tyler, 1987).

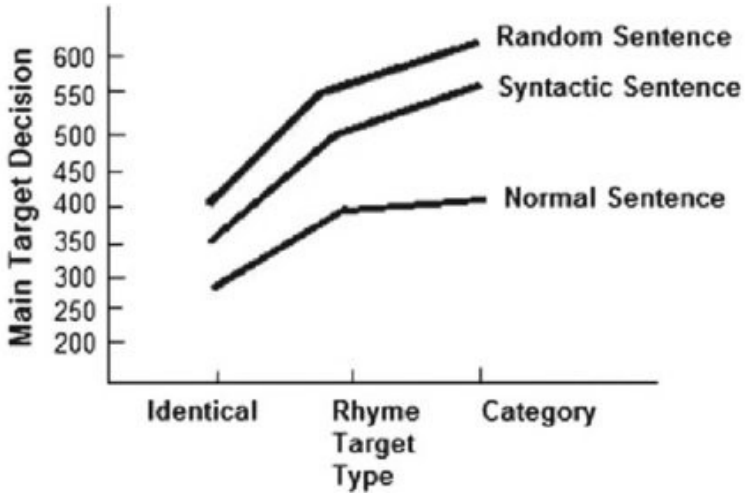

Figure 1. *time detection in word sentence in The Cohort theory (Marslen-Wilson & Tyler, 1980)*

Grosjean (1980) aimed to investigate the online processing of spoken word recognition by using a gating paradigm and discussed his finding in the light of the Cohort Model. The paradigm consisted of presenting an auditory stimulus repeatedly and successively increasing duration from the onset. Words were presented to the subjects in isolation (no-context condition -NC) or short context (SC), or long context LC, and the participants were asked to write down their guess of the target word that they believed they heard. They also had to write down the degree of confidence of their guesses (very

sure-very unsure). In light of the Cohort Model proposed by Marslen-Wilson & Welsh (1978), Grosjean (1980) confirms the following: (1) In the LC, isolation times vary from 105-245 msec, whereas Marslen-Wilson and colleagues found an RT of 175-200 msec when their participants recognising spoken words in Normal Prose. (2) Results from both studies also confirm that only half or less of the acoustic signal of a word is needed when identifying words in the normal context (LC). (3) As a result of the gating paradigm and compared with the NC condition, normal context can reduce amounts of bottom-up information necessary for isolation, which is concurrent with the conclusions of Marslen-Wilson and Welsh (1978)(Grosjean, 1980).

The TRACE model

TRACE is a highly interactive model of speech processing, proposed by McClelland & Elman (1986), which aim attention at the role of top-down processing on word recognition. It consists of three levels of units that interact with one another and operate between levels: features, phonemes, and words (see figure 3.). Each level functions as an individual processing unit that can detect processing conditions. For example, nodes or units within the feature level can identify, i.e., voicing. Inhibitory and excitatory interactions of processing information occur between the processing units that regulate its activation depending on other units to which it is connected. The excitation flow operates in a top-down and bottom-up direction during processing so that these interact at the time of perception (McClelland & Elman, 1986). The bottom-up activation starts at the feature level and moves up to the phoneme level and from the phoneme level to the word level. Top-down activation takes over from the word level to the phoneme level, from the phoneme level to the feature level, producing feedback, which develops segmental identification during ambiguous speech recognition. The process generates a pattern of activation that allows for both activation of units and the inhibition of competitors between units within each level. Hence, higher activated words will inhibit lower activated words during competition, and finally, the candidate obtaining the best-matched features will be recognised (McClelland & Elman, 1986; Weber & Scharenborg, 2012; Sarma & Sarma, 2014). Essentially, TRACE is similar to The Cohort model at the word level, where candidates are competing for the best match to be recognised. The TRACE model can account for underspecifications or ambiguities in the speech of a words' onset, but The Cohort model

cannot, nor does The Cohort model permit lateral inhibition. The Cohort model is more concerned with matching activated candidates with the best-suited alternative rather than emphasising its competitors' activation levels (Dahan, Magnuson, and Tanenhaus, 2001). The TRACE model copes with the temporal aspect of speech by dealing with all phoneme and word nodes over time. In the word *sun*, for instance, the phoneme node /s/ would be copied for all time and sustain the highest activation when the feature nodes representative of /s/ are coordinated in time (McClelland & Elman, 1986; Weber & Scharenborg, 2012). One critical aspect of the TRACE model is that it is based on how top-down context influences the recognition process at an early stage, a theory that is still controversial (Harley, 2014, p.277). Hannagan, Magnusson & Granger (2013) posits that TRACE is a model that goes beyond its competitors and that the TRACE model's temporal abilities are extraordinary since, i.e., stimulus time unfolds gradually with each step only containing a bottom-up input for that step. Furthermore, even though TRACE is not a learning model, it assumes localist and separate levels of representation which makes it easier to evaluate the influence of disturbing lexical or sublexical levels. Norris, Mcqueen & Cutler (2000), who presented a Bayesian model of continuous speech recognition, Shortlist B, claim that the central aspect that makes TRACE unreliable is top-down feedback. This feature does not improve an interactive model, nor does it provide evidence for favouring interactive models. The argument is that it could enhance phoneme recognition, but only at the price of complicating phonemic decisions in cases where the input is incompatible with linguistic knowledge as well as at the expense of possible misperceptions. Norris, Mcqueen & Cutler (2000) argue for an autonomous model of word recognition based on an interactive approach's illusory benefits.

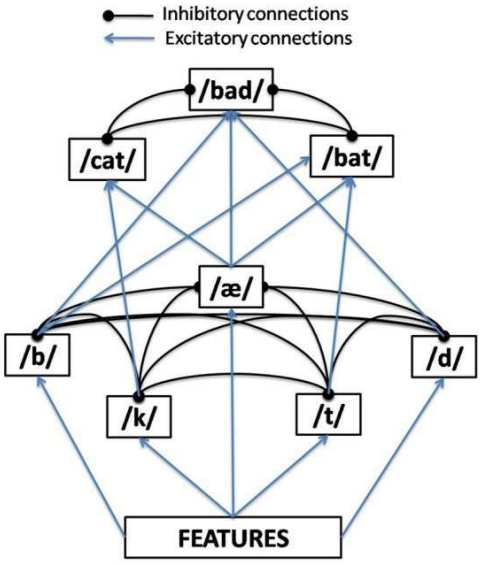

***Figure 2**. Time-slice of the TRACE model. (Hannagan, Magnusson & Granger, 2013).*

Shortlist B

Shortlist B is a Bayesian Model of Continuous Speech Recognition proposed by Norris & McQueen (2008) based on Shortlist (D. Norris, 1994; D. Norris, J. M. McQueen, A. Cutler, & S. Butterfield, 1997). The essential and significant changes rendered to the new model is that it is no longer a connectionist model; it is instead based on Bayesian principles. Second, the phoneme sequence consists of several phoneme candidates over three slices per segment. Since the interactive network of connectionist models is simply a convenient mechanism, the Bayesian theory of Shortlist B argues for more direct integration of the model's fundamental mechanisms. In a connectionist model, activation is necessary because the activation of a node will increase as the node gain more perceptual input. There is a decrease in activation when inhibition between words occurs. In contrast, Shortlist B replaces activation with the notion of probability and likelihood. The probability notion can be associated with behavioural measures.

One of the most important goals of Shortlist B was to find a way to account for words in a speech stream and not just words that are isolated. Norris & McQueen (2008) argues that any sufficient spoken word recognition model needs to account for the continuous stream of words and provide a solution to the segmentation problems that often occur. Shortlist B operates in the following way: the input consists of probability

values and not phoneme activation as in The TRACE model. The processing architecture of the Shortlist includes making the input more realistic than the old model Shortlist A. It is supposed to be more sensible since it builds on phonetic confusion data taken from a large-scale gating study.

Furthermore, there is a prelexical and a lexical level of processing after the input, whereas, during online processing, the information flows from the prelexical level to the lexical level. However, as information flow in both directions in some models, the information does not flow backwords in Shortlist B. Lexical representations are phonologically abstract, and the model also differentiates between the token representation of words and the type representation of words. *The type representation* means long-term memory of lexical representations that are stored, and *token representation* consists of representations of what is being heard and can contain several versions of the same word.

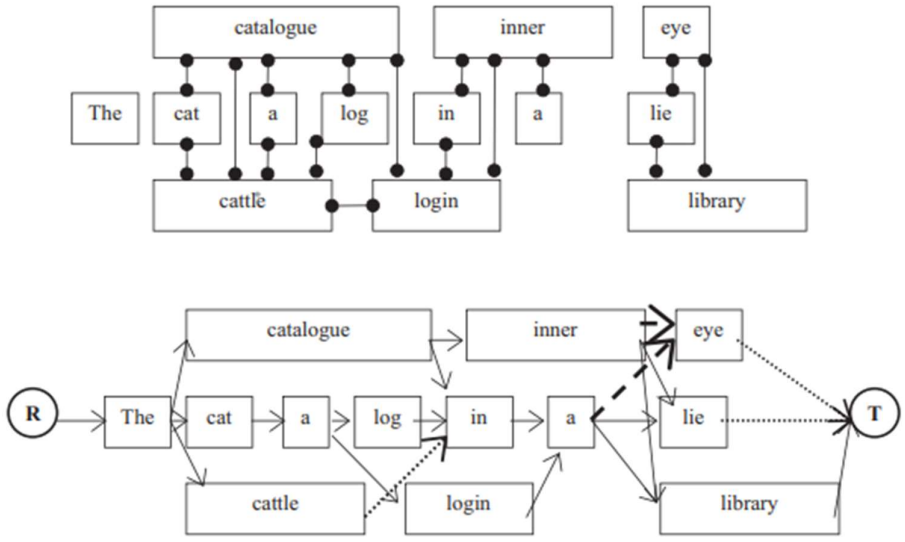

Figure 3. *The upper panel demonstrates the competitive inhibition process in an interactive-activation model. The lower panel represents Shortlist B in a path-based search.*

Top-down and bottom-up processing

There is consensus amongst linguists in describing language as a structural subsystem containing modules such as phonology, morphology, syntax, and semantics, and each subsystem is autonomous or modular. Regardless of the independence of these subsystems' rules and representation, psycholinguists disagree on whether the structural system and the speech processing system are equivalent in nature (Tanenhaus & Lucas, 1987). In a way, it is conceivable to propose that the structural organisation of language that applies to these subsystems also could pertain to our language comprehension system. Viewpoints in the past, such as the modularity hypothesis (Fodor, 1983), claim that each stage or modality is autonomous during lexical access, and the exchange of information between modalities is limited. The hypothesis also claims that context does not influence upcoming information, nor does the speed at which this information becomes available. Such an autonomous approach assumes that all information between modalities flows in one direction only, from the bottom-up. The mental architecture of such serial models contrasts with an interactive approach that claims that information is shared across modalities and that context may influence upcoming information and how quickly the information becomes available in a top-down way. The idea is that as soon as the appropriate sensory input has initiated activation, information is unlimited and flows in the necessary directions (M. K. Tanenhaus and M. M. Lucas, 1987). In an autonomous viewpoint, the information flow between processing levels is restricted to influence within a given level since each level can be considered a master file containing the most important information. In this view, context only affects the post access phase so that the word must have found its right match in the mental lexicon before context can make an appearance. For instance, context effects cannot be located in the word-recognition modality. The bottom-up approach of lexical processing also differs from a top-down model in that it does not allow for feedback. Feedback is important because it can illustrate a greater distinction between an interactive and a modular hypothesis. Interactive models allow for feedback between processing levels to guide lower-level processing by higher-order knowledge. To illustrate, let us consider the word /bæt/ as an input word. In this case, the node representing the phoneme /b/ is processed and will activate all lexical nodes containing lexemes starting with /b/. To this point, the process is consistent with both a modular and an interactive theory, but then they start to differ. Consistent with an interactive theory, the

lexical node starts sending activation back to the phoneme nodes in such a way that the phoneme /b/ activates the lexical nodes /bæt/ and /bæg/ which will send activation back to the phonemes /b, /ae, /t/, and /b/, /æ/ and /g/. As a result, /æ/ and /t/ increases activation. The word /bæt/ is additionally activated, which sends activation back to the phonemes /b/, /æ/ and /t/ until the right match is found; hence the feedback sequence (M. K. Tanenhaus and M. M. Lucas, 1987). Marslen-Wilson and Tyler (1987) claimed that the modularity hypothesis gave a misleading description of the language processing system and that it contained a constraint input system blindly concerned with being fast in its operations whilst not taking perception (i.e., of our visual world) and pragmatics into account. The modularity hypothesis tries to explain this by distancing language analysis from conscious control of the conventional reflex (Marslen-Wilson & Tyler, 1987). McClelland, Mirman & Holt (2006) argue that the interactive viewpoint is the more plausible approach of predicting context effect because lexical information helps speech perception, especially when sounds are impaired or ambiguous. In this way, pre-lexical processes are influenced by linguistic knowledge through a bi-directional flow of information. Hence, influence is occurring in the prelexical phase, supporting an interactive point of view. Norris, McQueen & Cutler (2000) claim that McClelland et al. (2006) 's assumption is premature since there is currently not enough evidence to exclusively support an interactive approach solely based on their review of the interactive model TRACE.

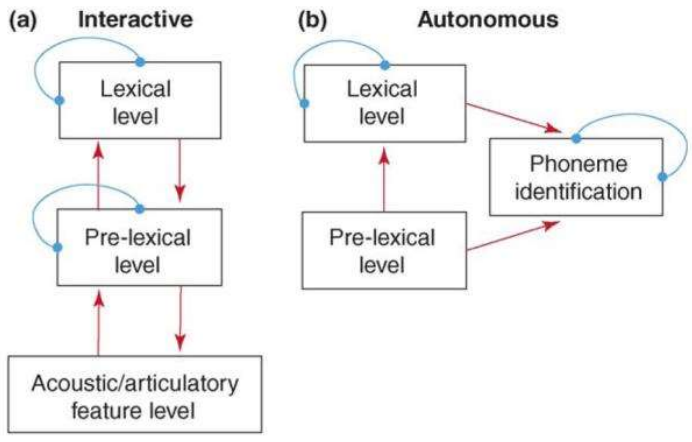

Figure 4*. Schematic representation of the interactive (a) and the autonomous (b)approach (Mclelland et al., 2006).*

The debate continues, and even though other research has been conducted on speech processing, some theories remain conflicted, such as the role of context in speech comprehension. Thus, Marslen-Wilson & Tyler (1980) were some of the first to investigate whether context could influence word recognition in sentences. In an attempt to find evidence for their Cohort model, which proposes that the target word is recognised at the point when the word distinguishes itself from the other members in the word-initial cohort, Marslen-Wilson & Tyler (1980) concluded that speech processing begins as an interactive bottom-up process where all possible targets are activated and continue in a top-down approach, where other information becomes available to facilitate the process. Forty-five paid American university students participated in two experiments containing three prose context that varied in content of syntactic and semantic processing information and three monitoring tasks: Identical (the subjects knew what word to listen for), Rhyme (subjects had to listen for a word that rhymed with the target) and Category (participants were told to monitor for a specific semantically categorised word). The first experiment aimed to investigate whether spoken word recognition included direct interaction between contextual constraint and sensory input. Participants were asked to listen for a target word specified in advance and press a key as quickly and accurately as possible when they heard it. The stimuli were of eighty-one pairs of spoken sentences with three conditions;

1. normal sentences (e.g., The church was broken into last night. Some thieves stole most of the *lead* off the roof.),

2. semantically anomalous sentences (e.g., The power was located into great water. No buns puzzle some in the *lead* off the text)

3. and scrambled sentences (e.g., Into was power water the great located. Some the no puzzle buns in *lead* text the off).

The target word was highly frequent and was distributed across nine-word positions in the test sentences. The assumption was that word-monitoring in Normal Prose should create a facilitation effect due to the appearance of semantic and syntactic aspects and that the facilitation would differ depending on the word position. By comparing these conditions, it is possible to see a divergence from the Syntactic and Scrambled conditions to the Normal

Prose in reaction time (RT). The results showed faster reaction times when syntactic and semantic information were present.

There was also a facilitation effect when only syntactic information was available and semantic information was absent. The results showed a main effect of Prose Context that was highly significant. All statistics were reliable at the 0.05 level. Target words in the Normal Prose had an RT of 373 msec, and the Syntactic prose showed a slower RT of 441 msec. The scrambled RT consisted of 476 msec. The results indicated a sensitivity between syntactic and semantic context ambiguities and the monitoring task. Another significant effect: Min F' (2,226) = 285.370) gave us the mean differences between the three monitoring tasks: Identical: 321 msec, Rhyme: 458 Category: 511 msec. These results favoured an interactive model of spoken word recognition.

The second experiment consisted of the same materials and procedure as in the first experiment. However, the second experiment excluded the first sentence in each pair and included another group of participants. The second experiment's goal was to support the conclusions of the first experiment, which the main results confirmed. The second experiment's other effects revealed an insignificant difference in intercept and slope in Rhyme and Identical monitoring after removing the first sentence (the lead-in). There was a significant increase in the steepness of the slopes in the Normal Prose. Still, there was no change in the Syntactic prose which supports the hypothesis (regarding Normal Prose) that simultaneous developments of strengths occur across the sentence for syntactic and semantic constraints(Marslen-Wilson & Tyler, 1980).

Other more recent research has tried to replicate Marslen-Wilson & Tyler's results, but with diversified outcomes. Two studies testing their hypothesis, this time on bilinguals, were Martin et al. (2013), who found evidence for predictive effects, and Ito et al. (2017), who failed to replicate the findings of Martin et al. (2013) and concluded with no evidence of predictive effects. Martin et al. (2013) investigated if L2 learners predict upcoming words during sentence reading in the same way as L1 learners, replicating DeLong et al. (2005). The study was an event-related potential (ERP) study to measure late Spanish-English bilinguals and monolinguals in sentence reading where sentences ended in an expected or unexpected noun. Sentence manipulation a/an was used as a tool (e.g., "Since it is raining, it is better to go out with **an** umbrella") and ("Since it is raining, it is better to go out with **a**

raincoat"). A 250–400 ms time window was used for the N400 analysis based on previous research (DeLong, 2005). Martin et al. (2013) predicted that by focusing on the effect of highly constrained sentences in semantic processing in L2 learners, it is possible to understand more about the linguistic processing capacities of L2 learners during sentence reading. The results showed more significant negativity in the N400 time window with predicted nouns for both groups; however, the difference was immense and appeared later in L1 learners than L2 learners. There was also additional evidence of frontal positivity in L1 learners, which was considered evidence for dissimilarities between L1 and L2 learners in predicting upcoming words during sentence reading. The results showed that L2 learners do not pre-activate words in highly constrained sentences in the same way as L1 learners. Still, it demonstrates that L2 learners rely on passive integration rather than an active prediction of upcoming words and that there is a more limited active prediction in L2 learners than in L1 learner and that this is the consequence of slower linguistic processing stages in L2 learners.

Ito et al. 2017 criticise Martin et al. (2013), claiming that their experiment is not a direct replication of DeLong et al. (2005) due to certain significant differences such as their presentation of sentences and placement of the target word. Ito et al. (2017) also investigated whether L2 learners would show the same results on predicting upcoming words during sentence reading in the same way as L1 learners do in a conceptual, non-direct replication from DeLong (2005) and Martin et al. (2013). Ito et al. (2017) tried to replicate the findings of Martin et al. (2013); however, adjusting some of the conditions. In Ito et al. (2017), the participants read both plausible and implausible sentences and read sentences word-by-word, consequently, to keep a steady reading rate. Martin et al. (2013) solely obtained an a/an manipulation, whereas Ito et al. also included manipulated sentences that could match possible words with the form or meaning of an expected word.

Furthermore, Ito et al. (2017) measured twenty-six native English speakers and fifteen Spanish-English bilinguals in a cloze test where the participants completed incomplete sentences with the first word that came to mind. The participants were exposed to 104 plausible sentences and 120 implausible pseudo-randomised sentences. The plausible sentences included 72 expected and 32 random target words divided between two lists with an equal number of sentences. The results showed no ERP differential effect

between the native speakers and the nonnative speakers when using the a/an article manipulation, and therefore there is no evidence for prediction. Even though null results do not prove a negative, Ito et al., 2017 concludes that lexical prediction can occur sometimes, but it is not constant. (Martin et al., 2013; Ito et al., 2017)

The key role of top-down and bottom-up processing has been a central debate for quite some time. Each gives different answers to how the information flows and influences one another in the language processing system. Both an interactive and autonomous theory can vary in the constraint of rules and activation, but a basic organisation is reflected above. Several variations of these two main hypotheses continue to develop and influence each other. Processing all the elements of one language is complex, but juggling two languages in one mind can seem even more advanced (Kroll, 2008).

Bilingual speech comprehension

Learning a language requires someone to acquire information about the specific features of that language. As discussed previously in the speech comprehension section, first language processing requires you to identify and specify the nature of the prelexical code (the sound input) and map it on to your mental lexicon, causing lexical access. The bilingual mind is not so different; still, most bilinguals recognising speech in your first language is more effortless than recognising spoken words in your second language. An exception is simultaneous bilinguals. Shi (2009) posited that age of acquisition and length of learning period affected simultaneous bilinguals and ESL listeners' (English-as-a-second-language listeners) performance on word recognition tests. Four groups of adult listeners: 24 English monolinguals, 12 simultaneous bilinguals, ten early ESL and 14 late ESL listeners participated in a clinical word test, four 50-word W-22 lists (see Hirsh et al., 1952) comprised of monosyllabic words suited for everyday use. The participants heard a male voice say: "say the word…" in four different conditions consisting of quiet, speech-weighted noise, multi-talker babble, or instrumental music played forward. The results showed that the simultaneous bilinguals who had been exposed to their second language before the age of 3 performed as well as monolinguals when listening to English words in the quiet condition. Blumenfeld & Marian (2011) also found similar results between simultaneous bilinguals and monolinguals in an eye-tracking paradigm. Bilinguals were equally efficient as monolinguals in identifying target words in the appearance of competitors. These results tell us that the

age of acquisition makes a difference, but a large number of bilinguals have not acquired their second language before the age of three. Successive bilinguals acquire their second language later in life, typically in a school environment or through immigration; it would make sense then to compare this group of successive bilinguals to other bilinguals rather than to merely monolinguals as most studies do. Regardless of if we would support Grosjean's (1989) view of "bilinguals are not two monolinguals in one person", it makes sense to take a closer look at Meador, Flege, and Mackay (2000), who investigated the recognition of English words by 72 native speakers of Italian who varied in the age of immigration to Canada and amount of remaining active native language use. All participants were in their forties and were assigned to a group depending on their age of arrival in Canada and their self-reported amount of native language use at the time of testing. Eighteen monolingual participants were also tested. Ten semantically unpredictable sentences were uses as stimuli consisting of a noun phrase + verb + noun phrase. The noun phrase consistently included article + adjective + noun. The definite article "the" was used as well, and the verb was employed in the past tense (i.e., The blond dentist ate the heavy bread). The sentences were presented on speakerphone by a Native speaker of English. The participants heard each sentence four times in a row with less background noise every time, and after each presentation of a sentence, they were asked to repeat as many words as they could remember and possibly guess if needed.

The mean average age of acquisition (AoA) of the early arrival group was seven years and these reported using Italian 32% of the time in their everyday lives. They had a length of residence (LOR) average of 40 years. The mid group had a LOR of 34 years and an AoA of 19 years and used Italian 20 % of the time. The mean average of AoA of the late group was 19 years, LOR 28 years, and they reported using Italian 41% of the time. These numbers show a strong relationship between AoA and LOR ($r=-0.62$). The results showed that in decreasing the noise, the participants performed better by remembering more words. The early group repeated a mean average of 64 % of the words, the mid 60 % and the late 51 %. The monolinguals repeated a mean of 77 % of the words. At the quiet level (+12 dB), the monolinguals and early group performed equally well. This study demonstrates a connection between the age of acquisition of a second language and word recognition (see Shi, 2009). Still, certain aspects remain an open question, such as whether or not the

connection is actually because of AoA or as a result of language use and familiarity (Grosjean, 2018).

Second language learning tends to support the notion that "the younger is better "and that there is a significant critical learning period, especially for grammar and pronunciation. Hence, learning a second language in adulthood is more challenging, and there is a lack of evidence of adults able to master this task perfectly (Dekeyser & Larson-Hall, 2005). Then, how is our adult bilingual mind structured?

Models of bilingualism

Bilingual Interactive Activation (BIA +)

Computational models such as the Bilingual Interactive Activation (BIA) model developed by Dijkstra and van Heuven (1998) and the extension BIA + (Dijkstra and van Heuven (2002), are connectionist models that rely on the interactive mechanism of activation. These models can help us understand linguistic behaviour in bilingual language processing. They are also developed to account for the adult, proficient bilingual speaker's knowledge. The BIA + assumes an integrated lexicon and contains language nodes, orthographic, phonological, and semantic representations that are considered part of a word identification system that provides output to a task/decision system. In this framework, semantic and syntactic factors of the sentence context can modulate the activation of lexical candidates (Dijkstra, 2005). The BIA + assumes that lexical access during reading is not language selective. Libben & Titone (2009) argued that much evidence for non-selectivity comes from the recognition of isolated words, such as interlingual homographs and cognates. Thus, they took it a step further and examined the processing of words in sentence context using eye movement recordings during reading. Thirty highly proficient French-English bilinguals read L2 English sentences containing cognates (e.g., Piano), interlingual homographs (e.g., coin, meaning corner in French). The words appeared in English sentences containing either a high or low-semantic constraint for the target- words, e.g., coin. The participants then completed a paragraph reading task where one passage was in English and one in French. Eye movements were monitored throughout the experiment. Early-stage comprehension measures such as first fixation duration, gaze duration, skipping, and late-stage comprehension measures such as go-past time and total reading time showed significant cognate facilitation and interlingual homograph interference for low constraint sentences.

There was no evidence of cognate facilitation or interlingual homograph interference for late-stage comprehension measures. In contrast to the relationship between cognate facilitation and second language proficiency, there was no relationship between interlingual homograph interference and second language proficiency. The results of the study are consistent with the BIA+ and other models with a similar framework. This suggests that "language processing in bilinguals is language non-selective at the early stages of comprehension regardless of contextual constraint" (Libben & Titone, 2009). The BIA + is one of the most recognised interactive models out there, and it needs to be discussed but bear in mind that it was developed to account for visual word recognition. Additionally, it is a stationary model, meaning that the representations are manually coded and that the model is not designed to evolve. It is also intended for the mental lexicon of proficient adult bilinguals. Thus, we will know to consider a model of word recognition with learning characteristics, SOMBIP.

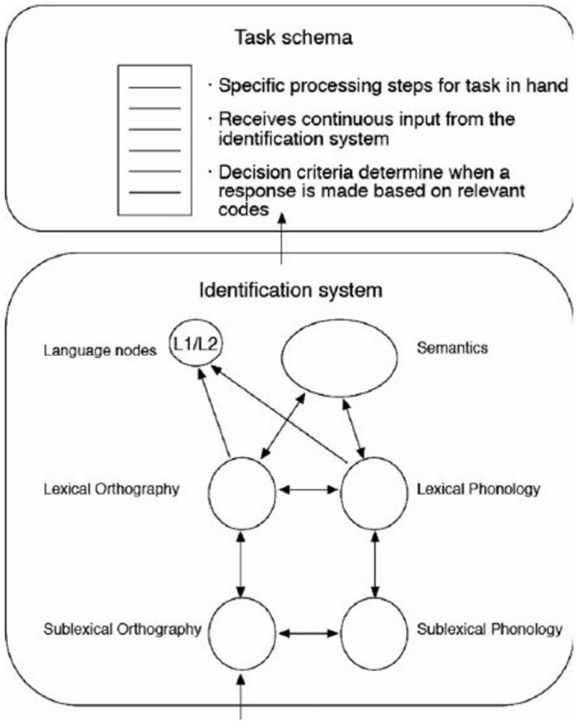

***Figure 5**. The BIA + is an example of how a second language can be adapted to a monolingual computional model (Dijkstra and van Heuven, 2002)*

SOMBIP

SOMBIP is a model of bilingual processing that self-organises on word forms and word meanings. It is based on *Hebbian learning*; information is stored in the form of weights and can change depending on the stored units' activity level. The units are stored in the connections between neurons in neural networks, and the networks learn to self-organise in such a way that the units learn to represent regularities in their surroundings (Munakata & Pfaffly, 2004). The architecture of SOMBIP consists of self-organisation, representation and Hebbian learning. It has two interconnected maps, SOM 1, which represents the phonological input of a word, and SOM2 representing the semantic aspect of the same word. The two two-dimensional topographic maps respond to each other by engaging in an activity in the network. The two SOMs continue to self-organise and make form-meaning associations in the bilingual lexicon through Hebbian learning for all the responsive active units in the map. Translation equivalents in two languages in this model are handled the following way. When the phonology of an English word (in this case, L1) is assigned to SOM1, the semantics of that word and its cross-language translation equivalents in the L2 are also assigned to SOM2. This is also the case if the semantics of the English word is assigned to SOM2; both phonology and its translation equivalent in the L2 are also assigned to SOM. The SOMBIP does not explicitly mark membership as the BIA +, nor does it include nodes or language tags. It can, however, account for specific patterns of the bilingual lexicon, and through self-organising, it acquires essential lexical-semantic categories. It can also utilise priming variations and interference effects due to the associative connection between phonology and semantics and account for variation in proficiency level and memory capacity in bilinguals. In sum, SOMBIP contains characteristics of both localist and distributed representations (connectionist) and integrates representation with learning, enabling it to capture the ambiguity essential to bilingual processing. The SOMBIP has later led to the development of the Dev-lex II, a self-organised language acquisition model that captures bilingual lexical development and interaction; however, this model will not be further discussed in this paper (Li & Farkas, 2002; Li & Zhao, 2013; Marian & Shook, 2013).

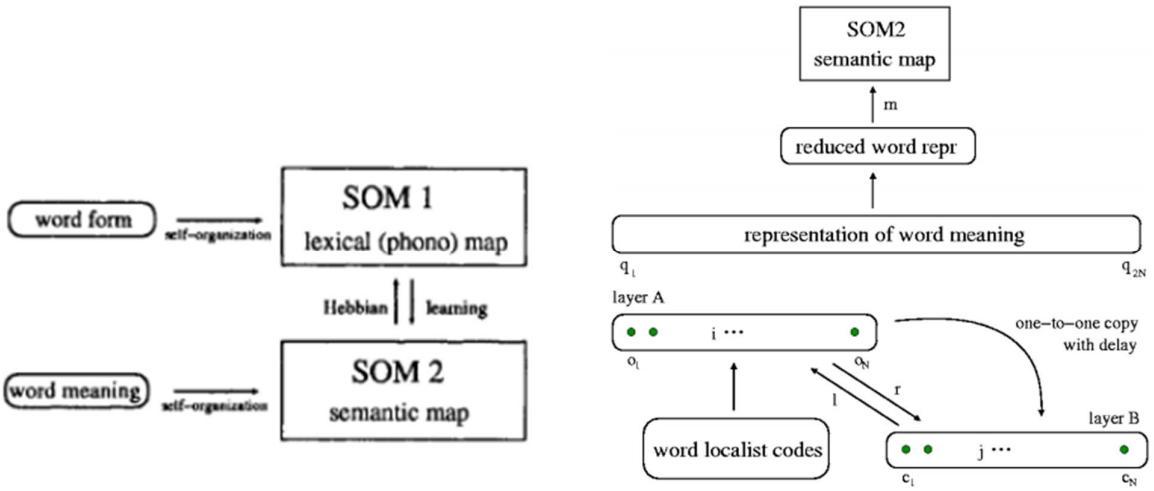

***Figure 6**. To the left. Schematic depiction of the self-organisation of SOM1 and SOM2 on word forms and word meanings in SOMBIP, illustrating an interconnection via associative pathways, influenced by Hebbian learning (Li & Farkas, 2002). To the right. Schematic demonstration of word localists codes (WCD) that reads through sentence input, one word at the time and moves through other levels of activity (for further description, (see Li & Farkas, 2002).*

Other models have also been proposed. The Bilingual Model of Lexical Access (BIMOLA) developed by Grosjean (1988, 1997) and inspired by the TRACE model (McClelland & Elman, 1986) does not assume an integrated lexicon as BIA + and SOMBIP; instead, it separates the two languages at lexicon level. The BIMOLA does not mark membership and is similar to the SOMBIP in that regard. The SOMBIP uses phonotactic cues of the input, while the BIMOLA relies on groups of semantic and syntactic cues. Models like BIMOLA and BIA + are both connectionist models and can provide us with valuable information about the bilingual processing system; however, in most cases, the system must be coded manually and delicately account for all variabilities present in the bilingual system. It can be problematic since variability can be considered highly significant and possible have an influence on short-term features (i.e., recent exposure) and not merely long-term features (AoA and language proficiency) (Yoo & Marian, 2011; Marian & Shook, 2013). With all these combining features, as well as the self-organising aspect of SOMBIP, emerges a promising dynamic model that can capture the ambiguities of bilingual processing, the

Bilingual Language Interaction Network for Comprehension of Speech (BLINCS) (Marian & Shook, 2013)

The Bilingual Language Interaction Network for Comprehension of Speech (BLINCS)

The BLINCS model is designed to handle spoken word recognition, in contrast to the BIA + that allows for written word identification in comprehension. It does need to rely on a global language-identification system. It can account for cross-linguistic ambiguities across levels of processing and audio visual-interference during speech comprehension (e.g., The McGurk effect) and cognate facilitation effects. BLINCS uses self-organising maps (SOMs), like the one in SOMBIP, where each processing level is interconnected and unfolds over time (phonological, phono-lexical, ortho-lexical and semantics). These processing levels flow bi-directionally and allow for feedback and *back-propagation* (an algorithm for detecting errors and learning by its previous mistakes). Representations for language specificity and representations for shared language use the same network space, which occurs *within* levels. *Between* levels, Hebbian learning contributes to bidirectional excitatory connections (Marian & Shook, 2013). BLINCS treat activation on the phonological level as it searches for the best match either directly on the target phoneme node or close to it, which can still result in activation. Visual input can also affect the process since visual information can influence speech recognition at the perception level (Mcgurk & MacDonald, 1976). BLINCS make predictions regarding rhyme competitors and activation of onset competitors within and between languages (Marian & Shook, 2013).

Let us take a closer look at the phonological, phono-lexical, ortho-lexical and semantic level in BLINCS in some detail to easier grasp the role of each level. The evidence retrieved by Marian & Shook (2013) using English and Spanish Stimuli seems to support a shared phonological system across languages and give no clear distinction between Spanish and English phonemes. This assumption is supported by previous evidence stating that phonological representations of languages are shared, not separate (Roelofs, 2006). Regardless of the shared representational system, language specificity can still occur. If we consider the Spanish phonemes /x/ and /ɣ/, which is solely available in Spanish and not English. In this case, Spanish words are more presumably to be activated at the phono-lexical level than English words. Additionally, these phonemes can activate each other, consequently causing a Spanish word bias.

BLINCS posits an integrated but separate language system divided into language domains at the phono-lexical level. The languages are free to interact; thus, cross-language overlapping can occur. Cognates and false cognates are most likely to be positioned at the boundaries between language domains, explaining the facilitation effect found in research conducted on cognates (Costa, Caramazza & Galles, 2000). In BLINCS, cognates and false cognates have either increased or more rapid activation. Further, the structure of the ortho-lexical level resembles the phono-lexical level. The ortho-lexical level, however, exhibits more overlap in the SOM than the phono-lexical level. The languages' differences will also impact the integration of ortho-lexical forms; hence, Russian and English will exhibit a greater difference in the degree of orthography than English and Spanish. (Marian & Shook, 2013).

The semantic level is similar to the one of BIA + that posits a shared conceptual representational system across languages, but a single shared semantic system (Dijkstra & van Heuven, 2002). Evidence comes from translation equivalents that share semantic structure across languages where the results indicated shared representations of syntactic and thematic information for English and Greek verbs in the bilingual lexicon (Salamoura & Williams, 2007). Regardless, cultural information may influence this process to some degree by influencing conceptual feature representations (see Pavlenko and Driagina, 2007; Marian & Shook, 2013).

BLINCS combines the characteristics of both distributed and localist models and does not need to add specific nodes or tags to the system to separate the two languages. These self-organising networks make it possible to account for particular patterns of the bilingual lexicon, and through explicit algorithms, it evolves as a model with learning characteristics. Consequently, a bilingual's language proficiency, language dominance and AoA will have implications for the training of the unsupervised self-organising networks (Blumenfeld & Marian, 2007). The BLINCS model is a step in the right direction in research regarding spoken word comprehension. It takes the temporal aspect of bilingual lexical activation to a new level, and it has moved forward from the SOMBIP model in its consideration for learning, representation and cross-language interactions bidirectionally (Li, 2013; Marian & Shook, 2013). The simulations provided by Marian & Shook (2013) validates each aspect of the BLINCS model, but more research is necessary to exploit this promising model of speech comprehension further.

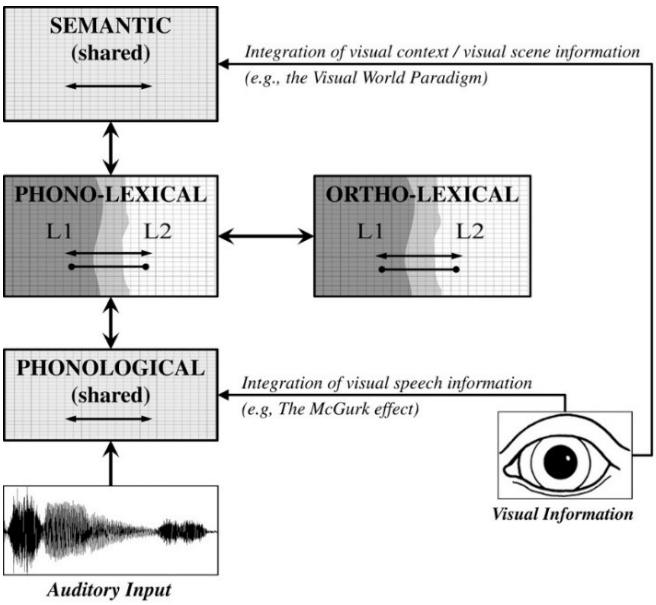

Figure 7. Schematics of the Bilingual Language Interaction Network for Comprehension of Speech (BLINCS) model. It starts with auditory input that can be integrated with visual information. Each level are affected by bi-directional excitatory connection flow and inhibitory connections at the phono-lexical and ortho-lexical levels. As in the SOMBIP, a self-organizing map exists within each level (Marian & Shook, 2013).

Language-selective and non-selective access

An important question often discussed by researchers is whether bilinguals have a combined or a separate system of memory representation and processing for each of their languages and if both are continuously active, even when the circumstances only require one language to be used. Thus, whether bilinguals have language-selective access or language-nonselective access to their mental lexicon is still a puzzling concern because researchers have found disputing evidence in visual word recognition studies in the past (e.g. Gerard & Scarborough, 1989; Costa, Caramazza & Galles, 2000). Cognates and interlingual homographs can be used in experiments to test language-selectivity to see if bilinguals read these words differently than matched control words that exist only in one language (Dijkstra, 2005). *Cognates* (in psycholinguistics) share both lexical forms and meaning, such as the word "color" in English and Spanish. *Interlingual homographs* are words that share lexical form but not meaning in more than one language, namely the word "angel" in Dutch means "insect's sting" in English (Poort, 2019). There is still no clear-cut answer to how cognates and interlingual homographs are represented in a bilingual's

lexicon. Yet, earlier studies concerning visual modalities using the Bilingual interactive activation plus model (BIA+) indicate that cognates could have shared representation for each language and that interlingual homographs may obtain a separate one (Dijkstra & Van Heuven, 2002). Studies have shown that bilinguals process cognates faster than words that only consist in one language, and when an effect arises, this process is called a *cognate facilitation effect*.

When referring to interlingual homographs, researchers often use the term interlingual homograph inhibition effect (Poort, 2019). A significant effect will indicate that bilinguals have a shared mental lexicon for both of their languages that are interconnected. Any differences in reaction time (RT) occurring between cognates or interlingual homographs and control words are recognised as evidence for language-nonselective access because it indicates that the item exists in both languages. Earlier studies, however, have shown that there are no apparent differences in RT between the two types of stimuli, material and control items (Caramazza & Brones, 1980). Gerard & Scarborough (1989) tested Spanish-English bilinguals in a lexical decision experiment using cognates, homographic noncognates and nonhomographic control items to study whether bilinguals have separate language-specific lexicons. They used word frequency as a variable and predicted that a high-frequency word would be recognised faster than a low-frequency word. It was also assumed that the word frequency for a cognate would be similar in both languages, whereas homographic noncognates with a different meaning would have different frequencies of usage. In an English target-lexicon decision task, the study predicted that a bilingual would perform like an English monolingual, faster recognising a high frequent word such as *red* in English, and slower recognising a low frequent Spanish word such as *fin* (meaning *end* in English). In a Spanish target-lexicon decision task, the opposite pattern was assumed to occur. The results favoured a language- selective access hypothesis because there was no evidence of a significant difference in RT between monolinguals and bilinguals. Other effects were found, such as the main effect of word type; however, it is assumed that this was due to slow responses to low frequent homographic noncognates in the target language. In sum, the study strongly supported a language-selective hypothesis (Gerard & Scarborough, 1989; Dijkstra, 2005). A language- selective access hypothesis is indeed a plausible theory because it would prevent a bilingual to map on to the inaccurate

lexicon and activate unnecessary candidates when the situation does not require it (Marian & Spivey, 2003).

While some evidence in the past has pointed towards language selectivity in visual studies, most research provides evidence for non-selectivity. For instance, Costa, Caramazza, and Galles (2000) investigated whether non-selected lexical nodes activate their phonological information. They investigated whether the cognate status of words affected picture naming latencies. Highly proficient Catalan-Spanish bilinguals and Spanish monolinguals were tested in the first experiment. They were asked to name pictures whose names are cognate words in Catalan and Spanish (e.g. gato-gat [cat]) and pictures whose names are not cognates in these languages (e.g. mesa-taula [table]. Forty-two participants were asked to name the pictures as fast and as accurately as possible in Spanish. The results of the first experiment showed that bilingual speakers named the pictures with cognate names faster than the pictures with noncognate names. The cognate facilitation effect seemed to be larger when bilinguals were required to name pictures in their non-dominant language, seemingly due to the search of both lexicons.

Furthermore, monolingual speakers named the two sets of pictures equally fast. In the second experiment, they tested whether the cognate status of words would affect the performance of bilingual speakers when naming in their dominant language and whether the magnitude of the effect is comparable to that acquired when speakers are using their second language. The procedure was the same as in the first experiment, and participants were Catalan-Spanish bilinguals with Catalan as their first language (L1). The results of experiment 2 depicted and confirmed the results in experiment 1. These findings support the argument that non-selected lexical items send activation to their phonological segments and that the significant cognate facilitation effect gives evidence for parallel activation of both languages (Costa et al., 2000). Notably, both Costa et al. (2000) and Gerard & Scarborough (1989) present evidence for language non-selectivity and selectivity in visual word studies, whereas our focus is on auditory modalities in speech comprehension. It is, therefore, intriguing to think about whether these effects would equally apply in the auditory domain of recognition.

Other research has been conducted on language-selectivity in bilingual spoken language processing. Marian & Spivey (2003) investigated whether bilinguals activate both languages

in parallel or a language-selective mode by performing an eye-tracking experiment on Russian-English bilinguals. They examined the number of glances a bilingual would perform when presented an object whose name was phonological similar to the target object against objects in a controlled condition where there was no phonological overlapping between the object and the target object. The name of the target object occurred either in the same language, the other language or both languages simultaneously (between-language competition, a within-language competition condition, and a simultaneous competition condition). These three conditions, including the no condition control condition, were the basis of the experiments. They assumed that the phonological overlap between stimuli could switch on the other language -system in a bottom-up way. In the first experiment, the participants were placed as close to the monolingual second-language mode as possible, and they were tested in English with a monolingual English experimenter. Eye movements were observed and recorded while subjects carried out commands from the experimenter, which included the four core conditions. The commands were carried out after the participant was presented with real objects on display. In the second experiment, the participants were placed close to the monolingual first language mode and tested in Russian with an impersonated monolingual Russian experimenter. The emphasis of this experiment was to investigate any possible effects occurring using the same conditions as in experiment 1 but keeping the participants close to their first language mode. The design, materials and procedure were the same in both experiments. Language mode was controlled for by not informing the participants about the nature of the experiment and by avoiding all cross-language interaction between English and Russian. The results from the first experiment supported the hypothesis of parallel language activation since the bilinguals experienced not only between-language competition from their first into their second language but also within-language competition from their second language. The second experiment showed within-language competition in Russian, and in the simultaneous condition, the evidence showed competition from both languages. The pattern of results indicates that the within-language competition is stronger than the between-language competition, which suggests that bilinguals activate lexical items in both of their languages in parallel (Marian & Spivey, 2003).

As bilinguals face an ambitious task activating lexical items across and within the two languages, it is intriguing to think about when this process of organisation and categorisation of their existing lexical system occurs. When and how the early bilinguals' interconnect their two languages are scarce since the focus has been primarily on adults' lexical processing system and the developmental phonetic representation in infants. Hence there is a gap between these two stages (DeAnda et al., 2016). In the future, more information about early bilinguals could lead to a broader understanding of the bilingual brain because a developmental model could give a greater indication of when the lexicons of a bilingual are separate and if they were ever integrated. It could also help us to learn more about what factor that influence lexical processing in bilinguals (Marian & Spivey, 2003). Another aspect of interest is whether or not the proficiency level in the L1 is essential in the L2 learning process. One bilingual model that assumes that L1 needs to be complete before L2 learning can begin is The Revised hierarchical model (RHM) (Brysbaert & Duyck, 2009)

The Revised hierarchical model (RHM)

The Revised hierarchical model (RHM ref. see figure 4) is a developmental model that proposes that words in each language have independent lexical representation but a shared conceptual system. The model focuses on how word-to-concept links are developed rather than determining the precise dynamics of lexical recognition during language processing (Kroll & Stewart, 1994). In the early stages of second language acquisition, the lexical links are assumed to be much stronger from your second language (L2) to your first language (L1) than from L1 to L2, which means that according to this model, it should be easier to translate words from L2 to L1, rather than from L1 to L2. The model assumes that the word-to concept links are stronger for L1 than for the L2 at a low proficiency level. However, as the proficiency level increases in L2, the connection between word and concept will be stronger, and the dependency on the L1 translation equivalent declines. Evidence for RHM usually comes from experiments on translation tasks. RHM hypothesises that L1 to L2 translation in the forward direction should be conceptually mediated; however, in the backward direction, it should be lexically mediated. RHM was initially proposed to account for observed asymmetries in translation performance by Kroll and Stewart (1994). They reported three experiment designs to test the prediction of the RHM with the primary goal of replicating the category

interference in picture naming and translation previously reported by Kroll & Curley (1988, but also to examine the organisational structure of bilingual memory. The participants performed picture naming and translation tasks with semantically categorised or randomised lists consisting of pictures and words. In the first experiment subjects, the pictures and words were presented one at a time, and the participants were instructed to name the stimuli as fast and accurately as possible. Each subject was presented with four lists that were counterbalanced. The items were presented in blocked lists that were either semantically related (e.g., all animals or clothes) or randomly mixed. It took 36 ms longer to name pictures in the categorised list than the randomised list, so the category organisation lead to semantic interference. In the second experiment, participants named pictures and words in alternation, and the result showed that the category interference effect in picture naming was decreased. The results of experiment 2 suggest that category interference in picture naming is not only caused by lexical activation, but that continuous access to related concepts produces increased activation at the conceptual level, which makes it more challenging to select the single lexical entry that best names the picture. In experiment 3, they investigated the occurrence of category interference in bilingual translation and whether asymmetry would occur using a naming and translation task. The subjects reported being highly proficient- fluent bilinguals. They performed the translation task in forwarding and backward directions. The results confirmed a category interference effect from L1 to L2 but not vice versa.

The RHM assumes an asymmetry in translation between L1 and L2, and the results seem to support and confirm the predictions of the RHM that language activation in bilinguals is non-selective at early stages of comprehension despite the aspect of contextual constraint. Later stages of the comprehension process may solve cross-language concerns in contexts that demonstrate high semantic constraint for a target word. According to the results, the bilingual language processing system seems to be integrated and context-sensitive, illustrating a top-down bias on lexical access of cross-linguistic ambiguous words (Kroll and Stewart 1994).

Brysbaert & Duyck (2009) suggests that it is time to leave behind the RHM because cross-language activation of translation equivalents can occur for highly proficient bilinguals when performing a relatedness task in their second language. The argument's basis relates to

Thierry and Wu (2007), who reported these findings in ERP measures for decently proficient Chinese-English bilinguals. Thierry & Wu (2007) data is a complication for the RHM since the model assumes that only early-stage learners will need to use the translation equivalent to retrieve meaning. Further, Brybaert & Duyck (2009) suggests that the L2 can be processed conceptually without lexical interposition. If so, then the Thierry and Wu data cause complications for their theory since the Chinese-English bilinguals were highly proficient and immerse in English as their second language; these bilinguals should master English processing without requiring accessing the Chinese translation equivalent (Kroll et al., 2010).

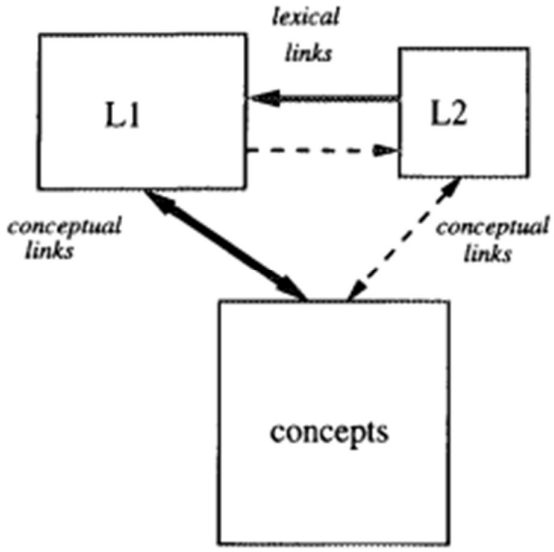

Figure 8. Schematic of the RHM showing the processing of lexical and conceptual links between L1 and L2(Kroll & Stewart, 1994).

The bilingual individual

Bilingualism can be difficult to define because it includes a large variety of speakers with individual language history. Defining a bilingual can be rather complex since there are important factors to consider, such as language background, proficiency, and use. Still, in the simplest form, bilingualism can be characterised as someone who knows two languages. Thus, what does it mean when someone knows a language? When classifying the term bilingual, it is necessary to consider the degree of bilingualism because some bilinguals are equally proficient in both languages, and others are more dominant in one language and less proficient in the other (Costa & Galles, 2014). We can classify bilinguals as simultaneous bilinguals who learn two languages at the same time, from birth or before the age of one, and successive bilinguals who acquire a second language (L2) later in life, either through formal education or in an immersion environment such as immigration. Evidence even shows that infants exposed to foreign phonetic cues affect phonetic perception.

Kuhl, Tsao & Liu (2003) investigated the effects of foreign-language short term exposure in infancy. They also addressed the role of social interaction in phonetic learning and if live exposure to a foreign language makes it consequential or not. Infants can distinguish differences among the phonetic units of all languages, including native and foreign-language sounds. However, between the age of 6 and 12 months, the ability to differentiate foreign-language phonetic units firmly declines. The experiment focused on two main issues: if first-time foreign-language exposure between the age of 9 and 10 months of age leads to phonetic learning, and whether phonetic learning at this age is triggered by hearing a language. In the first experiment, infants took part in 12 language sessions, every 25 minutes in duration, and it was scheduled over four weeks. The subjects included 32 infants where half were assigned to the Mandarin exposure group and the other half to the English control group. Three tests were applied: The Language exposure sessions, The Mandarin Chinese Stimuli, and The Phonetic perception test. The purpose of The Language exposure sessions was to establish a natural environment for the infants, which consisted of reading books and playing with toys. The same materials were used to interact with the infants during each session, and four native Mandarin or English speakers took a turn in conducting the language exposure sessions. They used "motherese", or infant-directed speech and kept eye contact with each child and used the infant's name in each

session. These language exposure sessions revealed that infants heard between 25,989 and 42,184 Mandarin Chinese syllables. In the Mandarin Chinese Stimuli, the infants were tested using a computer-synthesised version of a Mandarin Chinese phonetic contrast that does not appear in the English language. The phonetic contrast was an alveolo-palatal affricate and an alveolo-palatal fricative which contain a minimal phonetic difference. In the third test, a head-turn condition procedure was used to test infants' Mandarin speech discrimination, and the infants were trained to do a head-turn when they heard a change in the sound (phonetic contrast). In experiment 2, infants were exposed to language material via DVD (AV or A) to see if phonetic learning is only triggered by linguistic input. They wanted to examine the necessity of social interaction in phonetic learning from a foreign language. The method and the materials were the same as in experiment 1, as well as infant criteria and adults.

The results from the first experiment show that foreign-language exposure in infancy affects phonetic perception, and when infants are experiencing live foreign-language exposure, phonetic learning occurs. The results from experiment 2 show that phonetic learning is limited when foreign-language exposure is via machine. It did not reverse the decline in phonetic perception. (Kuhl, Tsao & Liu, 2003). As we can see, infants learn from early exposure to a foreign language and that there are many considerations in evaluating and determining the best-suited meaning of being bilingual. Bloomfield (1933) proposed that being bilingual means knowing two or more languages in a native-like fashion, which is somewhat unrealistic since native-like fluency is difficult to achieve unless exposure happens at an early age (Grosjean, 1997). Other definitions have been proposed, such as the ability to produce at least two meaningful utterances in your second language (L2) (Gonzales,1989). In this paper, I will instead define a bilingual accordingly to Grosjean (1997), "bilinguals will be defined as those people who use two (or more) languages in their everyday lives". However, the degree of usage is not defined because we are dealing with a variable highly dependent on the individual performing the task. Hence, the existence of low proficient and high proficient bilinguals. Bilinguals differ in several ways: gender, age, socio-economic status, educational status as well as language stability and history, and to cover it all in on paper would be fairly too ambitious, yet the focal point will centre around certain aspects of language background, proficiency and use (Grosjean (1997).

Figure 9. The table demonstrates the variability in language profiles between bilinguals (Marian & Hayakawa, 2020).

Comparing levels of bilingualism (see figure 4) is an essential task for those who are researching bilinguals. Imagine two Spanish-English bilinguals, a girl and a boy with diverse language background. The male adult had his age of acquisition in college but obtained a highly proficient level of Spanish due to hard work in school. Now, the female adult had acquired English and Spanish simultaneously from birth and was exposed to her second language constantly in her home environment, resulting in high proficient bilingual. The answer to who is more bilingual is a rather challenging one because of diversity. Regardless, it tells us something about the difficulty of defining a bilingual.

Proficiency, language background and language use

Bilingual word recognition models attempt to account for bilingual diversity, but it can be challenging to find a model that allows for all aspects of bilingual experience, as we have seen in the previous section. BLINCS is promising in that regard, but since bilingual experience is highly dynamic, it continues to be problematic to find satisfactory instruments that can capture all of the ambiguities of the bilingual mind. Hence, the importance of self-reports and standardised tests. Evidence from Bialystok & Luk (2013) shows a correlation between bilingual usage and self-rated proficiency, which confirms the relevance of applying self-rated judgment to research on bilingual experience. Luk & Bialystok (2013) investigated two aspects of bilingual experience: bilingualism is not a categorical variable

and the relationship between English proficiency and usage and self-reported proficiency in two languages. The study examined 160 heterogenous young adults between the ages of 18 and 30 through a Language and Social Background Questionnaire (LSBQ). The LSBQ was developed by the researchers of this study and has later been assessed as reliable and validated by other research (Anderson & Chahi, 2017).

All participants were required to report using two languages on a daily basis and were excluded from the experiment if reported otherwise. The bilinguals in this experiment lived in a community where English were the dominant language, and all testing was conducted in English. The LSBQ contained three sections: demographic and language background and daily usage of languages which included age, years of education, place of birth, age of arrival of immigration country, and languages spoken on daily basis. The relevance of these questions was to assess language usage patterns and language history and capture demographic information. Section two included self-rated usage and proficiency in both languages. The purpose was to learn about each participants' daily language use. The third section asked the participants to rate their proficiency in speaking, listening, reading and writing in relation to native speakers in each language. Participants reported using both English and non-English at home, and they reported a higher proficiency level for English rather than non-English for listening and speaking. The data was analysed by examining responses to SBQ and standardised scores from Peabody Picture Vocabulary Task – III (PPVT-III) and Expressive Vocabulary Task (EVT) to measure receptive and expressive vocabulary level. The main findings showed that bilingualism is not a categorical variable and that English proficiency and bilingual usage relate to the self-rated report. Bilingual usage daily and proficiency level seem to correspond with the age of active bilingualism, and the results indicated that bilinguals who spent more time engaging in English regularly also reported higher proficiency. The ones who spent more time engaging in a non-English language daily attained a lower proficiency level. The significance was only moderate but still present, which indicates that there are other aspects to bilingualism that also influence proficiency (Bialystok & Luk, 2013)

An essential question in bilingual studies is how much a difference in bilingual experience affects the L2 lexical access and processing. Persici, Vihman, Burro & Majorano (2019) found that processing efficiency is connected to bilingual balance of lexical

knowledge in each language so that a balanced language experience in both first and second language leads to equally strong access of words and concepts in both languages. The BLINCS model was used as a plausible architecture for the study. Thus, as children were seen to activate both languages during testing, proficiency was affected by performance in both languages and temporal language experience as well as the degree of between-language similarity. This indicates that proficiency serves a key role in bilingual processing. They also discovered that efficiency increases for unbalanced bilinguals between the age of 6- and 9-years but less for balanced bilinguals. Persici et al. (2019) conducted two studies: the first study tested a total of 77 participants, two groups (balanced versus unbalanced bilinguals) of Italian-German children with varying language experience in German. All children were in-between grades 1 and 3 and were tested in their knowledge of their L1 (German) and their L2 (Italian) in a computer-based picture-word pairs experiment with one session in each language. The four conditions included match (auditory word and image refer to the same object), mismatch (auditory word and image are not associated), bilingual homophones (or false friends, words that are similar in sound in two languages but not related in meaning), and semantic relation (word and image are semantically related but not associated). The participants were asked to respond accurately and quickly Yes or No (key labelled smileys) if the picture on the screen matched the word being heard. The findings of the first study showed that both languages became activated when the situation only called for one language. The unbalanced bilinguals responded slower when presented with false friends when compared with the control conditions; however, proficiency had a positive effect on performance. The balanced bilinguals showed similar efficiency scores in all conditions in both languages, whereas the unbalanced bilinguals had higher scores in their first language compared to their second. The second study was a replica of the first study, but this time, Italian-French unbalanced children were tested and compared with L1 Italian and L2 French or German to see if the crosslinguistic similarities of word forms' affects performance. The findings from the first study were compared to the second study, and it was found that the Italian-French group performed significantly better in their first language rather than their second and the degree of language interference was affected by proficiency. Overall, these results tell us that a higher proficiency level leads to modifications in bilingual processing.

Furthermore, the results also support the BLINCS model of Shook & Marian (2013) in that the two languages are viewed as self-organizing and connected with each other through a shared linguistic feature within-language network that is similar within a specific language. The linguistic features are connected through form-form and form-meaning across the languages of a bilingual.

The level of proficiency tends to create methodological challenges in bilingual studies because of the great variation bilinguals attain in their languages. Some bilinguals are equally proficient in both languages, and others are more dominant in one language and less proficient in the other (Costa & Galles, 2014). Accordingly, language proficiency and language use are two factors that need to be taken into account when considering bilinguals, and as Bialystok and Luk (2013) demonstrate, these are not mutually exclusive. Also, studies have shown that when the L1 is inactive and the L2 is being used, stronger interlingual competition occurs when L1 is being used (Marian & Spivey, 2003; van Hell & Dijkstra, 2002; Weber & Cutler, 2004). Chambers and Cooke (2009) found that listeners' proficiency level in L2 did not significantly affect their L1 interlingual competition. In the active language, proficiency did, however, influence predicted processing effects. This suggests that high proficiency in the active language alone does not facilitate interlingual competition.

Self-reported proficiency and experience measures such as The Language Experience and Proficiency Questionnaire (LEAP-Q) were created to assess Language Profiles in Bilinguals and Multilinguals. The LEAP-Q is designed to reach various groups of adult and adolescent bilinguals, obtaining different proficiency levels. The age of onset of exposure might vary, and both simultaneous bilinguals (who are exposed to two or more languages before the age of three), sequential bilinguals (who acquire their second language after acquiring their first language) as well as balanced bilinguals (who are equally proficient in both languages) and unbalanced bilinguals (who are more efficient in their first language than their second language) are accounted for in the LEAP-Q proficiency questionnaire. The idea is to give researchers a sufficient overview of their bilingual participants and their proficiency level using a self-rating proficiency tool that makes it possible to collect and analyse information about language background and language use. Marian, Blumenfeld & Kaushanskaya (2007) introduced the original version of the LEAP-Q. It is still a central and

sufficient tool used in research; thus, it has been translated into many different languages and adjusted to suit people with weaker literacy skills. The survey has become considerably more adaptable, making it plausible for the current study to exploit an amended version of the LEAP-Q to fit its requirements.

Figure 10. Visual schematic of the self-reporting language proficiency and experience data of the LEAP-Q (Marian, Blumenfeld & Kaushanskaya, 2007).

Studies show that certain factors of bilingual cortical organization (e.g. Marian, Spivey, & Hirsch, 2003, lexical processing (e.g., Kroll & de Groot, 1997), and phonological and orthographic processing (e.g., Doctor & Klein, 1992; Marian & Spivey, 2003 is connected with the age of acquisition in your second language as well as language history of use, proficiency and dominance level in bilinguals.

Language mode is also an important concept in understanding the bilingual mind because it tells us about a bilinguals' state of activation in language processing. There is the monolingual mode on the one end of the continuum, which is when a bilingual is engaging solely in the first language. It is also possible for the bilingual to engage in code-switching (switching back and forth between two languages) and borrowing (borrow words from another language and integrate them into your native language), resulting in both languages being active. Other circumstances can require a bilingual to use only the second language as the primary language of communication, promoting the aspect of bilingual mode (Grosjean, 1997). Grosjean & Soares (1984) found that bilinguals cannot completely deactivate their

second language when they are in monolingual mode. They tested fluent Portuguese - English bilinguals in two speech modes, and all had acquired their second language after the age of 12. The participants listened for a word or a non-word in a sentence that contained a specific phoneme (a phoneme-triggered lexical decision task) first in English, the later in Portuguese. As soon as the word had been recognised, they were told to specify if the word was a non-word or a word. For instance, "After lunch, the children asked for a piece of cake for dessert", In this sentence, the participants had to find the word with the phoneme /k/, /keɪk/. The English- monolinguals were also tested but only in the English sentence version. The results showed that bilinguals and monolinguals had similar RTs for the English words (849 and 868 msec), but the RT for non-words for bilinguals was significantly slower than for monolinguals (1.625 and 1.301 msec). These results suggest that bilinguals are equally fast in recognising words in their two languages as monolinguals (Grosjean & Soares, 1984). It is also interesting to see that a later age of acquiring a second language did not inhibit the fluent bilinguals in their recognition process. This raises the question of whether or not a bilingual can achieve full nativeness in a second language. Hulstijn (2018) argues that a nonnative cannot obtain complete nativeness since a native acquire their language at home from young age or birth and because of the strong empirical evidence of cross-linguistic interference from the two languages (Jarvis & Pavlenko, 2007). Nonetheless, the role of age of acquisition, level of education and general cognitive abilities are factors that should be even further investigated in relation to proficiency (Hulstijn, 2018).

Cross-linguistics differences in English and Norwegian

The search for similarities and differences in languages is essential to learning. In consideration of this paper's study, certain aspects of cross-linguistic variation will be discussed since it may concern the design and, thus, the results of the study. The English language is originally a Germanic language that was introduced and eventually popularised by invaders from today's England (Greenbaum, 1996 p.2). The Norwegian language is also originally a Germanic language, and it is assumed that at one point in time, both of these languages stem from a common language that has been reconstructed and named Proto-Germanic (Lundeby, 1972, p. 12). The role of English as an international language has expanded throughout the years and is considered a language of modernisation and technological advancement (Greenbaum, 1996 p.4). English words continue to enter the Norwegian

lexicon due to, i.e., lexical borrowing and other influences and transfers occurring between languages (e.g., code-switching (when a speaker switches back and forth between two languages).

Languages such as Norwegian, Danish and Swedish produce many similarities in their languages and consist of quite a few full-scale cross-linguistic similarities, but what happens when we attempt to investigate differences between two less closely related languages such as English and Norwegian? In language comprehension of related languages, learners have the advantage of perceiving cross-linguistic similarities with the other language, which makes the learning process more effortless. During the acquisition of an unrelated language, the learner will automatically transfer the same familiar linguistic features from the native language (See Jarvis, 1997:328). For instance, cognates share similarities across languages (e.g., Film (movie) in English – Film (movie)in Norwegian). Cognates in related languages are usually similar in form and meaning, and in between languages such as English and Norwegian, many cognates are existent. (e.g., English: cat, Norwegian: katt),(Ringbom, Håkan, 2006). Cognates and interlingual homographs are often mentioned in bilingual research and used as stimuli because evidence shows that bilinguals respond faster to cognates than to noncognates (see Caramazza and Brones, 1979). These bilingual ambiguity words tend to shed light on the non-selectivity activation controversy in bilingualism. The Norwegian language allows, in some cases, for fewer words of being used in sentences than in English. Assumingly, this is due to a more frequent appearance of compounds in Norwegian. A typical grammatical obstacle for Norwegian- English bilinguals to grasp is the difference between compound words in English and Norwegian since many Norwegian compound words are written as one word in Norwegian but two or more words in English (e.g. *iskrem* 'ice cream', *drivhus* 'green house').

The Norwegian language has two written standards, *nynorsk* and *bokmål*, whereas *bokmål* is the standardised one. In this paper, we will focus on bokmål and urban east Norwegian as the spoken dialect. Norwegian differs from English in that it still has grammatical gender. All nouns are either masculine, female or neutral, making it impossible for someone to classify the gender of a noun by only hearing the noun (e.g. bil, hus, ei jente). The gender can only be recognised with associated words such as the indefinite articles of *en, ei* and *et* (e.g. en bil, et hus, ei jente). For that reason, gender acquisition in

Norwegian is challenging and must be learned from noun to noun (Rodina & Westergaard, 2013). The English language does not have grammatical gender. In English, nouns are usually introduced by a determiner *The, a* or *an.* The indefinite articles *a* and *an* cannot cause an inflexion of the noun. The determiner *a* is only subject to change (to *an*) if the succeeding word starts with a phoneme vowel. In Norwegian, all nouns are gender determined. Furthermore, definite articles in English exist in front of a noun in the following way*: the house, the dog, the girl.* The Norwegian language use inflexion by adding a suffix and rearranges the gender position: hus-et, hund-en, jent-a. Both English and Norwegian have definite articles, whereas the only difference is their placement and that Norwegian has double determiners " det" hvite hus "et".

Some bilingual processing issues such as the gender marking effect, segmentation cues and the invariance problem arise due to non-existing mechanisms or strategies not previously encountered by a bilingual. Either because of a late AoA or that it simply does not exist in the first language. In some languages (e.g., Norwegian), gender can be classified according to gender. Norwegian has three genders. It is assumed that a congruent gender can speed up the recognition process. Guillelmon and Grosjean (2001) tested the marking effect in bilingual spoken word recognition to see if nouns were recognised faster when congruent gender marking on preceding words were accessible. For instance, "la petite fille" (the little girl). In this case, the article and gender contain a feminine marking. Adult early bilinguals and frequent users of French (AoA: 5;4 years) and late bilinguals who learnt French in a school environment (24;8 years average) were tested by asking to repeat the word after "joli (e*)"* in a phrase presented over headphones. A group of monolinguals were also tested. The conditions were incongruent nouns, congruent nouns or not present (control condition). The results showed that the bilinguals responded faster when the gender was present than when it was not present. A congruent and incongruent effect was seen in the early bilingual and the monolinguals, which tells us that this early group have become sensitive to gender marking. No such result was seen for the late bilinguals (Guillelmon and Grosjean, 2001). Language-specific properties of the language input in bilinguals can be significant because it can separate candidates from L1 and L2 and thus, speed up the word recognition process.

Kesteren, Dijkstra & Smedt (2012) investigated the effect of using sublexical language membership to make the word recognition process faster in 20 Norwegian-English bilinguals who had studied English in school for at least six years. In a language decision task, bokmål was the preferred written form. The participants were presented with a string of words on a screen, one at a time, and were told to discriminate between a Norwegian word and an English word by pressing two separate buttons, one for each. Language-specific letters and combinations were applied in the experiment ("smør" or "hawk"). The results showed a language-specific sensitivity in the participants as they responded faster to items that contain language-specific markedness. These results tell us that there is a marking effect sensitivity in bilinguals in visual word recognition (Kesteren, Dijkstra & Smedt, 2012). The remaining question is whether this effect extends to spoken word recognition and whether it presents a bias in spoken word monitoring tasks.

Sentence processing and prediction

Sentence processing is a fast and efficient process that requires a person to overtake noisy sensory input to recognise linguistic structures as phonology, morphology, syntax and combine these structures with context and world knowledge to create meaning. In research, studying the facilitation of predicting upcoming material in linguistic comprehension has its advantages in understanding linguistic processing mechanisms. For instance, it can provide insight into how linguistic information is processed between levels (Kutas, DeLong & Smith, 2011). Prediction errors in sentence anticipation are important because it allows for the comprehension mechanism to learn from previous mistakes. There are contrasting views concerning the process of predicting upcoming information in L2 speakers. Kaan, Dallas & Wijnen, 2010 found that first and second language learners differ during this process, and L2 learners cannot predict upcoming syntactic information during online processing; however, an increase in proficiency level would increase this ability. Others found that second-language learners of Spanish did not predict a noun in the auditory context of a masculine determiner. Still, they did anticipate a noun when they heard a feminine determiner (Dussias et al., 2013). Kaan et al.,2014 propose that the natural mechanisms that drive predictions in L1 and L2 learners are not different, but that they differ in aspects of what steers them. Moreover, the aspects that modulate predictions are individually dependent. The following factors that can modulate the prediction process are :(1) *Stored information*

of frequency can have consequences for predictions in that a different frequency representation could lead to either weaker or non-native-like predictions. (2) *Competing* information may reduce predictive processing because of the simultaneous overloading activation of lexical knowledge in two languages. (3) *Lexical quality* is a factor that can induce the anticipation process since higher proficiency has shown to increase predictive behaviour (Dussias et al.,2013). (4) *Task induced strategies* can affect predictive behaviour through the modulation of attention. In cases where contexts are highly predictive, extended effects of prediction might not occur in native speakers as processing may stop before the target word appears in the input (Faita, Czternasty, & Kutas, 1997; Kaan et al., 2013.) Batel (2019) found that both L2 and L1 learners use the constraining context to predict an upcoming word in a study investigating the effect of constraining sentence context on word recognition in both L1 and L2 in both visual and auditory modalities. The study addresses this issue by also examining the validity of the pre-access prediction model and the post-access model. The pre-access prediction model is in line with an interactive model of spoken word recognition and assumes that the perceptual system prepares for a probable word before encountering it, with the support from a semantically high constraining sentence (e.g. TRACE). The post-access model is more equivalent to serial models such as the cohort model, assuming that the word needs to be already encountered before it can be integrated into the context integration process (see models of spoken word recognition above).

The two experiments in this study investigated the effect of a high constraint-sentence on the recognition time of a visual or auditory presented target word, and whether an L2 speaker can recognise the target word as fast as an L1 speaker when the word is presented in a highly constrained sentence. The same participants and materials were used in both experiments, including 28 advanced-level, adult learners of English and 24 native English speakers as the control group. The L2 participants were Arabic native speakers, and all participants were university students. Arabic students were chosen because of the different orthographic systems they have compared to English and because they are likely to be more used to processing written stimuli rather than auditory stimuli. The participants started with a practice trial consisting of ten questions. There was a total of 48 English language sentences consisting of 24 semantically high-constraint sentences and

24 low-constraint sentences, one of each were placed in the two sets, which were divided between visual and auditory testing. A self-paced reading task was conducted in the first experiment, dividing each sentence into segments, including the target word. The participants were asked to press the space bar when recognising the target word in the segment. The timing started when the participant pressed the bar. The results showed faster RT for L1 speakers than L2 speakers and found that high constraint sentence context has a greater facilitative effect than low-constraint sentences in L2 speakers; however, a measurable effect is seen in both L1 and L2 participants. The second experiment investigated whether this facilitative effect also included auditory processing of upcoming L2 words. A self-paced listening task was conducted, instructing the participants to listen to a series of sentences using an auditory moving-window technique, meaning that they were listening to a phrase-by-phrase segment that would be played at a time. The participants were asked to press the space bar when they recognised the spoken segment, and RT was measured from the segments offset. The results of experiment 2 were similar to those of experiment 1, revealing that both L1 and L2 speakers show faster RT when words are presented in semantically high-constraint sentences, rather than low-constraint sentences; however, in both experiments, both groups show a slower RT when recognising words auditory rather than visually. These two experiments support the notion that there is a facilitative effect on semantically constraint sentences in both visual and auditory modalities in L1 and L2. Any lack of facilitative effect can be justified by extending the time window (Batel, 2019). The results are compatible with Dijkgraaf et al. (2017), who also found that proficient bilinguals predict upcoming words in their nonnative language by using linguistic context information.

The weaker links hypothesis

If we assume that the average bilingual knows about twice as many words as the monolingual, it also means more information to process. Astonishingly, bilinguals seem advanced in using the right word in the proper context. Regardless, evidence shows that processing costs occur when dealing with more than one language in a single cognitive system. Due to this disadvantage, The “weaker links” hypothesis proposes that monolinguals have an advantage relative to bilinguals on speaking tasks due to the frequency of use between their two languages (Gollan et al.,2008). Even though we are not

concerned with production tasks, the weaker link hypothesis is critical because it can explain the asymmetry in results of bilingual experimental tasks in that bilinguals may have weaker links between form and meaning (see Diependaele, et al., 2013). Shook et al. (2014) observed that lexical access is weaker in bilinguals than in monolinguals. They found that English-German bilinguals overall had fewer glances to target items than monolinguals in an eye-tracking task. They tested English-German bilinguals, German-English bilinguals and monolinguals. The type of sentence constraint did not seem to make a difference. All stimulus sentences had target item placed in the sentence-final position with the "and" and a determiner(High constraint: The drinker went to the recycling bin and threw away a bottle and a can. Low constraint: The typist went to the new conference room and brought along a printer and a can). Results showed that different patterns occurring in the English-German bilingual group compared to the German-English bilingual group; however, there was no difference in the pattern of glances of looks to competitors. The English-German bilinguals had fewer looks to target objects in general than monolinguals in both sentence conditions and showed an indicative amount of slower looks to the target object in the high constraint-sentence condition. The results showed that these bilinguals were not affected by the predictive sentence context. However, the German-English bilinguals were slower in recognising the target object when presented with low-constrain sentences and preserved target activation longer in the low-constraint sentence condition than the monolinguals. In the absence of cross-linguistic behavioural competition, it seems that lexical access is weaker in bilinguals, supporting the weaker links hypothesis. Additionally, the results demonstrate the importance of sentence context's influence on lexical access (Shook et al., 2015).

The present study

The aim of the experiment was to extend our understanding of the relationship between language profile, proficiency, and speech comprehension, by focusing on bilingual speech comprehension in context and to investigate whether syntactic and semantic factors might affect the speech comprehension process in both L1 and L2. Our second goal was to explore the potential effects of bilingual profile diversity in relation to the sentence comprehension process involving mixed word order, high-constraint and low-constraint sentences.

In the current study, we investigate Norwegian-bilinguals' relationship between language profile, proficiency and speech comprehension in English. In Norway, English proficiency levels have increased over the last decades due to international exposure and communication growth. American popular culture makes us vulnerable and hungry for exposure. Additionally, global workplaces and travelling increase the need for a proficient English vocabulary. These high exposure factors to the English language in Norway makes it possible for people to attain a high proficiency level. In Norway, English is traditionally taught as a mandatory second language in school, starting from the age of 5-6 (1st grade) and continues to 10th grade. In grades 10 -13, English is not always mandatory but present in most curriculums. Regardless of the early exposure and usage of the English language, Norwegian bilinguals do not qualify as English as a second language speakers (ESL) (e.g., Graddol 2006). English in Norway seems to be lacking a paradigm in language because it does not fall under immigration-language status, nor does English have an official status (Rindal & Piercy, 2013). Overall, the English proficiency level in Norway is considered high.

To quantify bilingualism, several self-measurements have been developed, such as the Language History Questionnaire (Li, Sepanski & Zhao, 2006), the Language Experience and Proficiency Questionnaire (LEAP-Q), (Marian et al., 2007), and the updated Language and Social Background Questionnaire (Anderson et al., 2017). These self -reported questionnaires have shown to be reliable in collecting scientific diversity in bilinguals (Li, 2013). We aim to assess our bilinguals accordingly, using an amended version of The Language Experience and Proficiency questionnaire by Marian et al. (2007).

Predictions

In the mixed word order condition and the low-constraint condition where we measure random sentence structure compared to a logical sentence structure, we expect to see a sensible syntax effect. It is predicted that the participants will have faster response times in the sensible sentences rather than the randomized sentences.

A second prediction is that in the constraint -measurement, it is predicted that participants should have faster response times for high-constraint sentences than low-constraint sentences indicating a high use of context in high-constraint sentences in both languages.

A third prediction is that there would be a pattern of language effect, whereas the Norwegian -English bilinguals should have slower responses in English compared to Norwegian across all sentence conditions.

Methodology

Participants

27 participants between the ages of 18 and 35 were recruited to perform in a comprehension experiment, part of a more extensive study involving three parts: comprehension, production, and tip-of-the-tongue (TOT). All the participants were required to be native speakers of Norwegian with English as their second language and reported speaking Norwegian exclusively in their home environment, apart from English. The participants were required to obtain a reasonable level of proficiency in English and to have no diagnosed cognitive or language impairments. They were also required to have normal or corrected-to-normal vision and hearing. The Norwegian Centre for research data (NSD)notification form was submitted and approved for this project. Each subject provided written informed consent. The participants were recruited through social media platforms and personal connections. All participants were compensated for their participation with a gift card of 300 NOK after the completion of all three experiments.

The Language Experience and Proficiency Questionnaire (LEAP-Q)

For our project, we used an amended version of the Leap-Q as a self-reporting tool to assess language experience and proficiency level in Norwegian (L1)- English (L2) bilinguals. The bilingual profile questionnaire included three sections of questions: (1) screening questions, (2) language background and (3) Norwegian and English proficiency and contained a total of 30 questions for the participant to respond to. The first section aimed to access some basic information to exclude or include a participant for further testing. The screening section (1) included 13 questions about the participant's age, gender, country of birth, education level and if the participant had any vision, language, or hearing limitations.

The language background section (2) aimed to identify what languages each participant speaks, exposure level, cultural self-identification, fluency self-rating, and language daily usage by percentage measurements. This section included 9 questions and sought to assess the participants' dominance level in each language and their self-rated language background experience. The Norwegian and English proficiency (3) section focused

on questions concerning language environment, exposure, proficiency level self-rating and natural language mixing with the intent to target how these factors could have impacted the participants' language proficiency.

Materials and design

Our amended version of the bilingual profile questionnaire contained a total of 30 questions, divided into three sections (see Appendix A). The screening section (1) was extended with questions confirming the participant's native language (Q 3), as well as questions about country of birth (Q 10), country of residence (Q 11), and right- or left-handedness (Q 9). We also asked if the participant considered him/herself a reasonably good speaker of English (Q 5) and whether Norwegian was the dominant language at home (Q 4). We excluded questions from the original version about the date of birth, today's date, and U.S immigration date.

For the language background section (2), we added questions where the participants were asked to list what percentage of the time they spent speaking (Q 17) and reading each language (Q18). The cultural self-identification question (Q 20) was adjusted to target Norwegian-English bilinguals by asking the participants whether they generally identified with Norwegian, British or American. We extended the section by adding questions about whether the participant thought his/her fluency level had decreased, resulting in a potentially lower proficiency level (Q 21). We also added a question asking in what language the participant would perform the various tasks of simple math, dream, talk to yourself or express anger and affection, as these questions provide useful language dominance information.

The Norwegian and English proficiency section (3) was limited to questions solely regarding English and Norwegian proficiency and gave no other language options than these two as it did in the original version of the LEAP-Q by Marian et al.2007. In the question asking the participant to list years and months spent in each language environment, we separated school and workplace as language environment options (Q 23). When asking them to rate how much the following factors contributed to their learning of each language, we added education and school as factor options (Q 24). We also asked the participants to rate their proficiency level in aspects of speaking, pronunciation, reading, writing, grammar, vocabulary and spelling, and all of these options were added to our version, except

speaking, reading and understanding spoken language, which was a part of the original LEAP-Q. We also extended our questionnaire by adding two questions about accidental and intentional language mixing.

LEAP-Q procedure

51 participants received the Language Experience and Proficiency Questionnaire by e-mail after submitting a signed consent form. A larger number of participants performed in the questionnaire task than in the comprehension experiment. All 51 participants were involved in all or parts of the three experiments of production, comprehension and tip-of-the-tongue. They were asked to fill out the LEAP-Q independently in their home environment and e-mail the experimenter if they had any questions. The experimenter then checked the answers to confirm that participants met the inclusion criteria for the study. The questionnaire took approximately 15 minutes to complete when dealing with two languages.

Main experiment: Word monitoring task

A word monitoring task is a research tool that can help us investigate sentence comprehension and reveal the underlying mechanisms of sentence context in spoken word comprehension in L1 and L2. By measuring a subject's button press in response time (RT), we can retrieve information about a participant's behaviour and relate it to their bilingual profile.

Materials

Target word stimuli

240 nouns were selected as targets in the word monitoring task. 120 Norwegian target words and 120 English target words that were matched for word frequency, phoneme length, orthographic length and monomorphemic nouns.

Target word	Grammatical class	Word frequency	Orthographic length	Syllable length	Phoneme length
army	noun	51.5	4	2	4
skyld	noun	50.1	5	1	4

art	noun	112.0	3	1	2
brann	noun	112.5	5	1	4

Table 1. Examples of closely matched Norwegian vs English target words.

	Word frequency	Orthographic length	Syllable length	Phoneme length
Mean value (Norwegians TW)	35.4	5.3	1.8	4.9
Mean value (English TW)	38.8	5.5	1.6	4.3

Table 2. Mean value of matched target words across languages.

The target words were matched for word frequency to ensure the observed word frequency effect would not be an issue as evidence claims that high-frequent words are processed faster than low-frequent words (Monsell, Doyle, & Haggard, 1989). Target words were unique across languages, such that if we included the word *flower* in English, the Norwegian target word *blomst* could not be included in the. All target words were matched with word frequency, phoneme length and grammatical class. The English target words contained a word frequency average of 38.8, phoneme length average of 4.3. In comparison, the Norwegian words had a word frequency of 35.4 and phoneme length of 4.9. Cognates, compounds and interlingual homophones were avoided, as well as interlingual homographs (since the sentences are heard but also the target word is seen on screen). We also tried to avoid set phrases and collocations. Norwegian indefinite nouns always have either feminine, a masculine or neuter article in front of an indefinite noun (en dam, ei jente, et møte,) and the only grammatical class applied for the Norwegian target words were indefinite monomorphemic nouns. In English, monomorphemic indefinite and definite nouns were both used. In both languages, we avoided plural nouns, and all nouns were between 1-3 syllables long. All Norwegian target words were calculated for frequency in NoWac (Norwegian web as a corpus), applying statistical measurements such as count, word form, lemma, and gender. We included and counted the nouns that were masculine, feminine, and neuter. Moreover, all other word forms were excluded and other lemma

options than the actual target word (i.e. target word: katt, excluded: katte). For the English frequency density, we used Subttlex -UK, a word-frequency database for British English (van Heuven, 2018)) and applied settings such as word, length, dominant position, and lemma frequency to retrieve information about the target word and to calculate word frequency. tophonetics.com was used to verify British syllable length.

Target word (TW)	Condition	Sentence
Spatula	High-Constraint Sentence	I flipped the pancake with the **spatula** without breaking it.
Spatula	Low-Constraint Sentence	I tried to find the correct **spatula** to flip the pancake without breaking it.
Spatula	Mixed word order	Tried the find to I correct **spatula** without pancake it to flip the breaking.

Table 3. Target word and sentence illustration.

Sentence stimuli

120 English and 120 Norwegian sentences were generated to contain the target words. In Norwegian, the 60 high-constraint sentences, low-constraint sentences and mixed word order of the low-constraint sentence were generated by following our criteria of matching all lead-in sentences for syntax, complexity, phoneme count and syllable length; still syllable length was prioritized above phoneme count. The target words were placed between the 5th and 26th syllable in a sentence and were equally divided between syllable positions; 30 target words between each position, 5-10, 11-15, 16-20 and 21-26. This gave an English target word syllable position mean value of 15,33 and the Norwegian target word syllable position average of 15.26. Target word position was also controlled for, still, not prioritized over syllable position. Target word positions had an average of 10.37 for the Norwegian words and an average of 11.55 for the English words. The English target words contained a word frequency average of 38.8, phoneme length average of 4.3, whereas the Norwegian words had a word frequency of 35.4 and phoneme length of 4.9. No target words were put at the end of the sentence because of prosody, as we suspected that the patterns of stress and intonation could reveal the position of the target word.

The high and the low constraint conditions for both languages were simultaneously manually generated in group sessions. All criteria' were carefully considered in every step. In Norwegian, the noun modifier, the indefinite article or other pre-target words for the

high- constraint sentence was conditioned to acquire the same syntax and phonetic sound (or at least the same phoneme category, i.e., voiceless stops p t k) as the low-constraint sentence in both languages. A Norwegian dictionary website (Dinordbok, 2021) was used as an inspiration to get ideas to create new sentences or to adapt to existing ones. Norwegian high-constraint sentences could be semantically culturally based in some instances, but it was not considered an issue since the participants were all native-Norwegian. In cases where the replacement of Norwegian words with similar phonetic sound was necessary (such as replacing a noun modifier before the target word), we used a rhyming dictionary (rimord, 2021) to find replacements. In cases where target word insufficiencies were detected, and there was a need to replace or amend a Norwegian sentence, NoWac was reused and found high-frequent words in Norwegian to match it to the English words. The English sentences were generated in two stages: first, we added the stimuli from Brothers & Kuperberg (2020) and Altarriba, Kroll, Sholl & Rayner (1996), and attempted to amend the sentences to fit the current experiment. When this was not sufficient, the Cambridge English dictionary online was used as a source of ideas to generate sentences (it can provide sentence examples). All amended sentences were adapted to British English, and all cultural references were avoided to ensure that Norwegian bilinguals would not have difficulties comprehending these. The mixed sentences in both languages were scrambled using an online scramblinator (altastic, n.d.). The section in front of the pre-target item and the section behind the target word was scrambled independently to maintain the target word and pre-target item position. Fillers was generated by exploiting previously excluded sentences and adapting them to our best use further. Some fillers were taken from Brothers et al. (2020) and altered to fit British English when they sounded American English.

Plural nouns were avoided in both languages, and the stimuli were controlled for across languages before amending the English sentences. Cognates in the filler sentences were not eliminated because we wanted to take advantage of the participant's unawareness of our non-cognate use in the test sentences, which would reduce a possible cognate prediction with the participants. We also adjusted the fillers as following: target: *pig* changed to *frogs* to avoid target word in a sentence since fillers were not supposed to follow word/sentence criteria; hence, they were in the lists to confuse the participant to reduce predictability.

Design

The stimuli consisted of 360 sentences in each language containing an embedded target word, 120 in English and 120 in Norwegian with three conditions: a high-constraint sentence, a low-constraint sentence, and a mixed word order of the low- constraint sentence. The experimental materials included two matched sets of 60 items in each language, including the three conditions. Each set contained three lists of 60 sentences, 20 triples in each condition (20 high-constraint sentences, 20 low-constraint sentences and 20 mixed sentences. The three experimental lists of 60 sentences were constructed, with each item occurring only once in different conditions across lists. The lists contained an equal number of the three conditions and consisted of a total of 6x Norwegian and 6x English basic lists of each language, in two different versions (i.e., NOR_S1_L1A and NOR_S1_L1B), hence a total of 12 unique lists in two versions (a total of 24 different randomized lists). The list of 60 sentences was divided into 4 blocks of 15 with 5 items from each condition. 36 fillers in total for each language were added and integrated into the blocks that were identical for each list. The fillers consisted of 24 no response filler items in which the target word did not occur (8 of each type) and 12 fillers with an early response where the target word occurs early in the sentence (4 of each type). In addition, one practice block was added and consisted of 10 items of 2 novel examples of each experimental type, 2 no response items and 2 early response items. The practice blocks were also identical for each list.

All sentences in each condition, practice items and fillers were recorded using a laptop with Praat software in a soundproof booth. The Norwegian sound was recorded in an urban east Norwegian dialect by a female voice. The English sound was recorded in British English with a slight Scottish accent also by a female speaker. When recording the sentences, all sentences across conditions in each language was aimed to match. Sound files were edited, measured in Praat software, and saved in the system as wav and text grid files. The high-constraint, low-constraint and mixed sentence durations were controlled for from the beginning of sound to target word (duration 1), beginning of the file to the target word (duration 2), and from the start of the target word to the end of the target word. These measurements were controlled and matched across all lists and conditions. The Norwegian

mean average of duration 1 across conditions was 2.21 sec, and duration 2, 2.47 sec. Target word measures showed an average of 0.37 sec. The English sentences showed a mean average of 2.87 sec in the duration 1 measurement and a 3.28 sec in duration 2. The target word average was 0.49 sec. All running lists of 12 for each language were counterbalanced since it was significant that the design obtained controlled randomization of all items, which would give all participants equal conditions. The duration from the beginning of the files to the beginning of sound was not a match across sentences; however, it is only a slight chance that this mismatch would be significant. Sometimes reduction occurred when the target word ended in a vowel, and the succeeding word also ended in a vowel, resulting in a shorter target word length.

	Duration 1	Duration 2	TW
Norwegian	2.21	2.47	0.37
English	2.87	3.28	0.49

Table 4. Illustrating mean averages (in sec) of measurements for audio files. Duration 1: the beginning of the audio file to target word measure. Duration 2: the beginning of the file to the target word. TW measure: duration of the target word.

Procedure

Prior to the word monitoring experiment, the participants took part in a speech production experiment. Both experiments appeared within the same hour.

In the word monitoring experiment, each participant was tested on two lists, one for each language, on two separate days within a week at the University of Agder's experimental linguistics laboratory. They were first tested in Norwegian and then in English, and all lists were counterbalanced. The laboratory was disinfected between participants, and the experimenters wore certified face masks during testing. Participants were informed that all communication would occur through the intercom. The experimenter would communicate with the participants before the experiments, after the practice blocks and between block breaks. The experimenter used a Sennheiser GSP 350 headset because its properties worked well in the laboratory.

Each participant performed the experiment in a soundproof booth seated in front of a computer screen (INTEL NUC) approximately 19 inches (0.5 m) from the participant. The speakers used in the experiments was Creative SBS270, and The booth microphone was a

VideoMic NTG. The instructions were presented visually on a computer screen, followed by a fixation cross and an auditory stimulus. Participants were given additional instructions verbally, if necessary, and instructed to press the spacebar when they heard the target word in the sentence they were listening to. On each trial of the experiment, the fixation cross appeared on the screen for 500 msec, followed by a blank screen for 1 sec. The target word appeared on the screen for 1 sec, and there was about a second break before each file started. The sound files were not matched for duration from the start of the file to the beginning of speech which induced slightly different time frames. Participants were given a short practice block consisting of 10 trials, followed by 4 blocks of 18 trials. All participants were tested on two separate days, one language for each day, with only one exception. In the exception, the participant had a four-hour break in between the two sessions and was informed that in the second meet, all communication would be in English. All other participants were told prior to each experiment which language mode was required. The experimenter was consistently enduring the required language mode throughout the sessions. After the experiment, the experimenter went through the potential missing information.

LEAP-Q DATA

Participants

All 51 participants were native residents of Norway and aged between 18 and 34, with a mean average of 25.17 years. There were 36 females, and 15 males and 48 participants were right-handed. One participant was a simultaneous bilingual of Norwegian and English and born in the USA, but the remaining participants reported Norway as their country of birth. The subjects reported having either normal vision or corrected-to-normal vision and reported no language or hearing impairment. Norwegian was reported as the dominant language for 48 participants, and only 3 reported English as the dominant language.

Nonetheless, 50 subjects reported Norwegian as their dominant language of acquisition. Only 1 reported English, which indicates an error in the responses since it is not plausible to characterize English as a dominant language but not the predominant language in acquisition. The mean average of years of education was 16.27, and 49 subjects reported having 3-5 years of higher education. Furthermore, 19 participants reported having 1-3

years of higher education, and only two people noted having only secondary school as their highest educational level.

Language background and use.

48 participants reported having Norwegian as their first language (L1), whereas the rest claimed English as their L1. 49 participants identified themselves with the Norwegian culture (96.07 %: M=9.4), two subjects identified themselves with the American and British culture. The mean value of the degree of identification of a second culture was 2.0. When Norwegian participants had to rate a second culture, the statistics showed that English speaking cultures, such as American, Australian, Canadian and British, consisted of 45.09 per cent. Furthermore, subjects reported performing tasks such as math, mainly in Norwegian (94.11 %). 82.35 % of the subjects reported dreaming in Norwegian, and 66.66 % expressing anger and affection. They reported talking to themselves 64.7 % of the time in Norwegian, but only 31.31 % in English. 86,3 % of the participants reported accidentally mixing words in both languages occasionally (M= 3.66). Participants reported a total exposure-measure of 59.6 % in Norwegian, 39.2 in English, and 1.4 in other languages (L3). Additionally, 62.74 % of the participants reported experiencing decreased proficiency over time in one of their languages. The mean average of proficiency decrease was 20.25 years (See figure 11).

The Norwegian-English bilinguals reported spending more time their time engaging in speaking Norwegian than speaking English, which is not surprising; however, when rating time spent reading in the two languages, only a slight difference was reported (5.9 percentage point).

Language exposure and learning.

Interaction with family showed the highest value in the contributing to language learning variable (M=9.3). In English, it showed a lesser value (M=2.5). The highest values revealed of contribution to language learning in English was school and education (M=7.6) and watching TV(M=7.5), followed by reading in English (M=7.2) and listening to music (M=6.4). The participants reported spending the most time in a school where English was spoken some of the time (M= 7.4 years), which is logical considering the amount of exposure existing in Norwegian schools and Universities. The extent of current exposure reported for listening to music (M=8.1) and watching TV (M= 8.0) in English was greater compared to

interaction with family (M=1.1) and self-instruction (M=1.7). In Norwegian, interaction with friends (M=9.1) and family (M=9.4) were predominant. Furthermore, the participants reported more language intrusions from English into Norwegian rather than from Norwegian into English, both accidentally and intentionally (see table 5).

Self-rated language proficiency.

In overall proficiency self-ratings, participants considered themselves as high-proficient in both L1 and L2. Participants rated themselves a mean average of 9.5 out of 10 in speaking, reading and pronunciation in Norwegian and a 9.8 in listening. Norwegian Grammar scored an 8.4 and writing 9.1. Vocabulary and spelling remained a lesser mean value of 8.7. In English, participants scored a mean value of 7.8 in speaking and 7.1 in pronunciation of English. Listening and reading were assessed a little higher at 8.5 and 8.1. Writing in English had a mean value of 7.8 and vocabulary 7.2. Grammar and spelling had the same score of 6.9. Moreover, participants reported hearing Norwegian regularly approximately from birth (M=0.1) and attained fluency of an average of 4.1 years. English was heard regularly from a mean average of 7.1 years, and fluency was attained of an average of 13.9 years.

Measures	Norwegian (L1)		English (L2)	
	M	Range	M	Range
Event durations in each language [a]				
Speaking	77.8	20-100	21.2	0-80
Reading	52.6	10-99	46.7	1-90
Contributed to language learning[b]				
Interaction with friends/colleagues	7.7	0-10	6.1	0-10
Interaction with family	9.3	5-10	2.5	0-10
Reading	6.8	0-10	7.2	2-10
School and education	7.5	2-10	7.6	0-10
Self-instruction	1.3	0-10	2.7	0-10
Watching TV	3.9	0-10	7.5	2-10
Listening to music	3.3	0-10	6.4	0-10
Spoken language immersion environment (years)[c]				
Country	24.5	18-33	2.2	0-23
Family	25.2	19-35	2.5	0-23
School (constant use)	14.6	0-27	0.8	0-13
School (some use)	5.9	0-27	7.4	0-18
Workplace (constant use)	5.7	0-21	0.1	0-3
Workplace (some use)	3.2	0-21	1.5	0-10
Extent of current language exposure[d]				
Interaction with friends	9.1	4-10	3.8	0-10
Interaction with family	9.4	0-10	1.1	0-9
Reading	5.3	0-10	6.9	1-10
Self-instruction	1.1	0-10	1.7	0-10
Watching TV	3.4	0-10	8.1	4-10
Listening to music	3.3	0-10	8.0	4-10
Self-reported proficiency[e]				
Speaking	9.5	5-10	7.8	4-10
Pronunciation	9.5	6-10	7.0	2-10
Listening	9.8	6-10	8.5	6-10
Reading	9.5	3-10	8.3	3-10
Writing	9.1	5-10	7.8	4-10
Grammar	8.4	4-10	6.9	3-10
Vocabulary	8.7	6-10	7.2	4-10
Spelling	8.7	4-10	6.9	3-10
Intentional switching between languages	8.1	4-10	8.1	4-10
Age milestones (years)[c]				
Started hearing language regularly	0.1	0-3	7.1	0-14
Attained fluency in speaking	4.3	0-16	13.9	6-23
Started learning to read	5.2	3-8	7.8	5-13
Attained fluency in reading	8.1	5-19	13.2	7-22
Language intrusion[d] (E→N, N→E)				
Accidental intrusion	3.6	0-8	1.7	0-7
Intentional intrusion	4.4	0-10	2.0	0-9

*Range[a] : total percentage of engagement. Range[b] : contributors 0= not a contributor, 5 = moderate contributor and 10 = most important contributor. Range[c]: duration in years Range[d]: scale of 0-10 whereby 0 = never, 5 = half of the time and 10 = almost always. Range[e]: scale of 1-10 wherby 0=none, 10= perfect.

Table 5. Self-reported measures.

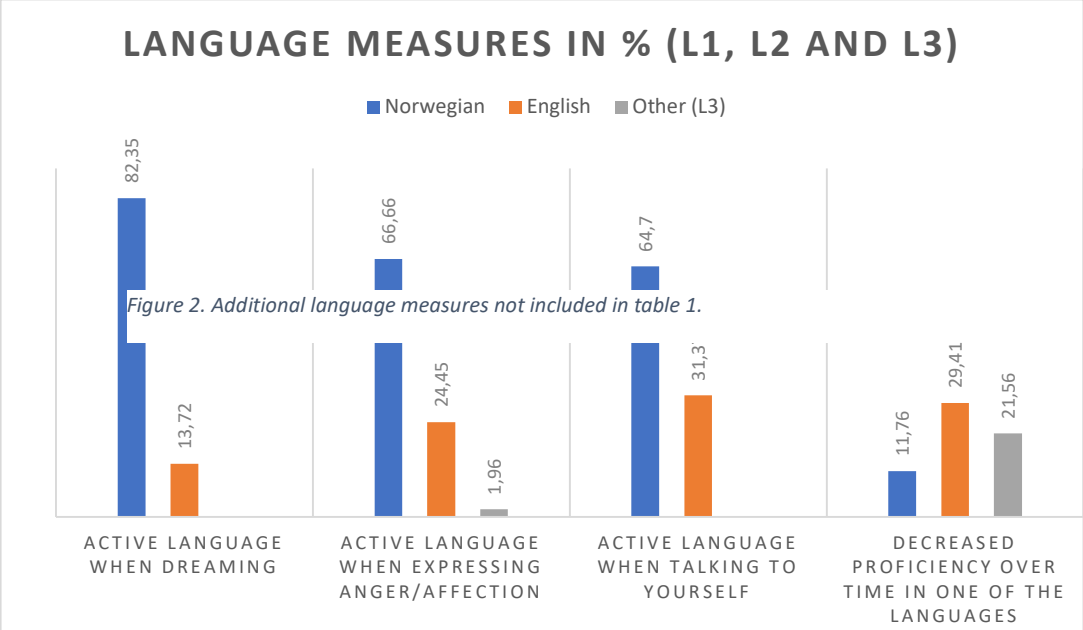

Figure 2. Additional language measures not included in table 1.

Figure 11. Additional language measures reported in L1, L2 and L3

Exclusion criteria for factor analysis

A correlation matrix was generated for the first analysis input that included 46 variables to examine the degree of co-variance. The variables were reduced to 38 variables due to little variation. All variables correlated >0.3 with at least one other variable. Variables with a correlation of 0.9 and above were also removed from the analysis. In cases where highly correlating variables consisted of versions of L1 and L2, the L2 variable was prioritized, and the L1 excluded. For the remaining variables of high correlations, one of the pairings was removed (see appendix G).The remaining 38 variables were submitted to a factor analysis. The factor analysis groups covarying variables into factors (See table 6).

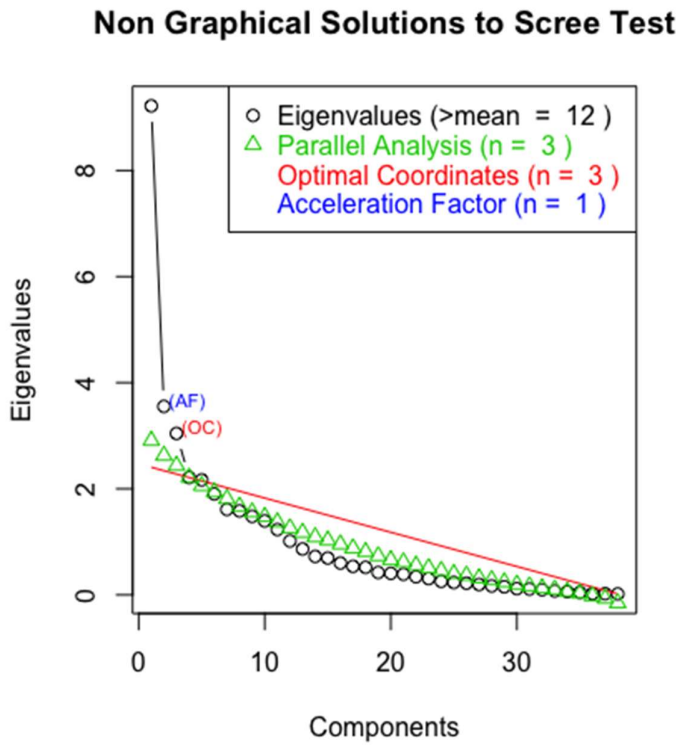

Figure 12. The proposed number of factors based on eigenvalues and paralell analysis. Inspection of the output suggested that 4 factors provide the most optimal grouping, instead of 3 as suggested.. See factor analysis.

The first factor consisted of only positive contributions to the factor (LV: 0.84-0.31). The positive loading variables were predominantly for English proficiency, including grammar, writing, reading, vocabulary, listening, speaking, and pronunciation skills. The factor also included the amount of current English exposure in reading, interaction with friends and family, music and TV. Other positive loadings included contributions to learning in English and Norwegian, counting reading, and school. Proficiency in switching when required and by choice, accidentally mixing two languages, and the loading values of age of fluency in reading and speaking, and age of reading acquisition were also part of the first-factor analysis. Due to a prevailing number of proficiency variables, this factor was named ***English proficiency***. Interestingly the age of acquisition of fluency in Norwegian is positively loaded on this factor, so as the age of becoming fluent goes up proficiency level in L2 increases.

The second factor obtained negative and positive loading variables and accounted for mostly spoken English proficiency and usage. The top positive variables included proficiency level in speaking in English, age of acquisition of speaking and reading fluently in English, proficiency when voluntarily switching between languages, current exposure to English when interacting with family and friends, and contribution to learning when interacting with family. Other positive variables with lesser loading values included accidental mixing of words in two languages, proficiency in vocabulary and pronunciation in English. The negative loading variables reflected Norwegian variables of contribution to learning, reading and current exposure to reading and television. This factor was named ***Spoken English proficiency and usage*** because it comprises several variables of speaking and proficiency. This factor indicates a negative relationship between English proficiency and usage and Norwegian usage and learning. Hence, an increased proficiency level in Norwegian affects the proficiency level in English negatively and contrariwise. The factor also suggests that as the age of fluency in Norwegian increases, so does the proficiency level in speaking in L2.

The third factor contained ten positive loading variables that primarily centralized informal learning of English, which consisted of contribution to learning in English variables of music, self-instruction, TV and reading. Current exposure to TV, music, interaction with friends in English, and current interaction with family in Norwegian also served as positive loading variables. Other positive loading variables were proficiency when language

switching was required and the age of fluency in reading (EN). The two negative loadings included the age of acquisition of fluency in speaking Norwegian and the age of fluency in reading English. This factor was named ***informal learning of English*** due to the large number of variables matching the description. The factor also suggests that age of acquisition in Norwegian speaking fluency and English reading fluency is interconnected as an earlier age of speaking Norwegian fluently would also indicate an earlier age of English reading fluency as these loading values operate in the same direction.

Similar to the third factor, the fourth factor contained two negative loading variables. The negative loading included accidental intrusion of L1 to L2 and the intentional substitution of L1. The fourth factor predominantly accounted for the age of English acquisition in fluent reading and speaking, age acquired when reading was established, and age when the language was heard regularly. The last three positive variables contained contribution to learning in English through interaction with friends and contribution to learning in Norwegian through reading and television. The fourth factor was named the ***age of English acquisition*** since many variables include age-related information. Thus, the factor suggests a relationship between age-acquired reading fluency and speaking fluency in English and the amount of intentional and accidental intrusions occurring between L1 and L2. Thus, it could suggest that the earlier a fluency level is achieved, the more intrusions will occur.

Factor 1 - English proficiency	Loading value	**Factor 2** - Spoken English proficiency and usage	Loading value	**Factor 3** - Informal learning of English	Loading value	**Factor 4** – Age of English acquisition	Loading value
EN – Proficiency, grammar.	0.84	EN – proficiency level, speaking.	0.68	EN – Contributing to learning, TV.	0.74	EN – Age, read fluent.	0.69
EN – Proficiency, writing.	0.82	NO – Age, spoke fluent.	0.60			EN – Age, started hearing language regularly.	0.65
EN – Proficiency, reading.	0.82	NO – Age, read fluent.	0.59	EN – Contributing to learning, Music.	0.65		
EN – Proficiency, vocabulary.	0.78	EN – Proficiency, switching by choice.	0.59			EN – Age, spoke fluent.	0.62
EN – Proficiency, listening.	0.74			EN – Current exposure, TV.	0.61	EN – Age, started to read.	0.61
EN – Proficiency, speaking.	0.71	EN – Current exposure, interact with family.	0.57	EN – Current exposure, music.	0.56	EN – Contributed to learning, interaction with friends.	0.51
EN – Proficiency, pronouncing.	0.69						
EN – Current exposure, reading.	0.65	EN -Contributed to learning, interaction with family.	0.44	EN – Contributing to learning, reading.	0.49	NO – Contributed to learning, reading.	0.48
EN/NO – Proficiency, switching required.	0.60						
EN – Contributed to learning, reading.	0.59	EN – Currently, exposure, interaction with friends.	0.41	NOR - Current exposure, interaction with family.	0.46	NO – Contributed to learning, TV.	0.47
NO - Contributed to learning, school.	0.43						
EN/NO -Accidentally mixing two languages.	0.41	EN/NO -Accidently mixing words.	0.37	EN/NO – Proficiency, switching required.	0.44	EN/NO – Accidently intrusion from L1 to L2.	-0.37
NO - Contributed to learning, reading.	0.41	EN - Proficiency, vocabulary.	0.33				
EN – Age, started to read.	0.38	EN – Proficiency, pronunciation	0.33	EN – Current exposure, interaction with friends.	0.35	EN – Intentionally substitute L1.	-0.58
NO – Age, spoke fluent.	0.36	EN – Age, read fluent.	0.33				
NO – Age, read fluent.	0.35	NOR – Contributed to learning, reading.	-0.37	EN – Contributed to learning, self-instruction.	0.35		
EN – Current exposure, interaction with friends.	0.35						
EN – Current exposure, music.	0.35	NO – Contributed to learning, school.	-0.40	EN – Age, read fluent.	0.31		
EN – Contributed to learning, school.	0.33			NO – Age, spoke fluent.	-0.30		
EN – Proficiency, switching by choice.	0.31	NO – Current exposure, reading.	-0.44	EN – Age, read fluent.	-0.40		
EN - Contributed to learning, interaction with family.	0.31	NO – Current exposure, TV.	-0.71				
EN – Current exposure, TV	0.31						
Proportion Var	0.19	Proportion Var	0.11	Proportion Var	0.09	Proportion Var	0.09
Cumulative Var	0.19	Cumulative Var	0.30	Cumulative Var	0.39	Cumulative Var	0.47

Table 7. Factor analysis (Some data were missing from the analysis and were replaced by the variable average.).

Word monitoring task data

The experiment investigated a within-language variable (mixed word order versus low-constraint versus high-constraint sentence conditions) with a between -participants language variable.

Exclusion of data.

Data was collected from 27 subjects, whereas each participant completed 120 experimental trials, the first 60 experimental trials in Norwegian, and then 60 in English. The sets of 1 and 2 were divided between 14 (1) and 13 (2) participants. Since we were dealing with two languages, each list consisting of 120 items per language included 240 target words which gave us 3240 observations. We measured the duration between the onset of the speech of the audio file and the participant's response when pressing the button (RT). Trials with RTs of -200 ms (40 observations, 1.23%) or larger than 1000 ms (8 observations, 0.25%) were assumed to be mistrials and discarded. This left 3192 observations. Outliers more than 2.5SD from the mean (2.63 %) were also removed.

To test the effects of sentence condition and language on RT, we ran a mixed-effects linear regression (see Baayen, Davidson, & Bates, 2008). Linear mixed-effects are linear regression that allows for groupings of several variances in one single analysis across sentence items and variability between participants. Our maximal structural approach (Barr et al., 2013) consisted of random intercepts for all 27 subjects and 240, but it also included random slopes to allow the variables to have different effects for each group. Thus, to account for variation between participants in the effect of condition and language and between items in the effect of conditions. (See syntax of the model in appendix H).

We included two variables: the dependent variable (RT) and the independent variables (sentence type and language - English versus Norwegian). Since language consisted of two levels, a simple centring contrast was assigned to each level, a value of -0.5 for English and 0.5 for Norwegian. For the sentence conditions (Mixed word order, low-constraint and high-constraint), backward difference coding was applied. The first contrast consisted of low-constraint minus mixed word order and the second of high-constraint

minus low-constraint. A third variable was added to investigate the potential effects of word frequency since frequency can affect behaviour (Monsell, Doyle & Haggard, 1989) and can account for approximately 30 % to 40 % of the variance in word recognition tasks (Brysbaert, Stevens, Mandera, & Keuleers, 2016). As suggested by van Heuven et al., 2014, word-frequency values were log-transformed for a more applicable frequency measure.

The output of the model is shown in Table 8, and the pattern of means is shown in Figure 13.

Mean Response time				
	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	378.89	10.42	36.37	**<.01**
language [en, -0.5; no, 0.5]	**-41.13**	**8.73**	**-4.71**	**<.01**
mixed.lowCons	**70.10**	**3.86**	**18.17**	**<.01**
lowCons.highCons	**31.87**	**3.87**	**8.25**	**<.01**
frequency	**-14.32**	**4.93**	**-2.90**	**<.01**
mixed.lowCons:frequency	-9.59	5.98	-1.60	0.11
lowCons.highCons:frequency	**13.98**	**5.92**	**2.36**	**0.02**
language:mixed.lowCons	-0.40	7.86	-0.05	0.96
language:lowCons.highCons	3.79	7.88	0.48	0.63

Table 7. Summary of the model

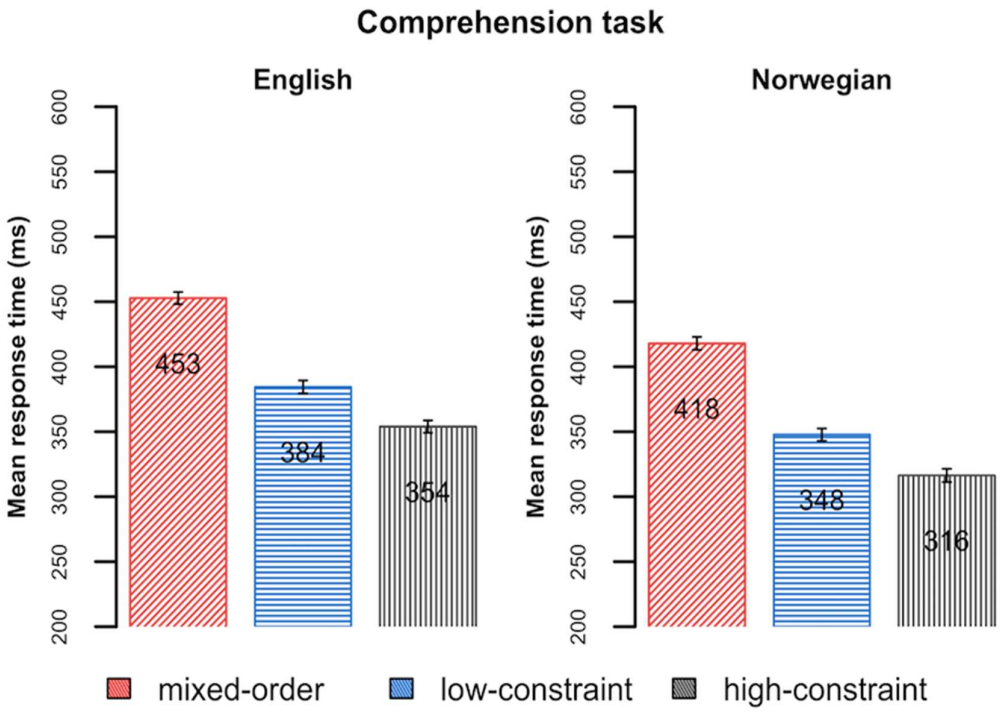

Figure 13. Mean reaction times by sentence condition. English (left panel) and Norwegian (right panel).

The main effect of language reached significance (see Figure 13). Participants had slower RTs in English compared to Norwegian across all sentence conditions. Participants were significantly slower at recognizing target words in the mixed word order condition than in the low-constraint condition. They also performed at a significantly slower rate in the low-constraint condition compared to the high-constraint condition. A similar pattern was seen in English. As we did not compare between languages in this study, no conclusion can be made with regard to such correlation; however, a similar pattern presents itself in both languages (see figure 13).

The effect of high-constraint sentences was even greater for high-frequency words in the Norwegian version of the experiment, but an effect was still seen in both the English and the Norwegian version. The results show that when the frequency of words was higher, the effect of predictiveness was greater. An increase in word frequency leads to a larger difference between response times on low-constraint and high-constraint sentences (see figure 14).

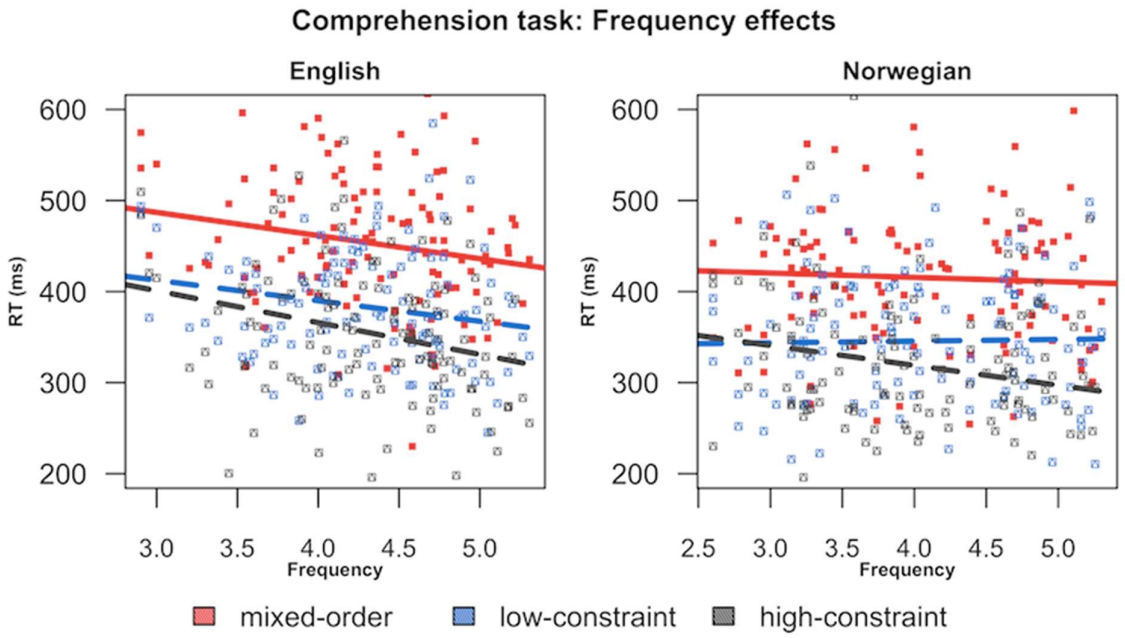

Figure 14. Effect of frequency pattern where target frequency is on the x-axis and mean RT for that target in each sentence on the y-axis.

Individual differences: the effects of factors

An additional set of analyses were run to evaluate the relationship between individual differences in the factors described above and participants' performance in the task. Mean differences were calculated for each subject between RT in each pair of the conditions for each language (mixed word order-low-constraint, low-constraint-high-constraint). The four factors from the factor analysis, English proficiency, Spoken English proficiency and usage, Informal learning of English and Age of English acquisition, were used as the predictors of these measurements (see table 8).

Mean Response Mixed word-order – Low-Constraint - English				
	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	68.17	7.31	9.33	0.00
EngProficiency	8.72	7.70	1.13	0.27
SpokenEngProficiency	0.39	6.47	0.06	0.95
InfEngLearning	**16.01**	**6.18**	**2.59**	**0.02**
AoAEng	0.49	6.56	0.07	0.94
Mean Response Low-Constraint-High-Constraint - English				
	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	31.68	8.30	3.82	0.00
EngProficiency	-0.92	8.74	-0.11	0.92
SpokenEngProficiency	4.93	7.35	0.67	0.51
InfEngLearning	**-15.35**	**7.02**	**-2.19**	**0.04**
AoAEng	-0.94	7.45	-0.13	0.90
Mean Response Mixed word order – Low-Constraint - Norwegian				
	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	70.00	4.66	15.03	0.00
EngProficiency	0.45	4.90	0.09	0.93
SpokenEngProficiency	-5.38	4.12	-1.31	0.21

InfEngLearning	**12.02**	**3.94**	**3.05**	**0.01**
AoAEng	4.30	4.18	1.03	0.31

Mean Response Low-Constraint-High-Constraint - Norwegian

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	30.66	6.04	5.08	0.00
EngProficiency	6.37	6.36	1.00	0.33
SpokenEngProficiency	4.87	5.35	0.91	0.37
InfEngLearning	0.27	5.11	0.05	0.96
AoAEng	-3.41	5.42	-0.63	0.54

Table 8. Findings of the effects of factors (Significant finding are in bold).

Individual differences: English

The English data only yielded an effect of informal learning. The results showed an effect in different directions for the differences between mixed word order and low-constraint and the differences between low-constraint and high-constraint contexts. Mixed word order took longer than low-constraint context, and this difference increases as informal learning increases. In the difference between low-constraint and high-constraint conditions, the high-constraint context's advantage decreased as informal learning increased (see figure 15).

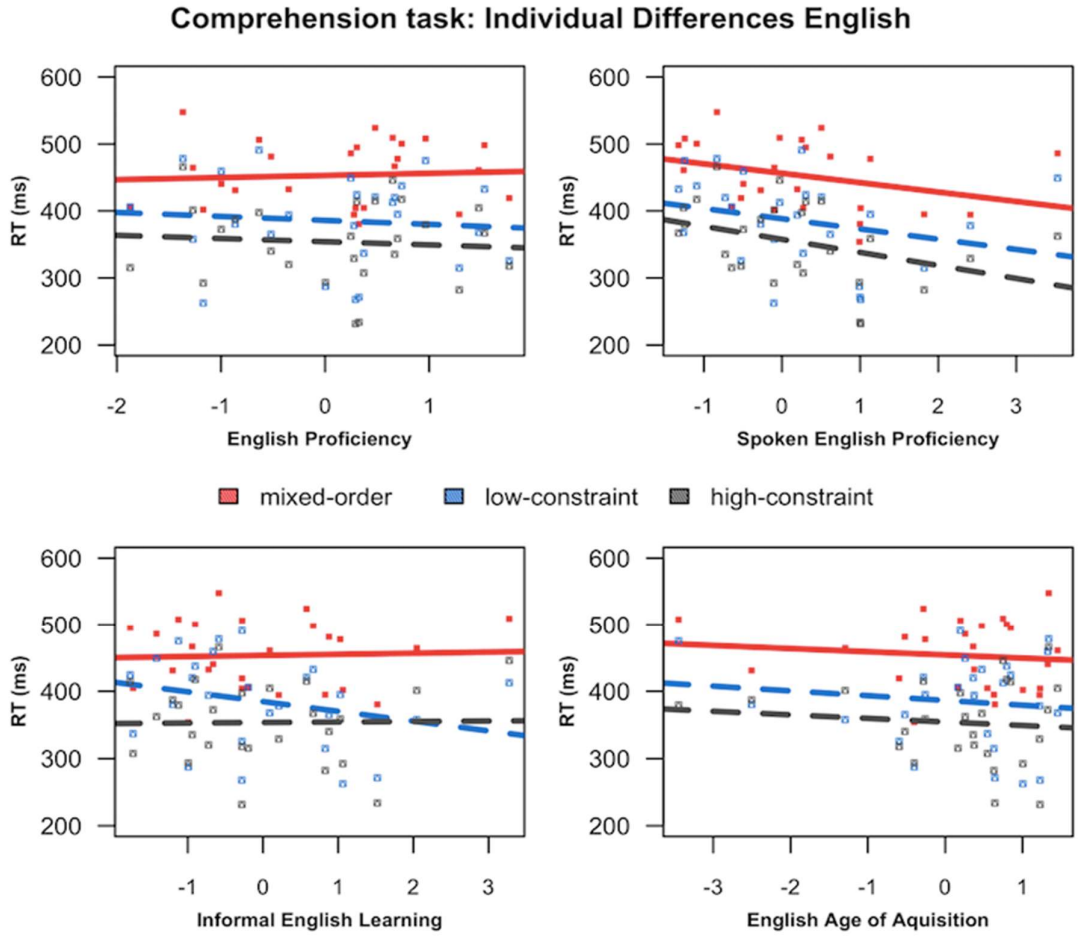

Figure 15. Individual differences – English data (illustrating the influence of the factors with individual differences for each participant) showing the scores on the factors and the mean RT for each condition in English).

Individual differences: Norwegian

The Norwegian data showed that only the contrast between the mixed word order and low-constraint condition interacts with informal learning (M=12.02, p > 0.01). The difference increases as informal learning increases (see figure 16).

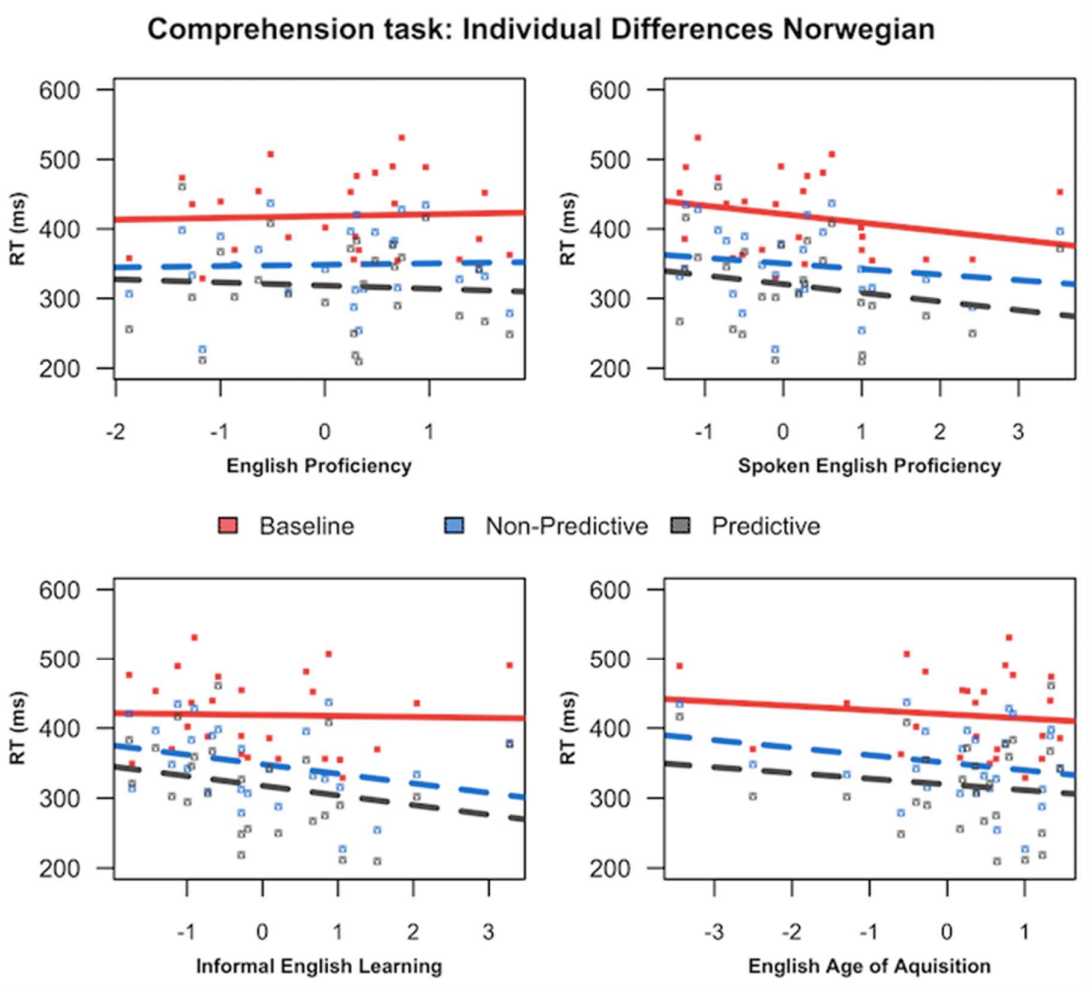

Figure 16. Individual differences – Norwegian data (illustrating the influence of the factors with individual differences for each participant) showing the scores on the factors and the mean RT for each condition in Norwegian).

Discussion

This study asked whether Norwegian – English bilinguals predict upcoming information with the benefit of syntactic and semantic factors that might aid the speech comprehension process in both L1 and L2. We also explored whether bilingual profile diversity would affect the sentence comprehension process involving high-constraint and low-constraint sentences. We were looking to compare low-constraint and randomized sentences to measure sensible syntax effect and low-constraint and high-constraint sentences to measure the effect of constraint. There were two main findings: sentence constraints effects and a main effect of language. In addition to the main findings, we also found other effects: an individual-difference effect and a frequency effect.

Sentence constraint effects

As a constraint measurement, we found that participants had faster response times for high-constraint sentences than low-constraint sentences, which indicates a high use of context in the high-constraint sentences in both languages. The evidence showed an overall consistent pattern of results across languages between all conditions. Participants responded faster in the higher-constraint sentences than low-constraint sentences. The participants responded even slower in mixed word order condition. The evidence is in line with Marslen Wilson & Tyler (1980), who found a similar pattern in their three conditions, normal prose, syntactic prose and random word order.

For the most part, our evidence supports an interactive model of word recognition that claims that context influence upcoming information in a top-down way. These results are consistent with an interactive model since our bilinguals take advantage of the context, and it seems that the pre-lexical processes are influenced by linguistic knowledge in the pre-lexical phase. Since we see a faster RT in the high-constraint sentences compared to the low-constraint sentences, we can assume that our bilinguals use linguistic information to predict upcoming information. In addition, since the participants responded slower in the mixed word order compared to the low-constraint condition, it indicates that there is a sensible syntax effect. The sensible syntax effect between the mixed word order and the low-constraint sentence tells us that the participants faster recognised the target word in a sensible sentence constraint than a random one. These syntax effects are consistent with

the findings of Patowski (1980), who found that higher syntactic proficiency is more embedded in second language learners who have had exposure to the target language at a younger age.

These results are also in line with Dijkgraaf et al. (2017), who found that proficient bilinguals can efficiently use semantic information to predict upcoming target words in both of their languages during listening, and to the same extent. Dutch–English bilinguals were tested in both their first and second language in an eye movement task based on a visual paradigm by Altmann and Kamide's (1999). In Altmann & Kamide (1999)'s paradigm, the participants were presented with a scene of a boy, a toy car, a toy train, and a cake. While participants listened to sentences, eye movements were recorded. The sentences could be, e.g. The boy will eat the cake. After hearing the word eat, the participants' eyes were moved to the edible object in the scene (cake). Active eye movements occurred prior to the presentation of the actual word cake. The results suggested that the participants used their already existing information in their mental lexicon of grammatical elements such as the verb *to eat* to predict what could come next in the input (Kaan, 2015; Altmann & Kamide, 1999).

The experiment of Dijkgraaf et al. (2017) consisted of a listening task with auditory stimulus in the speakers and pictures visually presented on a screen. Eye movements were recorded. Conditions included native vs non-native and neutral vs constraining. The results showed that the constraining condition had more gazes than the neutral conditions. In the comparison within bilinguals (L1 vs L2), no significant interaction was seen between languages, but there was a significant effect in the fixation proportion of the constraining condition and neutral condition. The constraining conditions were significantly higher than the neutral condition. Even in the comparison between L1 Monolingual Listening (in English) and L1 Bilingual Listening (in Dutch), a significantly higher effect was seen in the constraining condition compared to the neutral condition (Dijkgraaf et al., 2017). Evidence from these results are in line with our current experiment in that bilinguals use linguistic context information to make predictions about upcoming information in their non-native language. Dijkgraaf et al. (2017) also found that bilinguals predicted the upcoming information slower than monolinguals, which is also similar to our results(Note, however,

that we did not test monolinguals, only bilinguals in their L1 and L2). The explanation for slower lexical access and possibly slower prediction processing during word recognition could be a weaker link between the semantics and phonology in lexical items (see the weaker link hypothesis of bilingual processing, Gollan et al. 2008).

Sufficient evidence has been observed for the facilitatory functions of using context information to predict upcoming referents and that this process is fundamental in L1. By contrast, research is inconsistent on whether this effect is efficient to the same extent in L2. Our results confirm that this effect in predictive processing in L1 and L2 are both highly efficient. The debate is also centred around whether this effect is related to a pre-access prediction or a post-access transitional integration. Some studies show no facilitative effect constraining context in L2, such as Martin et al. (2013), whose results showed that L2 learners do not pre-activate words in highly constrained sentences in the same way as L1 learners. Studies that show a facilitative effect claim that a greater timespan could be necessary to retrieve an effect. The present study had a time window of below -200 and above 1000 ms after excluding data and facilitative effects in the within-language variables and between -language effect. The facilitative effects may result from a larger time window used in the present experiment and, therefore, in line with Ito et al. (2017)'s proposal to include an expanded time window in future research.

Kaan, Dallas & Wijnen (2010) found that L2 learners cannot use context to predict upcoming syntactic structure during online processing, but as proficiency level increases, bilinguals become more capable of predicting upcoming syntactic information due to parsing. In the current experiment, there was no comparison between monolinguals and bilinguals, only within language modes. Our highly proficient participants exhibited a slower RT in the English experiment than in the Norwegian experiment, but they showed excellent prediction efficiency in both experiments. The current study presents no evidence of inefficiency in predicting upcoming information; it demonstrates that the process is indeed efficient because our participants are the same in both language tests. Kaan, Dallas & Wijnen (2010) points out that such a result is may only be due to parsing strategies. It is impossible to give a clear-cut answer to that theory without having compared our highly proficient bilinguals with low-proficient bilinguals, and since the current study obtained no

subjects with lower-level proficiency, we can say that the prediction efficiency could very well be only due to the nature of the proficiency level of our subjects, but it is inconclusive.

Language effect

The results showed an apparent main effect of language between both languages across all conditions. A mean RT across conditions in Norwegian was 360.6 and a mean value of 397 in English. A significant difference was encountered but also expected, as evidence in the past has shown that bilinguals respond slower in their second language than in their first (Shook et al.,2014). Such a main effect of language is only natural as early exposure to a language (s) forms language specificity. For example, past evidence has shown that as infants can distinguish differences among the phonetic units of native and foreign-language sounds, between the age of 6 and 12 months, the ability to differentiate foreign-language phonetic units strongly declines. This means that language becomes language specific at an early age, and foreign language learning starts decreasing at the infant phonetic level (Kuhl et al., 2003). This exhibits the difference between native and foreign language learning mechanism at the infant level. We predicted that our participants would perform slower in the English part of the experiment across sentence constraints due to the lack of nativeness as our participants were not exposed regularly to English until a mean estimate of 7.1 years. Regardless, the amount of English exposure that our participants have been submitted to is relatively high as they reported a high level of exposure to both English formal and informal learning. This could explain the high proficiency level with our participants.

One minor concern is the position of the English language in Norway and how it is defined as a second language compared to other countries and languages. Due to the overall high proficiency level of English amongst Norwegian speakers, a comparison should be made only with other second language learners with high proficiency levels, as a second language learner of, i.e. Spanish in the United States would not be comparable in proficiency level to a second language learner of English in Norway. It is more likely that a third language in Norway suits the requirements of comparison with a second language in the United States or the UK. For future research on language effects between Norwegian and English in Norwegian-English bilinguals in Norway, one aspect of interest would be to test low proficient bilinguals to see if the same pattern would occur as in the current experiment

and to test Norwegian-English bilinguals simultaneously with other bilinguals with similar language experience and level of proficiency. With that said, in bilingual research, the results often have to do with what participants we have got, and it can be demanding to find groups of participants that have to correlate on all demographic elements and only vary in their language experience because language experience alone interacts with other factors (Luk & Bialystok., 2013). Thus, the importance of self-reported measures such as the LEAP-Q. Evidence shows that bilinguals tend to be quite accurate when self-assessing. Luk & Bialystok (2013) used the Language and Social Background Questionnaire (LSBQ) and found that their factors of bilingual usage and English proficiency significantly correlated with their participants' self-rated judgments, confirming the validity of a self-assessment test.

Individual-difference effect

The factor contained four different factors, but only factor 3, **informal learning of English,** revealed an individual- difference effect that was seen in both languages. The factor indicates that the age when Norwegian- English bilinguals become fluent in speaking Norwegian and fluent in reading English is interconnected. According to the results, it may seem like the earlier you become fluent in speaking Norwegian, a tendency of earlier reading fluency is seen. Additionally, the results show that the difference between low constraint and high constraint sentences changes as your degree of informal learning increases. The most significant effect seems to be in the English task on the low-constraint sentence condition; thus, the response times of low-constraint sentences become faster as your informal English learning goes up. However, it is not surprising that informal learning interacts with behaviour in a spoken word comprehension task since many of the loading variables of informal learning included auditive modalities such as TV, music, interaction with family and friends. Since the RTs of the low-constraint sentences become faster, it seems to suggest that the effect is related to sentence structure rather than an effect of semantic context, but any further explanation is unresolved. In addition, an increase in informal learning, in this case, would suggest less context influence since we are dealing with the low-constraint sentence. A significance was also found in the Norwegian task concerning informal learning. Both the high-constraint and low constraint condition have a significant effect on informal learning. Faster response times in both conditions indicate an

increase in informal learning. Again, it may be due to the nature of the variables. One puzzling concern is that in both language tasks, we experienced the same direction of these effects. One explanation could be that several of the Norwegian variables from the factor analysis were removed due to lack of variation, and the remaining factors focused on English language behaviour, which could result in a Norwegian language behaviour limitation included in the analysis. In a way, it is likely that as informal learning increases, a negative effect should occur with regard to the Norwegian variables. Our graphs show otherwise and that the effect is similar in both languages. A second explanation to the informal learning factor could affect the amount of spoken language engagement overall since the effect moves in the same direction for the same variable.

Frequency effects

A words' frequency of occurrence in a language is an important effect to consider because it may be considered by far the most viable predictor of language performance (Cop, Keuleers, Drieghe & Duyck, 2015). The current experiment found that when the frequency of words was higher, there was an increase in the effect of predictiveness. As the word frequency increased, a larger difference between response times on low-constraint and high-constraint sentences was seen. Frequency effect was seen in both languages in low-constraint versus high-constraint conditions, but a lesser effect was seen in English than in Norwegian. The results indicate that frequency effects depend on the sentence condition, meaning that there is a difference between the high and low constraint sentences when the level of frequency changes. In the Norwegian version of the testing, we see that as the word frequency increases, the low and the high constraint sentences go in different directions, indicating that context is exploited even greater when dealing with high-frequent words. In the English test, both conditions move in the same direction, and our results are in line with Diependaele et al., 2013 and Gollan, Montoya, Cera & Sandoval, 2008, who found that a frequency effect in the L2 of bilinguals. These results are not surprising because high-frequency words are usually processed faster than low-frequency words, and it is seen to have a greater impact in the second language (Diependaele et al., 2013) than in the first language. There are two theories regarding the matter. The first theory claim that stronger frequency effects in the second language are caused by language competition (based on

interactive models of visual word recognition). The second theory believes that frequency effects occur due to differences in language-specific competence. Since there is much evidence for non-selective activation in bilinguals (Gerard & Scarborough, 1989; Costa, Caramazza & Galles, 2000; Miwa, Brummelhuis, Sappelli, & Baayen, 2010; Haigh & Jared, 2007), and the first theory assumes that in lexical activation, since both languages spread words across, it is possible that the reason for stronger frequency effects is that bilinguals need to handle more competition between related word form representations, more so than monolinguals. Bilinguals need to discriminate words from neighbours not only from in their first language but also their second language, hence, increased competition (Diependaele et al., 2013). Low-frequency words with high-frequency neighbours are especially thought to slow down the competition process even further (Segui & Grainger, 1990). This theory predicts that the amount of languages that someone knows plays a role in the degree of frequency effects that may occur and how proficient a person is in these languages (Gollan et al.,2008; Diependaele et al., 2013). This supports the findings of Gollan et al., 2008), who found a large frequency effect in L2, a lesser frequency effect in L1 bilinguals and a minimal effect in monolinguals. It should be mentioned that in Gollan et al. (2008)'s experiment only involved word production, which is different from word recognition. Regarding the proficiency prediction, it is assumed that as proficiency increases in one language in relation to another, the less affected is the processing of the target language from competition interference from a non-target language (Caramazza & Brones, 1979; Diependaele et al., 2013). Another prediction is that an increase in frequency can also have to do with similarities between two languages (i.e. . two languages that are orthographical similar). Another explanation that can explain stronger frequency effects in L2, according to the second theory, is that since there is a general lower-proficiency level in L2 than L1 in unbalanced bilinguals, lexical representations are processed with more energy in L2; thus, the representations become "weaker"(Ellis, 2002; Diependaele et al., 2013) and as a result, the frequency effects will be increased in L2. The more surprising results were the frequency effect seen in the Norwegian test. The high-constraint sentences behave as predicted, and if the word in the sentence increase in frequency, faster response times occurs. However, the low-constraint sentence behaves the same regardless of whether the word is low-frequent or high-frequent, which indicates that our participants have similar

response time with both conditions. A similar pattern is seen between the mixed word order and the low-constraint sentence. If we take an even closer look at figure 14, there is a slight indication that the low-constraint sentence moves in the opposite direction. If so, this would illustrate that high- frequent words are processed slower in the low-constraint sentences. This is a puzzling result and is partly in contrast with Gollan et al., 2008 who obtained only a small L1 frequency effect in their study. Regardless, another explanation for an increased frequency effect could be that the participants are presented with the target word visually prior to hearing it, which could facilitate the process and thus, create a larger effect of frequency.

Conclusion

These finding suggests that L2 processing is not that inherently different from L1 processing when considering highly proficient bilinguals. We do see a pattern of slower RT's in L2 compared to L1; however, the efficiency of predictive behaviour is still applicable. There is an obvious language effect across conditions in both languages, which supports earlier findings (Dijkgraaf et al.,2017; Altmann & Kamide, 1999). However, these results are also in contrast with other previous research regarding efficient language predictive processing in L2 (Dussias et al., 2013; Grüter, Lew-Williams & Fernald, 2012). The effects were seen between high-constraint, low-constraint, and mixed word order sentences support the interactive approach of a predicative, top-down sentence processing.

Future studies will have to point out more precisely what circumstances predictive language processing is retained to other aspects of language background and behaviour. We have seen that informal learning may be related to proficiency and that proficiency seems to be interconnected to the efficiency of predictive behaviour. Additionally, low proficiency should be considered as a variable to extend our understanding of the relationship between language profile, proficiency and speech comprehension in English even further. A cloze test was not included in the current experiment due to time-sensitive issues; however, such a test could perhaps have improved the stimuli to a degree. Regardless, it is unlikely that a slight improvement would have affected the results significantly.

Furthermore, all of our bilingual participants were tested in Norwegian first and then English, which may caused a priming effect; henceforth, it could be intriguing first to test

half of the participants in Norwegian and the other half in English and then the opposite. An inducement of the target language to enhance language activation could also be bettering during testing. In the translation of speech to an appropriate computational model, The BLINCS model seems to have promising potential as a bilingual model of spoken word comprehension because it can account for specific patterns of the bilingual lexicon. In the light of our findings, it certainly would be compelling to learn how this model would implement the bilingual ambiguities seen in the current study with regards to a bilingual's proficiency, language background, dominance level and even age of acquisition.

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Appendices

Appendix A: Amended LEAP-Q

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

SCREENING QUESTIONNAIRE

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		
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
(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

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	

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		
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 28.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 B: Target word and sentence stimuli – word monitoring task (Norwegian)

TARGET	CONDITION	SENTENCE
røver	High-Constraint Sentence	De lekte politi og **røver** ute i gata med de andre hele dagen.
røver	Low-Constraint Sentence	Han ville gjerne være **røver** mens vennen var politi når de lekte.
røver	Jumbled version of LC sentence	Ville gjerne han være **røver** lekte når var mens de politi vennen.
skuff	High-Constraint Sentence	Hun trakk ut en **skuff** og tok frem vottene.
skuff	Low-Constraint Sentence	Bortglemt i en **skuff** fant hun vottene.
skuff	Jumbled version of LC sentence	En i bortglemt **skuff** vottene fant hun.
tallerken	High-Constraint Sentence	Hun fant frem bestikk og **tallerken** og begynte å legge opp maten.
tallerken	Low-Constraint Sentence	Gutten fant frem duk og **tallerken** og begynte å dekke på bordet.
tallerken	Jumbled version of LC sentence	Duk frem fant gutten og **tallerken** å bordet begynte dekke og på.
skjørt	High-Constraint Sentence	Kleskoden var kjole eller **skjørt** for damer og dress for menn.
skjørt	Low-Constraint Sentence	Ofte foretrakk de heller **skjørt** enn kjole på søndager.
skjørt	Jumbled version of LC sentence	Foretrakk ofte de heller **skjørt** søndager på kjole enn.
hale	High-Constraint Sentence	Å logre uten **hale** er vanskelig for hunder.
hale	Low-Constraint Sentence	Å leve uten **hale** går fint for en hund.
hale	Jumbled version of LC sentence	Leve å uten **hale** hund for går en fint.
formue	High-Constraint Sentence	Min tante etterlot seg en stor **formue** som vi arvet.
formue	Low-Constraint Sentence	Jeg fikk vite at det lå en stor **formue** og ventet på meg der.
formue	Jumbled version of LC sentence	Lå en fikk det at jeg vite stor **formue** meg og på ventet der.
herre	High-Constraint Sentence	Mannen var en eldre **herre** med hatt som kjørte forsiktig.
herre	Low-Constraint Sentence	Varene fantes for **herre** og dame i forskjellige størrelser.
herre	Jumbled version of LC sentence	Fantes varene for **herre** forskjellige dame i og størrelser.
haug	High-Constraint Sentence	Hun rakte lauvet til en stor **haug** på plenen.
haug	Low-Constraint Sentence	Jenta så plutselig en stor **haug** på plenen.
haug	Jumbled version of LC sentence	en så jenta plutselig stor **haug** plenen på.
pølse	High-Constraint Sentence	Vi tente bål og grillet ei **pølse** mens vi så på skiløperne som kom forbi.
pølse	Low-Constraint Sentence	Vi pratet litt og fant frem ei **pølse** mens vi så på skiløperne som kom forbi.

pølse	Jumbled version of LC sentence	Og litt vi fant frem pratet ei **pølse** kom så mens forbi på som skiløperne vi.
beskjed	High-Constraint Sentence	Legen hadde ringt og lagt igjen **beskjed** på telefonsvareren til pasienten.
beskjed	Low-Constraint Sentence	Mannen hadde vært og gitt en **beskjed** til sekretæren på kontoret.
beskjed	Jumbled version of LC sentence	Hadde og mannen gitt vært en **beskjed** på sekretæren kontoret til.
skyld	High-Constraint Sentence	Kevin angret og følte **skyld** for det som hadde skjedd.
skyld	Low-Constraint Sentence	De endte med å dele **skyld** for det som hadde skjedd.
skyld	Jumbled version of LC sentence	Å de med endte dele **skyld** skjedd for det hadde som.
møte	High-Constraint Sentence	Politikerne satt i **møte** og ble avbrutt av telefonen.
møte	Low-Constraint Sentence	Kameratene var i **møte** på jobben da det skjedde.
møte	Jumbled version of LC sentence	Var kameratene i **møte** da det jobben skjedde på.
rett	High-Constraint Sentence	Kokken tilberedte en helt ny **rett** til konkurransen.
rett	Low-Constraint Sentence	Teamet hans utviklet en helt ny **rett** til konkurransen.
rett	Jumbled version of LC sentence	En utviklet teamet helt hans ny **rett** konkurransen til.
skole	High-Constraint Sentence	Elevene gikk på en **skole** som lå like i nærheten.
skole	Low-Constraint Sentence	De hadde oppdaget en **skole** ikke langt unna huset.
skole	Jumbled version of LC sentence	Hadde oppdaget de en **skole** langt ikke huset unna.
bilde	High-Constraint Sentence	Jeg fant frem kamera og tok et **bilde** av den fine utsikten.
bilde	Low-Constraint Sentence	Jeg lette videre og fant et **bilde** av den fine utsikten.
bilde	Jumbled version of LC sentence	Videre og lette jeg fant et **bilde** utsikten av fine den.
svulst	High-Constraint Sentence	Kreftlegene undersøkte ham og fant en stor **svulst** i tarmen.
svulst	Low-Constraint Sentence	De undersøkte ham nærmere og fant en stor **svulst** i tarmen.
svulst	Jumbled version of LC sentence	Ham en fant nærmere og undersøkte de stor **svulst** tarmen i.
pensel	High-Constraint Sentence	Han likte å male landskap med tynn **pensel** på lerret, og satte seg ved vinduet.
pensel	Low-Constraint Sentence	Det tok altfor mye tid å bruke tynn **pensel** til å male med, så han fant en tykkere.
pensel	Jumbled version of LC sentence	Mye tok bruke å altfor tid de tynn **pensel** så han tykkere med, til fant male å en.
konvolutt	High-Constraint Sentence	Hun signerte brevet og fant frem frimerke og **konvolutt** for å skrive på adressen.
konvolutt	Low-Constraint Sentence	Hun lette nederst i skuffen og fant frem penn og **konvolutt** og begynte å skrive brevet.
konvolutt	Jumbled version of LC sentence	Og skuffen fant hun i penn nederst frem lette og **konvolutt** skrive begynte brevet og å.

paraply	High-Constraint Sentence	Hun ville ikke bli våt og tok med seg en **paraply** da hun gikk ut.
paraply	Low-Constraint Sentence	Hun lette gjennom veska og fant til slutt en **paraply** helt på bunnen.
paraply	Jumbled version of LC sentence	Til gjennom lette slutt hun og veska fant en **paraply** bunnen helt på.
pil	High-Constraint Sentence	Han strammet buen godt, siktet og skjøt en **pil** mot blinken.
pil	Low-Constraint Sentence	Han rettet seg opp, pustet og sendte en **pil** mot blinken.
pil	Jumbled version of LC sentence	Og rettet opp, sendte han pustet seg en **pil** blinken mot.
bamse	High-Constraint Sentence	Far ligner på en bjørn og mor kaller han sin store **bamse** som alltid passer på.
bamse	Low-Constraint Sentence	Mor sier hun ser noe som ligner hennes store **bamse**, og det er far.
bamse	Jumbled version of LC sentence	Kun som noe ligner mor hennes sier ser store **bamse**, er det og far.
fiende	High-Constraint Sentence	Jeg ble virkelig min egen verste **fiende**, sa gutten trist.
fiende	Low-Constraint Sentence	Gutten sa at Ola var hans beste **fiende** i hele klassen.
fiende	Jumbled version of LC sentence	Gutten Ola sa hans var at beste **fiende** klassen i hele.
billett	High-Constraint Sentence	Jeg dro til kinoen for å kjøpe **billett** til kveldens forestilling.
billett	Low-Constraint Sentence	Jeg dro ned til byen for å kjøpe **billett** til kinoforestillingen.
billett	Jumbled version of LC sentence	Til å byen jeg for ned dro kjøpe **billett** kinoforestillingen til.
vits	High-Constraint Sentence	Hun trengte å le litt, så han fortalte en god **vits** for å muntre henne opp.
vits	Low-Constraint Sentence	Vennene satt på toget og ble servert en god **vits** som skulle få dem til å le.
vits	Jumbled version of LC sentence	På og ble satt en vennene servert toget god **vits** til dem le skulle få å som.
ønske	High-Constraint Sentence	Til jul skrev hun brev til nissen med ett eneste **ønske**, som var en ny sykkel.
ønske	Low-Constraint Sentence	Camilla gikk rundt og tenkte på sitt eneste **ønske**, som var å feire jul hjemme.
ønske	Jumbled version of LC sentence	Tenkte Camilla på rundt og sitt gikk eneste **ønske**, hjemme feire som jul å var.
selskap	High-Constraint Sentence	Kristine fylte år og pyntet til et stort **selskap** hjemme på gården.
selskap	Low-Constraint Sentence	To rørleggere dro kjapt av sted til et stort **selskap** med vannlekkasje.
selskap	Jumbled version of LC sentence	Et rørleggere sted til kjapt av to dro stort **selskap** vannlekkasje med.
regel	High-Constraint Sentence	De spilte Monopol og laget hver sin nye **regel** fordi de ikke kunne de vanlige reglene.
regel	Low-Constraint Sentence	Hele kvelden satt de og laget hver sin nye **regel** fordi de ikke kunne spillet.
regel	Jumbled version of LC sentence	Hver satt laget kvelden de og sin hele nye **regel** kunne fordi spillet ikke de.
mor	High-Constraint Sentence	Hun hadde endelig fått et barn og var blitt **mor** for første gang.

mor	Low-Constraint Sentence	Tannlegen kjente naboen min som var blitt **mor** for første gang.
mor	Jumbled version of LC sentence	Min som tannlegen var naboen kjente blitt **mor** gang første for.
ansvar	High-Constraint Sentence	Den jobben fører med seg et veldig stort **ansvar** for pasientene.
ansvar	Low-Constraint Sentence	De to barna gikk og snakket om hvor stort **ansvar** man får som voksen.
ansvar	Jumbled version of LC sentence	Barna de snakket gikk hvor to og om stort **ansvar** man voksen som får.
sted	High-Constraint Sentence	Om sommeren vet jeg om et hemmelig **sted** der det vokser jordbær.
sted	Low-Constraint Sentence	Snekkeren oppdaget et merkelig **sted** som var spennende å pusse opp.
sted	Jumbled version of LC sentence	Et oppdaget snekkeren merkelig **sted** spennende pusse å var opp som.
kiste	High-Constraint Sentence	Etter begravelsen måtte den avdøde bæres i ei **kiste** ut til gravstedet.
kiste	Low-Constraint Sentence	Etter at det hadde gått enda en stund, tok de med seg ei **kiste** for å legge ham i.
kiste	Jumbled version of LC sentence	Gått at de med det hadde en stund, enda seg tok etter ei **kiste** i legge ham å for.
gaffel	High-Constraint Sentence	Hun hadde bare fått kniv og spurte kelneren om å finne en **gaffel** til henne.
gaffel	Low-Constraint Sentence	De lette etter noe lurt til vaktmesteren og fant til slutt en **gaffel** i sølv.
gaffel	Jumbled version of LC sentence	Fant og etter lurt vaktmesteren lette noe de til til slutt en **gaffel** sølv i.
greve	High-Constraint Sentence	Han hadde kjøpt seg et ordentlig herskapshus og levde som en **greve** mens han nøt livet.
greve	Low-Constraint Sentence	En dag i sommerferien oppdaget vi at det var en **greve** på besøk i slottet.
greve	Jumbled version of LC sentence	Oppdaget sommerferien vi at var en dag det i en **greve** slottet på i besøk.
plakat	High-Constraint Sentence	Under demonstrasjonen sto det «Slipp ham ut!» på en stor **plakat** ved det gamle fengslet.
plakat	Low-Constraint Sentence	Senere den samme dagen fant en liten gutt en stor **plakat** ved det gamle fengslet.
plakat	Jumbled version of LC sentence	Liten samme den fant en dagen en senere gutt stor **plakat** det gamle ved fengslet.
nøkkel	High-Constraint Sentence	Døra var låst da de kom frem til hytta, men de fant en **nøkkel** som passet i boden.
nøkkel	Low-Constraint Sentence	Da Ada kikket rundt seg, oppdaget hun at det stod en **nøkkel** i døra.
nøkkel	Jumbled version of LC sentence	At stod hun kikket det da seg, oppdaget Ada rundt en **nøkkel** døra i.
hjerne	High-Constraint Sentence	En robot er god å ha, men den har ikke hjerte og **hjerne** slik som oss mennesker
hjerne	Low-Constraint Sentence	Noen steder i verden er det vanlig å spise rå **hjerne** fra dyr.
hjerne	Jumbled version of LC sentence	Spise i er vanlig det å verden steder noen rå **hjerne** dyr fra.
sikring	High-Constraint Sentence	Plutselig gikk strømmen i huset og mannen måtte skifte en **sikring** som var gått.
sikring	Low-Constraint Sentence	Katrine gikk målrettet bort dit og sjekket om det var en **sikring** som var gått.

sikring	Jumbled version of LC sentence	Bort sjekket gikk var målrettet om det dit og Katrine en **sikring** var som gått.
advarsel	High-Constraint Sentence	Han skulle hatt bot for å kjøre for fort, men slapp med en kraftig **advarsel** denne gangen.
advarsel	Low-Constraint Sentence	Det var favorittaktiviteten hans, men han fikk en heftig **advarsel** fra mor om å kjøre saktere.
advarsel	Jumbled version of LC sentence	En han favorittaktiviteten men hans, det fikk var heftig **advarsel** fra å kjøre mor om saktere.
premie	High-Constraint Sentence	Han vant konkurransen og lurte på om han ville få **premie** etterpå.
premie	Low-Constraint Sentence	Alle som kom frem før middagen ble servert, skulle få **premie** etterpå.
premie	Jumbled version of LC sentence	Servert før ble kom frem middagen skulle som alle få **premie** etterpå.
handel	High-Constraint Sentence	På Black Friday er det mange muligheter for å gjøre en god **handel** i butikkene.
handel	Low-Constraint Sentence	I bunn og grunn er det mange muligheter for å gjøre en god **handel** i butikkene.
handel	Jumbled version of LC sentence	En er mange og å muligheter bunn i det gjøre grunn for god **handel** butikkene i.
klem	High-Constraint Sentence	Kari var trist så han gikk bort for å gi henne en god **klem**, men hun vridde seg unna.
klem	Low-Constraint Sentence	Dette var slett ikke dagen for å komme med en god **klem**, og derfor gikk hun sin vei.
klem	Jumbled version of LC sentence	Slett med var for dette dagen komme en ikke å god **klem** derfor og vei hun sin gikk.
menneske	High-Constraint Sentence	Det var helt tomt i alle gatene og ikke et eneste **menneske** å se ute den dagen.
menneske	Low-Constraint Sentence	På den deilige turen opp på fjellet var det fint å se et **menneske** igjen.
menneske	Jumbled version of LC sentence	Se på å fint den fjellet opp på turen var det deilige et **menneske** igjen.
gutt	High-Constraint Sentence	De hadde fire jenter fra før og ønsket seg veldig en **gutt** denne gangen.
gutt	Low-Constraint Sentence	De hadde ventet lenge på dette og håpte det ble en **gutt** denne gangen.
gutt	Jumbled version of LC sentence	Håpte ble lenge på ventet hadde de dette det og en **gutt** gangen denne.
sak	High-Constraint Sentence	Politikerne i kommunestyret hadde en vanskelig **sak** til behandling.
sak	Low-Constraint Sentence	Line var klar over at dette ville bli en motbydelig **sak** å behandle.
sak	Jumbled version of LC sentence	Over at bli en ville var dette Line klar motbydelig **sak** behandle å.
behov	High-Constraint Sentence	Gutten var utagerende i klassen og det var stort **behov** for ekstra ressurser.
behov	Low-Constraint Sentence	De gikk en tur rundt vannet og snakket om at det var stort **behov** for opprydding der.
behov	Jumbled version of LC sentence	Rundt de var at tur snakket gikk om en det vannet og stort **behov** opprydding der for.
møll	High-Constraint Sentence	Da hun fant frem vinterkåpa, var den støvete og full av små hull, og det fløy **møll** ut av lomma.
møll	Low-Constraint Sentence	Da hun åpnet opp døra for første gang på lenge, oppdaget hun at det kom **møll** ut fra klærne.
møll	Jumbled version of LC sentence	Lenge døra det oppdaget at første hun på for opp hun gang da åpnet kom **møll** fra ut klærne.

åker	High-Constraint Sentence	Bonden hadde veldig mange gulrøtter og poteter som han plantet i en **åker** på gården sin.
åker	Low-Constraint Sentence	Tor hadde drømmer om vakre damer, aktive ferier og om å eie en **åker** om 10 år.
åker	Jumbled version of LC sentence	Aktive vakre om Tor eie hadde ferier å og om drømmer damer en **åker** år 10 om.
kalkun	High-Constraint Sentence	På nyttårsaften liker de alltid å servere vennene en saftig **kalkun** til middag.
kalkun	Low-Constraint Sentence	Noen ganger liker Jostein godt å overraske vennene med en god **kalkun** med stuffing.
kalkun	Jumbled version of LC sentence	Godt en å noen Jostein liker vennene overraske ganger med god **kalkun** stuffing med.
kurv	High-Constraint Sentence	Endelig var jordbærene her, så hun gikk bort til åkeren for å plukke en **kurv** med seg hjem.
kurv	Low-Constraint Sentence	Endelig var alle tantene her, og mamma dro til byen for å finne en **kurv** med jordbær til dessert.
kurv	Jumbled version of LC sentence	Mamma alle byen tantene dro å til finne og her, var endelig for en **kurv** til jordbær dessert med.
drage	High-Constraint Sentence	En dag det var passe sterk vind, gikk vi ut på et stort jorde for å fly med **drage** sammen med pappa.
drage	Low-Constraint Sentence	Da jeg var barn, likte jeg å dra ut sammen med pappa for å leke med **drage** i vinden.
drage	Jumbled version of LC sentence	Med da likte ut sammen for barn, å dra jeg var jeg pappa leke å med **drage** vinden i.
hummer	High-Constraint Sentence	I oktober er det mange på Sørlandet som finner frem teiner for å fange **hummer** til høstens festmåltider.
hummer	Low-Constraint Sentence	Når familien endelig er samlet til jul, gleder de seg til å finne frem **hummer** fra fryseren og lage et festmåltid.
hummer	Jumbled version of LC sentence	Seg jul, samlet familien de til endelig finne gleder er å til når frem **hummer** fra fryseren og festmåltid et lage.
elg	High-Constraint Sentence	Mange dyr forviller seg ut på veiene i høstmørket, og skrekken er å få en enorm **elg** på panseret.
elg	Low-Constraint Sentence	Det han fryktet på veien hjemover i ferien, var at det plutselig skulle komme en **elg** rett foran bilen.
elg	Jumbled version of LC sentence	Fryktet ferien, hjemover veien det komme i plutselig var på at han det skulle en **elg** foran bilen rett.
skap	High-Constraint Sentence	Det nye kjøkkenet hadde liten oppbevaringsplass, så de monterte et nytt **skap** på veggen.
skap	Low-Constraint Sentence	De hadde mange planer for det nye huset og startet med å finne et nytt **skap** til kjøkkenet.
skap	Jumbled version of LC sentence	Planer finne huset å og et nye mange de det for startet hadde med nytt **skap** kjøkkenet til.
tvang	High-Constraint Sentence	Den psykotiske mannen ville ikke legges inn frivillig, så de måtte bruke **tvang** for å få han med seg.
tvang	Low-Constraint Sentence	Mannen vandret på gaten en kald mandag morgen da noen plutselig måtte bruke **tvang** for å få han vekk fra stedet.
tvang	Jumbled version of LC sentence	Vandret gaten måtte da mandag plutselig morgen noen på en mannen kald bruke **tvang** vekk for han fra å få stedet.
hatt	High-Constraint Sentence	Sola stekte på hodet hans og han skulle ønske han hadde tatt på seg en **hatt** før han gikk ut.
hatt	Low-Constraint Sentence	Den gamle vaktmesteren gikk aldri utenfor døra uten å sette en **hatt** på hodet.
hatt	Jumbled version of LC sentence	Gikk sette uten å døra vaktmesteren utenfor gamle den aldri en **hatt** hodet på.
fengsel	High-Constraint Sentence	Den respektløse og utspekulerte mannen var skyldig og ble dømt til sju år i **fengsel** for noe han ikke hadde gjort.

fengsel	Low-Constraint Sentence	Venninnen til Kristine ble litt lei seg da hun endelig forstod at hun skulle i **fengsel** for noe hun ikke hadde gjort.
fengsel	Jumbled version of LC sentence	Skulle endelig ble hun venninnen at til lei forstod hun da Kristine seg litt i **fengsel** hadde noe for gjort hun ikke.
ferie	High-Constraint Sentence	På grunn av COVID-19 kan man ikke reise til utlandet, så vi må ta årets **ferie** innenlands.
ferie	Low-Constraint Sentence	Situasjonen gjør at mye er annerledes dette året, så derfor må Siris **ferie** gå innenlands i år.
ferie	Jumbled version of LC sentence	Må at gjør året, mye dette annerledes er så derfor situasjonen Siris **ferie** i innenlands gå år.
høst	High-Constraint Sentence	Sommeren var over, bladene skiftet farge og vi kunne endelig si at det var **høst** i bygda.
høst	Low-Constraint Sentence	Skogen var fantastisk vakker, duften var deilig og vi kunne endelig si at det var **høst** i bygda.
høst	Jumbled version of LC sentence	Si vi endelig var kunne deilig fantastisk det at og var vakker, skogen duften var **høst** bygda i.
vekt	High-Constraint Sentence	Nå har mamma gått opp så mange kilo at hun ikke lenger kan bruke en vanlig **vekt** slik som jeg gjør.
vekt	Low-Constraint Sentence	Mamma ville gjerne ha noe annet i julegave i år siden hun fikk en **vekt** i fjor.
vekt	Jumbled version of LC sentence	Julegave ha mamma i siden ville noe annet fikk år gjerne i hun en **vekt** fjor i.
ord	High-Constraint Sentence	Når livet er tungt og trist, er det virkelig godt å få høre noen gode **ord** til trøst.
ord	Low-Constraint Sentence	De gikk innom en bekjent som alltid er så snill, og fikk med seg noen gode **ord** på veien.
ord	Jumbled version of LC sentence	De alltid er med noen snill, og så fikk som bekjent innom seg en gikk gode **ord** veien på.
linjal	High-Constraint Sentence	Å tegne en rett strek uten **linjal** er ikke lett.
linjal	Low-Constraint Sentence	Å tegne et helt hus uten **linjal** er ikke lett.
linjal	Jumbled version of LC sentence	Helt tegne hus et å uten **linjal** er lett ikke.
blyant	High-Constraint Sentence	Hun kladdet med **blyant** for å kunne viske ut igjen.
blyant	Low-Constraint Sentence	Jenta fant fram blyant fra pennalet og skrev i vei.
blyant	Jumbled version of LC sentence	Fant jenta fram blyant skrev og fra pennalet vei i.
dam	High-Constraint Sentence	Endene svømte i en **dam** og ble matet med brød av barna.
dam	Low-Constraint Sentence	De tok turen ned til en **dam** for å mate endene.
dam	Jumbled version of LC sentence	Tok ned til de turen en **dam** for mate å endene.
skinke	High-Constraint Sentence	Vi kjøpte horn med ost og **skinke** til niste på turen.
skinke	Low-Constraint Sentence	Vi kjøpte poteter og **skinke** som skulle bli julemat.
skinke	Jumbled version of LC sentence	Kjøpte poteter vi og **skinke** bli som skulle julemat.
veske	High-Constraint Sentence	Som håndbagasje kan du ha en **veske** med inn på flyet.
veske	Low-Constraint Sentence	Hun reiste seg og tok med seg en **veske** med lommebok og mobil.

veske	Jumbled version of LC sentence	Reiste med hun seg tok seg og en **veske** mobil med lommebok og.
etappe	High-Constraint Sentence	På stafetten vant de siste **etappe** og sikret gullet.
etappe	Low-Constraint Sentence	Han skulle av sted på neste **etappe** og gjorde seg klar.
etappe	Jumbled version of LC sentence	Sted skulle på han av neste **etappe** seg gjorde og klar.
trussel	High-Constraint Sentence	Terroristene var en stor **trussel** for rikets sikkerhet.
trussel	Low-Constraint Sentence	Hun oppfattet det som en rar **trussel** og ikke en reell fare.
trussel	Jumbled version of LC sentence	En som det hun oppfattet rar **trussel** ikke fare og reell en.
himmel	High-Constraint Sentence	Utenfor var det sol, blå **himmel** og fantastisk natur.
himmel	Low-Constraint Sentence	Det finnes en nydelig **himmel** over jorda.
himmel	Jumbled version of LC sentence	Finnes en det nydelig **himmel** jorda over.
regjering	High-Constraint Sentence	Høyre dannet **regjering** sammen med Fremskrittspartiet.
regjering	Low-Constraint Sentence	Men uansett **regjering** blir resultatet ganske likt for miljøet.
regjering	Jumbled version of LC sentence	Uansett men **regjering** likt miljøet ganske resultatet for blir.
skatt	High-Constraint Sentence	Piraten lette etter en **skatt** som var skjult på øya.
skatt	Low-Constraint Sentence	Det viste seg å være en **skatt** som var skjult i hagen.
skatt	Jumbled version of LC sentence	Å være det seg viste en **skatt** var hagen som skjult i.
alder	High-Constraint Sentence	Ved femten års **alder** er det vanlig å konfirmeres.
alder	Low-Constraint Sentence	Dette er en **alder** der det er vanlig å konfirmeres.
alder	Jumbled version of LC sentence	Er dette en **alder** er konfirmeres vanlig det der å.
kvinne	High-Constraint Sentence	Brundtland var landets første **kvinne** til å bli statsminister.
kvinne	Low-Constraint Sentence	Siri var aller første **kvinne** til å bestige det høye fjellet.
kvinne	Jumbled version of LC sentence	Aller var Siri første **kvinne** høye å det bestige til fjellet.
kveld	High-Constraint Sentence	Jenta la seg trist hver **kveld** i fjorten dager på rad.
kveld	Low-Constraint Sentence	Guttene fant en klar **kveld** i august til å sove under åpen himmel.
kveld	Jumbled version of LC sentence	En fant gutten klar **kveld** å til himmel i åpen under sove august.
brann	High-Constraint Sentence	De så flammer fra en stor **brann** i kjøpesenteret.
brann	Low-Constraint Sentence	Pål fikk øye på en stor **brann** rett i nærheten.
brann	Jumbled version of LC sentence	En øye fikk på Pål stor **brann** i rett nærheten.

arbeid	High-Constraint Sentence	Elektrikerne gjorde et godt **arbeid** og firmaet gikk så det suste.
arbeid	Low-Constraint Sentence	Det er bedre å gjøre et godt **arbeid** helt fra starten av prosjektet.
arbeid	Jumbled version of LC sentence	Å er bedre det et gjøre godt **arbeid** starten helt prosjektet av fra.
klynge	High-Constraint Sentence	Alle jentene stod samlet i en stor **klynge** midt i skolegården.
klynge	Low-Constraint Sentence	Simon kjørte langs veien og så en stor **klynge** med hus midt på jordet.
klynge	Jumbled version of LC sentence	Så kjørte og veien en langs Simon stor **klynge** på med jordet midt hus.
nisse	High-Constraint Sentence	I jula pleier de å sette ut grøt til en **nisse** som de tror bor på låven.
nisse	Low-Constraint Sentence	Barna ble vettskremte da det plutselig kom en **nisse** inn i stua.
nisse	Jumbled version of LC sentence	Plutselig ble vettskremte barna kom da det en **nisse** stua inn i.
gren	High-Constraint Sentence	Hun så noen fine kongler som hang på en **gren** ute i skogen.
gren	Low-Constraint Sentence	På den daglige joggeturen så hun en **gren** med fine kongler ute i skogen.
gren	Jumbled version of LC sentence	Daglige så hun den joggeturen på en **gren** skogen i ute fine med kongler.
bekk	High-Constraint Sentence	De hørte sildringen fra vannet som rant i en **bekk** ved siden av stien.
bekk	Low-Constraint Sentence	De gikk tur på søndag formiddag og hørte en **bekk** med vann som sildret.
bekk	Jumbled version of LC sentence	Tur gikk på de formiddag og hørte søndag en **bekk** med sildret som vann.
sitron	High-Constraint Sentence	Kremen på kaken hadde en syrlig smak av **sitron** og smakte deilig.
sitron	Low-Constraint Sentence	Siri spurte desperat hva de hadde av **sitron** i butikken den dagen.
sitron	Jumbled version of LC sentence	Desperat hva Siri spurte hadde de av **sitron** i dagen butikken den.
teppe	High-Constraint Sentence	Gulvet var trist og kaldt, så de kjøpte et **teppe** som kunne friske opp stua.
teppe	Low-Constraint Sentence	På vei hjem fra bestemor kjøpte de et **teppe** som kunne gjøre det litt lunere i stua.
teppe	Jumbled version of LC sentence	Kjøpte bestemor fra på de hjem vei et **teppe** gjøre litt kunne stua det lunere som i.
vask	High-Constraint Sentence	Bilen var skitten og trengte en **vask**, så hun fant frem vannslangen.
vask	Low-Constraint Sentence	Hun så at alt sammen trengte en **vask**, så hun fant frem vannslangen.
vask	Jumbled version of LC sentence	Hun alt trengte så sammen at en **vask**, frem fant så vannslangen hun.
vegg	High-Constraint Sentence	De ville utvide kjøkkenet og slo ut en **vegg** mot stua for å få bedre plass.
vegg	Low-Constraint Sentence	De pusset opp kjøkkenet og oppdaget at en **vegg** var full av råte.
vegg	Jumbled version of LC sentence	Opp at kjøkkenet de oppdaget og pusset en **vegg** av var full råte.
mage	High-Constraint Sentence	Gutten lurte på om babyen i mammas **mage** kunne le slik som han.

mage	Low-Constraint Sentence	Gutten spurte om moren visste hvordan en **mage** ser ut innvendig.
mage	Jumbled version of LC sentence	Om visste moren gutten hvordan spurte en **mage** innvendig ut ser.
stein	High-Constraint Sentence	Han knuste naboens vindu med en **stein**, og dermed ringte de politiet.
stein	Low-Constraint Sentence	Han vandret rundt i byen og fant en **stein** som han kastet på vinduet til naboen.
stein	Jumbled version of LC sentence	Vandret og i han fant byen rundt en **stein** han på som vinduet kastet naboen til.
øl	High-Constraint Sentence	Det beste Ola visste om sommeren var en kald **øl** i sola
øl	Low-Constraint Sentence	Det beste Ola visste i hele verden var kald **øl** i sola om sommeren.
øl	Jumbled version of LC sentence	I Ola var verden hele visste det beste kald **øl** sola sommeren om i.
tro	High-Constraint Sentence	De ville tenke positivt, men hadde ingen **tro** på at dette skulle gå godt.
tro	Low-Constraint Sentence	De tre ungdommene prøvde, men hadde ingen **tro** på at dette skulle gå godt.
tro	Jumbled version of LC sentence	Ungdommene de prøvde, hadde tre men ingen **tro** på gå skulle at dette godt.
jente	High-Constraint Sentence	Guttene sa det var for tøft for henne som var **jente**, så derfor fikk hun ikke være med.
jente	Low-Constraint Sentence	Tante ble veldig overrasket da en som var **jente** prøvde og likevel klarte det.
jente	Jumbled version of LC sentence	Tante da veldig som overrasket ble en var **jente** likevel klarte det prøvde og.
rekke	High-Constraint Sentence	Hun stilte dem opp etter hverandre på **rekke** og rad bortover på plenen.
rekke	Low-Constraint Sentence	Hun kommenterte at alt sammen stod på **rekke** og rad bortover på plenen.
rekke	Jumbled version of LC sentence	Hun stod alt kommenterte at sammen på **rekke** rad på bortover og plenen.
uke	High-Constraint Sentence	På Sørlandet er vinterferien alltid i **uke** åtte hvert år.
uke	Low-Constraint Sentence	Barna synes det er vanskelig å vente til **uke** åtte og vinterferien.
uke	Jumbled version of LC sentence	Synes vanskelig er vente barna å det til **uke** vinterferien og åtte.
frakk	High-Constraint Sentence	Legen hadde nettopp kommet på jobb og gikk for å ta på seg ren **frakk** før skiftet.
frakk	Low-Constraint Sentence	Mannen hadde nettopp kommet på jobb og gikk for å finne frem en **frakk** før skiftet.
frakk	Jumbled version of LC sentence	Jobb finne frem gikk for mannen og å hadde på kommet nettopp en **frakk** skiftet før.
kirurg	High-Constraint Sentence	Legen som skulle utføre operasjonen, jobbet som **kirurg** på et samarbeidende sykehus.
kirurg	Low-Constraint Sentence	Den som var hovedansvarlig for arbeidet, jobbet som **kirurg** på et samarbeidende sykehus.
kirurg	Jumbled version of LC sentence	Var hovedansvarlig som den arbeidet, for jobbet som **kirurg** et sykehus på samarbeidende.
sprøyte	High-Constraint Sentence	Helsesøster satte vaksinen i armen til barnet med ei **sprøyte** på helsestasjonen.
sprøyte	Low-Constraint Sentence	Den store mannen ble redd og begynte å gråte da han fikk ei **sprøyte** av sykepleieren.

sprøyte	Jumbled version of LC sentence	Ble store å den og redd gråte han da mannen fikk begynte ei **sprøyte** sykepleieren av.
appelsin	High-Constraint Sentence	Hun tok en pause på skituren og satte seg ned for å skrelle en **appelsin** ved bålet.
appelsin	Low-Constraint Sentence	Hun satt på nattbussen hjem og hørte på musikk da hun fant frem en **appelsin** fra veska.
appelsin	Jumbled version of LC sentence	Musikk nattbussen hjem da frem på og hørte på hun fant hun satt en **appelsin** veska fra.
genser	High-Constraint Sentence	Selv om hun synes det er kjedelig å strikke armer, ble det til slutt **genser** av det.
genser	Low-Constraint Sentence	Selv om hun synes det er kjedelig med store prosjekter, ble det **genser** til slutt.
genser	Jumbled version of LC sentence	Hun selv om prosjekter, er synes kjedelig med ble det store det **genser** slutt til.
hjelm	High-Constraint Sentence	Gutten fikk ikke lov til å sykle til skolen uten **hjelm** og måtte hjem for å hente den.
hjelm	Low-Constraint Sentence	Det ble så travelt at han glemte seg og dro av sted uten **hjelm** og måtte hjem og hente den.
hjelm	Jumbled version of LC sentence	Glemte ble travelt sted dro han at så det og av seg uten **hjelm** hente og måtte og den hjem.
kjole	High-Constraint Sentence	Hun likte ikke å gå med bukser, så hun kjøpte en **kjole** til hverdagsbruk.
kjole	Low-Constraint Sentence	Kari tenkte hardt og nøye før hun endelig fant en **kjole** hun kunne ha på.
kjole	Jumbled version of LC sentence	Fant og Kari nøye hardt hun før endelig tenkte en **kjole** på hun ha kunne.
stol	High-Constraint Sentence	Middagen var klar, så han gikk til bordet og trakk ut en **stol** for å sette seg sammen med de andre.
stol	Low-Constraint Sentence	Middagen var klar, så han vasket hendene og tok en **stol** fra det andre rommet med seg til bordet.
stol	Jumbled version of LC sentence	Tok vasket klar, hendene middagen så han var og en **stol** bordet seg til det fra rommet med andre.
ulv	High-Constraint Sentence	Bonden lette etter lammene og så at de var tatt av **ulv** ute på beitet.
ulv	Low-Constraint Sentence	Karine gikk ut døra og oppdaget at det hadde vært **ulv** og tatt lammene.
ulv	Jumbled version of LC sentence	Hadde ut det og gikk oppdaget døra Karine vært at **ulv** og lammene tatt.
kunde	High-Constraint Sentence	Butikkmedarbeideren var opptatt med å hjelpe en **kunde** med å finne riktig størrelse.
kunde	Low-Constraint Sentence	Det var en stille og rolig formiddag og ikke en **kunde** i hele butikken.
kunde	Jumbled version of LC sentence	Og ikke rolig formiddag en det og stille var en **kunde** butikken i hele.
skade	High-Constraint Sentence	Forsikringsselskapet ringte etter at hun hadde meldt om en **skade** på bilen.
skade	Low-Constraint Sentence	Foreldrene ringte etter at de hadde sett at det var en **skade** på bilen.
skade	Jumbled version of LC sentence	Ringte de var sett det foreldrene hadde etter at at en **skade** bilen på.
bolig	High-Constraint Sentence	De ville bo nærmere skolen og lette etter en ny **bolig** i nærheten.
bolig	Low-Constraint Sentence	De lette rundt på nettet for å prøve å finne en ny **bolig** i nærheten.
bolig	Jumbled version of LC sentence	Å rundt en finne å lette prøve for nettet de på ny **bolig** nærheten i.

måned	High-Constraint Sentence	Det var begynnelsen av mars og påsken begynte om en knapp **måned** allerede.
måned	Low-Constraint Sentence	Paret diskuterte stadig at de virkelig trengte en slapp **måned** fordi de var slitne.
måned	Jumbled version of LC sentence	Stadig at diskuterte trengte de virkelig en paret slapp **måned** var fordi de slitne.
omgang	High-Constraint Sentence	De kjempet godt og ledet fotballkampen etter første **omgang,** så vidt det var.
omgang	Low-Constraint Sentence	Han skyndte seg alt han kunne og rakk akkurat første **omgang**, så vidt det var.
omgang	Jumbled version of LC sentence	Alt rakk akkurat han han seg skyndte kunne og første **omgang**, var vidt det så.
navn	High-Constraint Sentence	Foreldrene skulle døpe barnet, men fant ikke på et **navn** og måtte få hjelp av fadderne.
navn	Low-Constraint Sentence	Vi møttes helt tilfeldig, så jeg glemte å spørre om et **navn** jeg kunne henvise til.
navn	Jumbled version of LC sentence	Spørre tilfeldig, om helt å jeg møttes så glemte vi et **navn** kunne til jeg henvise.
kommode	High-Constraint Sentence	Huset ble mye ryddigere da de la tingene sine i hver sin skuff i en **kommode** som stod i gangen.
kommode	Low-Constraint Sentence	Alt ble så mye mer oversiktlig da de endelig gjorde alvor av å få en **kommode** til alle tingene.
kommode	Jumbled version of LC sentence	Ble så få endelig å oversiktlig alt alvor mye gjorde mer de da av en kommode tingene alle til.
frisyre	High-Constraint Sentence	Før bryllupet brukte hun flere timer på å få satt opp håret i en fin **frisyre** med pynt og blomster.
frisyre	Low-Constraint Sentence	Hun gledet seg til å treffe vennene sine igjen og fikk ordnet en fin **frisyre** og nye klær til festen.
frisyre	Jumbled version of LC sentence	Seg hun ordnet sine treffe gledet fikk en igjen til og vennene å fin **frisyre** festen nye og til klær.
bunad	High-Constraint Sentence	Jenta fant frem nasjonaldrakten på søttende mai, og gledet seg til å gå med **bunad** i toget.
bunad	Low-Constraint Sentence	Det var tjueførste juni og full sommer, men jenta ville likevel ha med **bunad** til bestemors fest.
bunad	Jumbled version of LC sentence	Juni ha var jenta tjueførste sommer, ville likevel full det men og med **bunad** fest til bestemors.
perm	High-Constraint Sentence	Hun ryddet i arkene på skrivebordet og fikk endelig satt dem inn i en **perm** som kunne stå i hylla.
perm	Low-Constraint Sentence	Hun lette ganske desperat gjennom hele huset og fant den mystisk nok i en **perm** bak en støvete hylle.
perm	Jumbled version of LC sentence	Hele gjennom huset lette hun den desperat mystisk og i ganske fant nok en **perm** en bak hylle støvete.
flis	High-Constraint Sentence	Hun fant frem sandpapir og begynte å pusse planken godt så ingen skulle få **flis** i fingeren.
flis	Low-Constraint Sentence	Jentene gjorde et grundig forarbeid for å sørge for at ingen skulle få **flis** i fingeren da de snekret.
flis	Jumbled version of LC sentence	Forarbeid for et ingen skulle sørge grundig at for jentene gjorde å få **flis** snekret de da fingeren i.
gris	High-Constraint Sentence	Hun hadde begynt å tenke på juleribba og gikk ut for å slakte en **gris** de hadde der.
gris	Low-Constraint Sentence	Barna syntes det var spennende å besøke naboen for å se på en **gris** med små grisunger.
gris	Jumbled version of LC sentence	Var å for besøke det syntes se naboen på barna å spennende en **gris** små grisunger med.
kanin	High-Constraint Sentence	Selv om gulrot er sunt for mennesker, er løvetann mye bedre mat for en **kanin** i grunnen.

kanin	Low-Constraint Sentence	Selv om det høres koselig ut, er det ingen god løsning å kjøpe en **kanin** hvis du ikke har tid til den.
kanin	Jumbled version of LC sentence	Kjøpe det er ingen ut, det løsning selv god om høres å koselig en **kanin** du ikke den har til hvis tid.
dugnad	High-Constraint Sentence	Malejobben blir alltid mye gøyere hvis mange venner samles til **dugnad** og får alt gjort i en fei.
dugnad	Low-Constraint Sentence	Vi hadde vært altfor lenge borte og samlet sammen mange venner til **dugnad** for å rydde hagen
dugnad	Jumbled version of LC sentence	Borte og lenge vært altfor hadde vi venner sammen samlet mange til **dugnad** hagen å rydde for.
jeger	High-Constraint Sentence	Jaktsesongen var i gang og de lette etter et rådyr som var skadeskutt av en **jeger** som satt på post.
jeger	Low-Constraint Sentence	Mannen hadde gått veldig langt og satte seg for å hvile da han plutselig så en **jeger** som kom ut av skogen.
jeger	Jumbled version of LC sentence	Å satte mannen han langt hvile så da og veldig hadde seg for gått plutselig en **jeger** skogen av kom som ut.
dommer	High-Constraint Sentence	Hvis siktede tilstår og samtykker til det, kan straffesaken avgjøres av en **dommer** alene.
dommer	Low-Constraint Sentence	Selv om alle sammen er enige om det, kan de ikke starte opp uten en **dommer** på banen.
dommer	Jumbled version of LC sentence	Alle uten er starte sammen ikke opp det, om enige kan om de selv en **dommer** banen på.
ansatt	High-Constraint Sentence	Daglig leder var sykemeldt, men nå hadde Kristina endelig fått en ny **ansatt** som kunne hjelpe henne.
ansatt	Low-Constraint Sentence	På fredagen fant de på mye gøy etter at de hadde endelig fått en ansatt som organiserte dette.
ansatt	Jumbled version of LC sentence	På etter gøy mye fått de fant på endelig at de hadde fredagen en **ansatt** dette organiserte som.
verdi	High-Constraint Sentence	Maleriene er nydelige, koster mye, og i snitt har de en **verdi** på en million kroner.
verdi	Low-Constraint Sentence	Vi diskuterte sakene i mange dager og ble enige om en **verdi** på en million kroner.
verdi	Jumbled version of LC sentence	Om i ble sakene dager og enige vi mange diskuterte en **verdi** kroner million en på.
retning	High-Constraint Sentence	Hun var forvirret over hvilken vei hun skulle gå og visste at de var på vei i feil **retning** bortover.
retning	Low-Constraint Sentence	Opplæringen de fikk var veldig mangelfull og verktøyene de brukte viste helt feil **retning** i målingene.
retning	Jumbled version of LC sentence	De veldig mangelfull verktøyene og helt opplæringen brukte de viste var fikk feil **retning** målingene i.
forslag	High-Constraint Sentence	Etter lange diskusjoner kom endelig et av partiene opp med et nytt **forslag** til løsning.
forslag	Low-Constraint Sentence	Det endte med å gå mange måneder og fremdeles var det ikke kommet noe nytt **forslag** til løsning.
forslag	Jumbled version of LC sentence	Mange å kommet og med gå det endte ikke det fremdeles noe måneder var nytt **forslag** løsning til.
kamp	High-Constraint Sentence	Fotballspillerne skulle til motstandernes arena for å spille søndagens **kamp**, og gikk inn i bussen.
kamp	Low-Constraint Sentence	De tre vennene skyndte seg for å rekke bussen hjem i tide til søndagens **kamp**, som gikk på TV.
kamp	Jumbled version of LC sentence	Bussen tre å tide seg vennene rekke skyndte for til i de hjem søndagens **kamp**, gikk TV som på.

Appendix C: Target word and sentence stimuli – word monitoring task (English)

TARGET	CONDITION	SENTENCE
spatula	High-Constraint Sentence	I flipped the pancake with the **spatula** without breaking it.
spatula	Low-Constraint Sentence	I tried to find the correct **spatula** to flip the pancake without breaking it.
spatula	Jumbled version of LC sentence	Tried the find to I correct **spatula** without pancake it to flip the breaking.
veil	High-Constraint Sentence	The bride covered her face with a **veil** made of silk.
veil	Low-Constraint Sentence	The seamstress sewed two sheets and a **veil** made of silk.
veil	Jumbled version of LC sentence	Sheets the and sewed two seamstress a **veil** of made silk.
shovel	High-Constraint Sentence	He was digging with a **shovel** in the garden.
shovel	Low-Constraint Sentence	In the store he bought a **shovel** for the garden.
shovel	Jumbled version of LC sentence	He in the bought store a **shovel** garden the for.
stove	High-Constraint Sentence	The hot pan was bubbling on the **stove** in the kitchen.
stove	Low-Constraint Sentence	Jonathan couldn't turn on the **stove** in the kitchen.
stove	Jumbled version of LC sentence	Turn couldn't Jonathan on the **stove** kitchen the in.
ink	High-Constraint Sentence	His green pen had just run out of **ink** in the office.
ink	Low-Constraint Sentence	They discovered they'd run out of **ink** in the office.
ink	Jumbled version of LC sentence	discovered run they out they'd of **ink** the in office.
shelf	High-Constraint Sentence	Sarah pulled the book off the **shelf** in the study.
shelf	Low-Constraint Sentence	Sarah saw the mouse on the **shelf** in the study.
shelf	Jumbled version of LC sentence	On saw mouse Sarah the **shelf** study in the .
carrot	High-Constraint Sentence	The rabbit chewed on a **carrot** that looked wilted.
carrot	Low-Constraint Sentence	On the shelf she found a **carrot** that looked wilted.
carrot	Jumbled version of LC sentence	Shelf found she the on a **carrot** looked that wilted.
spider	High-Constraint Sentence	The web had been spun by the large **spider** on our porch.
spider	Low-Constraint Sentence	He was trying to catch the large **spider** on the porch.
spider	Jumbled version of LC sentence	Trying the he catch was to large **spider** porch the on.
curtain	High-Constraint Sentence	She pulled back the plastic shower **curtain** and stepped into the tub.
curtain	Low-Constraint Sentence	Sally sewed a fine hem on the **curtain** for her daughter's bedroom.
curtain	Jumbled version of LC sentence	A on sewed Sally hem fine the **curtain** daughters for bedroom her.

pool	High-Constraint Sentence	We went swimming in the **pool** two hours after lunch.
pool	Low-Constraint Sentence	The girls walked into the **pool** to cool down on the hot day.
pool	Jumbled version of LC sentence	The walked into girls the **pool** down hot the cool day on to.
army	High-Constraint Sentence	The soldier decided to leave the **army** after Christmas.
army	Low-Constraint Sentence	The students were learning about the **army** after school.
army	Jumbled version of LC sentence	Were the learning about students the **army** school after.
cheese	High-Constraint Sentence	Cheddar is the best kind of **cheese** to put on a hot baked potato.
cheese	Low-Constraint Sentence	Ken usually puts lots of **cheese** on his hamburger as it is cooking on the grill.
cheese	Jumbled version of LC sentence	Lots put usually Ken of **cheese** hamburger his as is grill on cooking on it the.
truth	High-Constraint Sentence	No need to lie, John will tell me the **truth** about Sarah.
truth	Low-Constraint Sentence	Jim wondered if he could find out the **truth** about Sarah.
truth	Jumbled version of LC sentence	find if out wondered he could Jim the **truth** Sarah about.
floor	High-Constraint Sentence	Before mopping, he had to sweep the **floor** because the boss insisted.
floor	Low-Constraint Sentence	After the party they helped clean the **floor** because the boss insisted.
floor	Jumbled version of LC sentence	Clean after helped the party they the **floor** boss because insisted the.
kitchen	High-Constraint Sentence	The fridge and stove came with the **kitchen** but they had to buy the dishwasher.
kitchen	Low-Constraint Sentence	Liz enjoyed working in the **kitchen** evenings and weekends.
kitchen	Jumbled version of LC sentence	In enjoyed working Liz the **kitchen** and weekends evenings.
bleach	High-Constraint Sentence	To get your linen whiter, you should add a little **bleach** to the water.
bleach	Low-Constraint Sentence	To prepare the next sample, you should add a little **bleach** to the water.
bleach	Jumbled version of LC sentence	The to sample, you prepare add a next should little **bleach** the water to.
puddle	High-Constraint Sentence	The water from her umbrella collected in a **puddle** on the floor.
puddle	Low-Constraint Sentence	The fizzy drinks that they didn't finish made a big **puddle** on the floor.
puddle	Jumbled version of LC sentence	Finish drinks a they that the didn't made fizzy big **puddle** on floor the.
couch	High-Constraint Sentence	Lauren turned on the TV and laid down on the **couch** in the den.
couch	Low-Constraint Sentence	Before starting to paint the roof we covered the **couch** with a tarp.
couch	Jumbled version of LC sentence	We paint covered the before to roof starting the **couch** tarp a with.
dice	High-Constraint Sentence	To take her turn at Monopoly, Helen rolled the **dice** and moved the token.
dice	Low-Constraint Sentence	While cleaning out the cluttered closet, Helen found the **dice** and put it in the box.

dice	Jumbled version of LC sentence	Out the found closet, cleaning while Helen cluttered the **dice** in box it put the and.
pillow	High-Constraint Sentence	The little girl was tired and laid her head on the **pillow** and fell asleep.
pillow	Low-Constraint Sentence	Her wallet was missing, but she found it under her **pillow** in the bedroom.
pillow	Jumbled version of LC sentence	But missing, she found it her under wallet was her **pillow** the in bedroom.
chalk	High-Constraint Sentence	The teacher walked up to the board, grabbed a piece of **chalk** and started writing.
chalk	Low-Constraint Sentence	While cleaning the garage, the man found a piece of **chalk** hidden in a corner.
chalk	Jumbled version of LC sentence	Found a while the piece the garage, man cleaning of **chalk** in corner hidden a.
spell	High-Constraint Sentence	Merlin needed his magic wand to cast the **spell** for some reason.
spell	Low-Constraint Sentence	The princess could not be awakened by the **spell** for some reason.
spell	Jumbled version of LC sentence	Be the awakened by not could princess the **spell** reason for some.
lane	High-Constraint Sentence	Many highways in Norway only have one **lane** in each direction.
lane	Low-Constraint Sentence	The sixteen runners had to cross more than one **lane** to get to the other side.
lane	Jumbled version of LC sentence	Cross to sixteen than more had runners the one **lane** to other the to get side.
farmer	High-Constraint Sentence	Because he loved to work the land, Jim became a **farmer** in his hometown.
farmer	Low-Constraint Sentence	When he returned from his travels, Jim became a **farmer** in his hometown.
farmer	Jumbled version of LC sentence	From returned Jim became travels, he his when a **farmer** hometown his in.
flour	High-Constraint Sentence	To keep the dough from sticking, she dusted her hands with **flour** from the store.
flour	Low-Constraint Sentence	At the end of the day, all her clothes were covered with **flour** from the store.
flour	Jumbled version of LC sentence	Her the day, covered all clothes were end of at the with **flour** store the from.
suit	High-Constraint Sentence	To dress up for the wedding, he needed to buy a **suit** that fitted properly.
suit	Low-Constraint Sentence	Simon wanted to look good and needed to buy a **suit** that fitted properly.
suit	Jumbled version of LC sentence	Good to needed Simon and wanted look to buy a **suit** fitted that properly.
border	High-Constraint Sentence	The immigrants left Mexico and tried to cross the **border** into Texas.
border	Low-Constraint Sentence	The teenagers were afraid to fail when crossing the **border** into Texas.
border	Jumbled version of LC sentence	Crossing teenagers when afraid the fail to were the **border** Texas into.
farm	High-Constraint Sentence	Old McDonald had plenty of animals on his **farm** in Pennsylvania
farm	Low-Constraint Sentence	My uncle is installing solar panels on his **farm** in Pennsylvania.
farm	Jumbled version of LC sentence	Panels solar installing uncle on is my his **farm** Pennsylvania in.
sauce	High-Constraint Sentence	On the mashed potatoes she poured a delicious **sauce** that tastes great.

sauce	Low-Constraint Sentence	The restaurant was famous for their delicious **sauce** that tastes great.
sauce	Jumbled version of LC sentence	Restaurant their for the famous was delicious **sauce** great tastes that.
south	High-Constraint Sentence	Lines of longitude go from the north to the **south** I think.
south	Low-Constraint Sentence	On their long vacation, they traveled to the **south** I think.
south	Jumbled version of LC sentence	To traveled vacation, their they on long the **south** think I.
nappy	High-Constraint Sentence	The parent sensed a strange smell from the crib and checked the baby's **nappy** for accidents.
nappy	Low-Constraint Sentence	Before leaving the maternity ward, someone checked the baby's **nappy** for accidents.
nappy	Jumbled version of LC sentence	The leaving ward, the maternity someone before checked baby's **nappy** accidents for.
candy	High-Constraint Sentence	On Halloween, children in costumes grabbed several pieces of **candy** with nuts.
candy	Low-Constraint Sentence	The food scientists were trying to develop a new type of **candy** with nuts.
candy	Jumbled version of LC sentence	Were scientists develop food a the new type to trying of **candy** nuts with.
lawn	High-Constraint Sentence	The nice old woman next door offered to pay the child to mow the **lawn** in front of her house.
lawn	Low-Constraint Sentence	He suddenly saw the man he needed to talk to and left the **lawn** to catch up with him.
lawn	Jumbled version of LC sentence	He to the saw and he to needed left man talk suddenly the **lawn** him with catch up to.
tooth	High-Constraint Sentence	He made an appointment at the dentist to extract his broken **tooth** that was infected.
tooth	Low-Constraint Sentence	After some discussion, they decided to remove the broken **tooth** that was infected.
tooth	Jumbled version of LC sentence	Some remove the discussion, decided after they to broken **tooth** infected was that.
spoon	High-Constraint Sentence	After the evening meal, she ate her ice cream with a small metal **spoon** with a long handle.
spoon	Low-Constraint Sentence	At the flea market in Sacramento he bought a small metal **spoon** with a long handle.
spoon	Jumbled version of LC sentence	A Sacramento bought flea he small market at in the metal **spoon** handle long a with.
desk	High-Constraint Sentence	Late at the office, Victor can always be found sitting at his **desk** near the window.
desk	Low-Constraint Sentence	When I came home yesterday, I saw that Victor was fixing his **desk** near the window.
desk	Jumbled version of LC sentence	That was saw yesterday, I home when I fixing came Victor his **desk** window the near.
sentence	High-Constraint Sentence	Susan forgot to put a question mark at the end of the **sentence** in the essay.
sentence	Low-Constraint Sentence	The English teacher was pretty impressed by the length of the **sentence** in the essay.
sentence	Jumbled version of LC sentence	The length the by of impressed pretty was teacher English the **sentence** the in essay.
flower	High-Constraint Sentence	Pam received a rose, but really preferred any other type of **flower** according to Alan.
flower	Low-Constraint Sentence	Charlotte just finished reading a good book about a rare kind of **flower** according to Alan.
flower	Jumbled version of LC sentence	Just good book a finished a Charlotte rare kind about reading of flower according to Alan.

relief	High-Constraint Sentence	During her nasty headache, she took some painkillers to get some **relief** like we suggested.
relief	Low-Constraint Sentence	She decided they should take a longer vacation to get some **relief** like we suggested.
relief	Jumbled version of LC sentence	Take longer they get she to a should vacation decided some **relief** suggested we like.
memory	High-Constraint Sentence	Ben was great at remembering long numbers because he had a good **memory** since childhood.
memory	Low-Constraint Sentence	Ben was always an excellent employee because he had a good **memory** and worked efficiently.
memory	Jumbled version of LC sentence	Was had a because excellent he always employee an Ben good **memory** efficiently and worked.
plane	High-Constraint Sentence	The airport was crowded, and the passengers couldn't board the **plane** on the runway.
plane	Low-Constraint Sentence	After a three hour wait, the men could finally see the **plane** on the runway.
plane	Jumbled version of LC sentence	Hour could three see finally wait, the a men after the **plane** the on runway.
rubbish	High-Constraint Sentence	Susana walked over to the bin to throw away all the **rubbish** that had been cluttering up the basement.
rubbish	Low-Constraint Sentence	They drove through the street and saw that the empty lot was filled with **rubbish** from the construction work.
rubbish	Jumbled version of LC sentence	Drove the filled lot was street through and empty they the that saw with **rubbish** construction the work from.
collection	High-Constraint Sentence	Rachel bought yet another pair of new shoes to add to her **collection** and had to expand her wardrobe.
collection	Low-Constraint Sentence	Amanda had to expand the bedroom to make room for her **collection** of shoes she had aquired.
collection	Jumbled version of LC sentence	Bedroom to had room to Amanda expand make for the her **collection** aquired she of had shoes.
goal	High-Constraint Sentence	The football team celebrated after their player scored a **goal** during the game.
goal	Low-Constraint Sentence	All the young children knew that it was important to have a **goal** during the game.
goal	Jumbled version of LC sentence	Young important was to have knew all the children that it a **goal** the during game.
art	High-Constraint Sentence	My sister enjoys poetry, painting, and other forms of **art** from the past.
art	Low-Constraint Sentence	They hired the consultant because of her wide knowledge of **art** from the past.
art	Jumbled version of LC sentence	Of her knowledge hired consultant wide they because the of **art** the from past.
squid	High-Constraint Sentence	The impressive creature they saw was either an octopus or an enormous **squid** with long tentacles.
squid	Low-Constraint Sentence	The museum display had some very impressive pictures of an enormous **squid** with long tentacles.
squid	Jumbled version of LC sentence	Pictures of museum an impressive some display very the had enormous **squid** long tentacles with.
chimney	High-Constraint Sentence	Every Christmas Eve, Santa Claus lands on the roof with his sleigh and comes down through the **chimney** of the house.
chimney	Low-Constraint Sentence	Every spring, we go up to our summer house and clean out the basement and the **chimney** properly.
chimney	Jumbled version of LC sentence	House go the our spring, summer clean and we and to basement out every up the **chimney** properly.
revenge	High-Constraint Sentence	When she suddenly discovered that her husband was unfaithful, she decided to get **revenge** on him as soon as possible.
revenge	Low-Constraint Sentence	When she finally came home from her long trip to Australia, she decided to get **revenge** on him for being unfaithful.

revenge	Jumbled version of LC sentence	From finally decided she Australia, she came when home to to long her trip get **revenge** on being him unfaithful for.
cave	High-Constraint Sentence	The biologists at the local university knew that there were bats living in the **cave** in the woods.
cave	Low-Constraint Sentence	The biologists at the local university knew that there were animals in the **cave** in the woods.
cave	Jumbled version of LC sentence	In animals were the local biologists knew university that at there the the **cave** the in woods.
shelter	High-Constraint Sentence	In the blizzard, the shivering family came across a small cabin where they could find **shelter** from the storm.
shelter	Low-Constraint Sentence	They kept on walking in the same direction for another hour and managed to find **shelter** the from blizzard.
shelter	Jumbled version of LC sentence	Another same direction managed on the kept and in walking hour for to they find **shelter** from blizzard the.
valley	High-Constraint Sentence	The beautiful little village of Willingdon lies right between two hills in a **valley** somewhere in Canada.
valley	Low-Constraint Sentence	The beautiful little girl lives in a house which sits right between two shops in a **valley** somewhere in Colorado.
valley	Jumbled version of LC sentence	Two shops house in lives right sits a beautiful little which the between in girl a **valley** Colorado in somewhere.
forest	High-Constraint Sentence	Many fairy tales describe quite frightening stories about how children get lost in the **forest** and need to be rescued by a hero.
forest	Low-Constraint Sentence	The new state senator was elected because she supported a bill to protect the **forest** and endangered species.
forest	Jumbled version of LC sentence	State a the was senator because protect to bill supported she elected new the **forest** species and endangered.
attempt	High-Constraint Sentence	We had repeatedly tried to get in contact with Mr Smith and decided to make another **attempt** before giving up.
attempt	Low-Constraint Sentence	Mr Smith had been away for a long time, so we decided that it was time to make another **attempt** to contact him.
attempt	Jumbled version of LC sentence	Mr time it we been away was make Smith decided a for that time, long had so to another **attempt** him to contact.
favour	High-Constraint Sentence	I needed help and went over to the neighbour to ask if she would do me a **favour** that afternoon.
favour	Low-Constraint Sentence	When I got home from work that evening, the neighbour came over and asked about a **favour** I had done for his brother.
favour	Jumbled version of LC sentence	When I home evening the got from work that came neighbour asked over about and a **favour** had done I for brother his.
vehicle	High-Constraint Sentence	The police officer asked the driver whether she was the registered owner of the **vehicle** she was driving.
vehicle	Low-Constraint Sentence	The curious neighbour asked the young woman whether she was the lucky owner of the **vehicle** she was driving.
vehicle	Jumbled version of LC sentence	Young curious was neighbour the lucky she whether of owner the woman asked the the **vehicle** driving was she.
bottle	High-Constraint Sentence	The fascinating fairy tale tells about a genie who is stuck inside a **bottle** and cannot escape.
bottle	Low-Constraint Sentence	The fascinating story tells about the life of man who lives inside a **bottle** because he is a genie.
bottle	Jumbled version of LC sentence	The the story fascinating tells inside of life lives who man about a **bottle** genie he is a because.
voice	High-Constraint Sentence	Only minutes before the show started, the sick opera singer suddenly lost her **voice** and couldn't speak.
voice	Low-Constraint Sentence	Only minutes before leaving for an important meeting, she suddenly lost her **voice** and couldn't speak.
voice	Jumbled version of LC sentence	Before she an minutes meeting, leaving lost suddenly important only for her **voice** and speak couldn't.
office	High-Constraint Sentence	We have been working hard to establish our company abroad and have recently opened a new **office** in London.

office	Low-Constraint Sentence	After spending a relaxing weekend at the beach, we went to visit the recently opened new **office** nearby.
office	Jumbled version of LC sentence	Visit after opened at weekend went relaxing to we the beach recently a spending the new **office** nearby.
bed	High-Constraint Sentence	When I arrived at the mountain cabin, I helped my grandmother change the sheets on the **bed** in the guestroom.
bed	Low-Constraint Sentence	When I arrived at the mountain cabin, there was a pile of presents waiting on the **bed** in the guestroom.
bed	Jumbled version of LC sentence	Waiting was I at when pile of there a mountain presents arrived the on cabin the **bed** guestroom in the.
garden	High-Constraint Sentence	Several beautiful varieties of colourful tulips were growing in the **garden** in the spring.
garden	Low-Constraint Sentence	She loved to immerse herself in the abundance of beautiful colours all over the **garden** in spring.
garden	Jumbled version of LC sentence	All to in herself over of she immerse colours beautiful the loved abundance the **garden** spring in.
thimble	High-Constraint Sentence	The seamstress placed the silver **thimble** on her finger to avoid injury.
thimble	Low-Constraint Sentence	The man often placed an old **thimble** on the end of his cane in order to make a loud noise.
thimble	Jumbled version of LC sentence	Man often an the placed old **thimble** end a noise of to on his the make loud cane order in.
napkin	High-Constraint Sentence	The food was messy, so he grabbed a **napkin** from the counter.
napkin	Low-Constraint Sentence	While walking down the street he dropped a **napkin** on the ground.
napkin	Jumbled version of LC sentence	Street while dropped he the down walking a **napkin** ground the on.
broom	High-Constraint Sentence	He swept up the broken glass with the **broom** from the supply closet.
broom	Low-Constraint Sentence	After school, the children used an old **broom** and pretended it was a horse.
broom	Jumbled version of LC sentence	School an after children the used old **broom** a was and horse pretended it.
pumpkin	High-Constraint Sentence	For Halloween, they carved out a large **pumpkin** at the Farmer's market.
pumpkin	Low-Constraint Sentence	Before the party, they bought a large **pumpkin** at the Farmer's market.
pumpkin	Jumbled version of LC sentence	Party bought before the a they large **pumpkin** the market Farmers at.
drought	High-Constraint Sentence	The lake had dried up after the **drought** in California.
drought	Low-Constraint Sentence	The men made a film about the **drought** in California.
drought	Jumbled version of LC sentence	About a the film men made the **drought** California in.
towel	High-Constraint Sentence	She dried herself off with the **towel** hanging on the rack.
towel	Low-Constraint Sentence	The department store has a **towel** sale through next Thursday.
towel	Jumbled version of LC sentence	Department has store the a **towel** Thursday next sale through.
sponge	High-Constraint Sentence	She wiped up the spilt milk with a **sponge** that she found under the sink.
sponge	Low-Constraint Sentence	Jim went over and bought a new **sponge** at the drugstore in the mall.
sponge	Jumbled version of LC sentence	Bought over went and a Jim new **sponge** the the mall at drugstore in.

throat	High-Constraint Sentence	The pill I swallowed is stuck in my **throat** which is uncomfortable.
throat	Low-Constraint Sentence	They can't do anything to fix my **throat** which is uncomfortable.
throat	Jumbled version of LC sentence	Anything to can't do fix they my **throat** is which uncomfortable.
iron	High-Constraint Sentence	I smoothed the wrinkles with the new **iron** in the bedroom.
iron	Low-Constraint Sentence	Water was coming out of the new **iron** in the bedroom.
iron	Jumbled version of LC sentence	Out coming water the was of new **iron** in bedroom the.
smoke	High-Constraint Sentence	The firefighter saw clouds of grey **smoke** coming out of the burning house.
smoke	Low-Constraint Sentence	When we got closer, we saw lots of grey **smoke** coming out of the burning house.
smoke	Jumbled version of LC sentence	Saw of when lots we closer we got grey **smoke** burning of house out the coming.
frame	High-Constraint Sentence	She displayed the photo in a nice **frame** made of silver.
frame	Low-Constraint Sentence	When in town she bought a really nice **frame** made of silver.
frame	Jumbled version of LC sentence	A she when in really bought town nice **frame** silver of made.
beach	High-Constraint Sentence	The resort had a sandy, long **beach** and new tennis courts.
beach	Low-Constraint Sentence	Kim and Susan drove to the long **beach** to have a swim.
beach	Jumbled version of LC sentence	Drove to Kim the Susan and long **beach** a have swim to.
star	High-Constraint Sentence	Next to the moon, a bright **star** lit up the sky.
star	Low-Constraint Sentence	The two girls saw the first **star** that lit up the sky.
star	Jumbled version of LC sentence	Two the the saw girls first **star** up sky the that lit.
letter	High-Constraint Sentence	He put a stamp on the **letter** before he mailed it.
letter	Low-Constraint Sentence	Her grandmother dropped the **letter** in the mailbox at the corner.
letter	Jumbled version of LC sentence	Grandmother her dropped the **letter** the at corner in mailbox the.
street	High-Constraint Sentence	Always look both ways when crossing a **street** as busy as that one.
street	Low-Constraint Sentence	It was not bad advice to choose a **street** as busy as that one.
street	Jumbled version of LC sentence	Advice was not choose it to bad a **street** as that busy one as.
scripture	High-Constraint Sentence	To read the prophecy, he unrolled an ancient **scripture** from Egypt.
scripture	Low-Constraint Sentence	A couple of researchers just found a recent **scripture** from Egypt.
scripture	Jumbled version of LC sentence	Researchers a found a couple just of recent **scripture** Egypt from.
paw	High-Constraint Sentence	The dog stepped on glass on his walk and was licking his **paw** to clean the cut.
paw	Low-Constraint Sentence	The poor injured animal was trying to clean his **paw** which had a wound.

paw	Jumbled version of LC sentence	Animal clean to the trying was injured poor his **paw** had wound which a.
hose	High-Constraint Sentence	To water the huge garden, they needed a long **hose** with an attachment.
hose	Low-Constraint Sentence	Over at the loading dock, they needed a strong **hose** with an attachment.
hose	Jumbled version of LC sentence	Loading the at over a needed dock, they strong **hose** an with attachment.
shield	High-Constraint Sentence	The warrior blocked the spear thrust with his metal **shield** covered in spikes.
shield	Low-Constraint Sentence	The famous young artist designed the new metal **shield** on the building.
shield	Jumbled version of LC sentence	Designed the new famous the artist young metal **shield** building the on.
cart	High-Constraint Sentence	At the supermarket, the toddler wanted to push the **cart** near the tall shelves.
cart	Low-Constraint Sentence	At work, the assistant needed to find the **cart** near the tall shelves.
cart	Jumbled version of LC sentence	needed at find work, to the assistant the **cart** shelves near tall the.
attic	High-Constraint Sentence	They stored all of the Christmas tree decorations up in the **attic** at home.
attic	Low-Constraint Sentence	The young accountant put all of the old documents in the **attic** at home.
attic	Jumbled version of LC sentence	All of put old the in young the accountant documents the **attic** home at.
slice	High-Constraint Sentence	The birthday boy didn't want frosting on his **slice** of cake after all.
slice	Low-Constraint Sentence	My husband saw that he could not finish his **slice** of cake after all.
slice	Jumbled version of LC sentence	My could he finish that saw husband not his **slice** after of all cake.
lawyer	High-Constraint Sentence	When the company sued him, he decided to hire a **lawyer** right away.
lawyer	Low-Constraint Sentence	After reading the letter, he decided to call a **lawyer** right away.
lawyer	Jumbled version of LC sentence	Call he the reading decided letter, after to a **lawyer** away right.
library	High-Constraint Sentence	The book was overdue so Billy returned it to the **library** down the street.
library	Low-Constraint Sentence	After finishing up at the store, they went into the **library** down the street.
library	Jumbled version of LC sentence	Went the they after store, into at up finishing the **library** street the down.
nest	High-Constraint Sentence	Before laying its eggs, the robin had to build a **nest** made of twigs.
nest	Low-Constraint Sentence	While cleaning up outside, Jennifer came across a **nest** made of twigs.
nest	Jumbled version of LC sentence	Across Jennifer up while outside, came cleaning a **nest** of made twigs.
paint	High-Constraint Sentence	The young artist dipped her brush into a fresh can of **paint** for the mural.
paint	Low-Constraint Sentence	Eric had always wanted to try a new type of **paint** for the mural.
paint	Jumbled version of LC sentence	Wanted a try to had type new Eric always of **paint** mural the for.
wood	High-Constraint Sentence	At the sawmill they slice logs into long planks of **wood** with smooth edges.

wood	Low-Constraint Sentence	At the old burial site they found weapons made of **wood** with smooth edges.
wood	Jumbled version of LC sentence	Site made at burial they the weapons found old of **wood** smooth with edges.
sugar	High-Constraint Sentence	The children had many cavities in their teeth because they ate a lot of **sugar** all the time.
sugar	Low-Constraint Sentence	The hotel didn't have coffee, so instead they asked for **sugar** with their tea.
sugar	Jumbled version of LC sentence	Have didn't so they coffee, hotel the asked instead for **sugar** tea their with.
court	High-Constraint Sentence	Eric sued the taxi driver and took him to **court** on Tuesday.
court	Low-Constraint Sentence	Eric picked up his grandfather and brought him to **court** on Tuesday.
court	Jumbled version of LC sentence	Picked grandfather brought his Eric him up and to **court** Tuesday on.
election	High-Constraint Sentence	The senator campaigned in order to win the **election** that was weeks away.
election	Low-Constraint Sentence	My new roommate needed to learn more about the **election** that was weeks away.
election	Jumbled version of LC sentence	About to needed learn new more my roommate the **election** was away weeks that.
turtle	High-Constraint Sentence	The beautiful little pond had a few fish and a small green **turtle** swimming near the shore.
turtle	Low-Constraint Sentence	The town had a beautiful park with a statue of a small **turtle** sitting in a little pond.
turtle	Jumbled version of LC sentence	Beautiful a statue park of a town a the had with small turtle a in sitting pond little
glove	High-Constraint Sentence	At the hospital, the doctor took off his sterile rubber **glove** because it was broken.
glove	Low-Constraint Sentence	Just before the feast, grandmother needed to buy one thicker **glove** for the oven.
glove	Jumbled version of LC sentence	Buy one the feast, to just needed grandmother before thicker **glove** oven the for.
liar	High-Constraint Sentence	Because Peter never told the truth, everyone knew he was a **liar** with real issues
liar	Low-Constraint Sentence	After Peter got out of prison, everyone knew he was a **liar** with real issues.
liar	Jumbled version of LC sentence	Out he after of was everyone prison, Peter knew got a **liar** issues real with.
coin	High-Constraint Sentence	We argued about who should go first and agreed to flip a **coin** to decide.
coin	Low-Constraint Sentence	He was carrying so much stuff in his hands that he dropped a **coin** on the ground.
coin	Jumbled version of LC sentence	Stuff much was so his he hands in that he dropped carrying a **coin** ground the on.
leaf	High-Constraint Sentence	He was walking through the autumn forest and saw a falling **leaf** landing on the path.
leaf	Low-Constraint Sentence	He was walking through the streets one evening and saw a falling **leaf** landing on the path.
leaf	Jumbled version of LC sentence	Saw he through the a and walking one was streets evening falling **leaf** the on landing path.
snake	High-Constraint Sentence	A boa constrictor is a very dangerous type of **snake** in the jungle.
snake	Low-Constraint Sentence	My little sister had never in her life seen that type of **snake** in the jungle.
snake	Jumbled version of LC sentence	Her life seen my that in had sister never type little of **snake** jungle the in.

possession	High-Constraint Sentence	This pen that my old grandfather gave me happens to be my most treasured **possession** and it brings back lots of memories.
possession	Low-Constraint Sentence	Sarah could not believe this would end up being her most hated **possession** and it brings back lots of memories.
possession	Jumbled version of LC sentence	Most would end Sarah up being believe this her could not hated **possession** it lots back and brings of memories.
nurse	High-Constraint Sentence	My medical records are accessible to the doctor and the **nurse** at the clinic.
nurse	Low-Constraint Sentence	Afterwards, she had to be interviewed by both the lawyer and the **nurse** at the clinic.
nurse	Jumbled version of LC sentence	She both had lawyer and the be by afterwards, interviewed to the **nurse** at clinic the.
equipment	High-Constraint Sentence	Every major hospital always has quite a lot of special **equipment** for medical purposes.
equipment	Low-Constraint Sentence	Every time they came together for rehearsals, they used special **equipment** to get the effect they wanted.
equipment	Jumbled version of LC sentence	Every used came they rehearsals, time they together for special **equipment** effect get the to they wanted.
vision	High-Constraint Sentence	If you keep staring directly at the bright light, you can damage your **vision** for good.
vision	Low-Constraint Sentence	If you avoid seeing a doctor about this, you can damage your **vision** for good.
vision	Jumbled version of LC sentence	Damage you if doctor seeing this, a about avoid you can your **vision** good for.
vegetable	High-Constraint Sentence	It is a fact that the potato is the most popular **vegetable** in this country.
vegetable	Low-Constraint Sentence	He was often reminded that this country's most popular **vegetable** is the potato.
vegetable	Jumbled version of LC sentence	Most he often country's reminded was that this popular **vegetable** the is potato.
speech	High-Constraint Sentence	The politician stood at the podium and gave a long **speech** about slavery.
speech	Low-Constraint Sentence	Harry and his friends were chatting together after the long **speech** about politics.
speech	Jumbled version of LC sentence	After and his were chatting the friends together Harry long **speech** politics about.
sign	High-Constraint Sentence	When exiting the highway, they had trouble reading the small **sign** in the distance.
sign	Low-Constraint Sentence	When driving along the highway, they suddenly saw a small **sign** in the distance.
sign	Jumbled version of LC sentence	When suddenly along saw highway, the a driving they small sign the in distance.
island	High-Constraint Sentence	The sailors saw a single palm tree in the center of the **island** in Bermuda.
island	Low-Constraint Sentence	The rescue workers just learned that the captain had died on the **island** in Bermuda.
island	Jumbled version of LC sentence	That died the the just on captain workers had learned rescue the **island** Bermuda in.
animal	High-Constraint Sentence	The little bumblebee bat is officially the world’s smallest **animal** and is about the size of a thumb.
animal	Low-Constraint Sentence	All the scientists were asked questions about the world’s smallest **animal** which is the bumblebee bat.
animal	Jumbled version of LC sentence	Were the asked scientists the world’s questions about all smallest **animal** is the bat which bumblebee.
utensil	High-Constraint Sentence	I searched among all the ladles and whisks in the drawer to find a suitable **utensil** for my purpose.
utensil	Low-Constraint Sentence	I searched through a huge number of drawers to see if I could find a suitable **utensil** for my purpose.

utensil	Jumbled version of LC sentence	Through I find drawers a number if could a searched huge I of see to suitable **utensil** my for purpose.
poison	High-Constraint Sentence	In the famous play, Romeo and Juliet died after drinking a cup of **poison** in despair.
poison	Low-Constraint Sentence	The naive young woman next door didn't realize that she was served a cup of **poison** last night.
poison	Jumbled version of LC sentence	Naive didn't cup realize was she a woman served the door young that next of **poison** night last.
witch	High-Constraint Sentence	The kids started to believe that the scary old woman next door was probably a **witch** after all.
witch	Low-Constraint Sentence	She finally decided that she would never write a children's story about a **witch** after all.
witch	Jumbled version of LC sentence	Write children's would that she about she never a finally decided story a **witch** all after.
hook	High-Constraint Sentence	The fisherman ankered his boat in the middle of the sea and attached the worm to the **hook** with the sharp point.
hook	Low-Constraint Sentence	Young James was crying and feeling upset because he didn't have enough money for the **hook** with the sharp point.
hook	Jumbled version of LC sentence	Was and because feeling young crying he have enough upset James didn't for money the **hook** point with sharp the.
shark	High-Constraint Sentence	He was swimming in the Atlantic Ocean when he was attacked by a scary **shark** in the ocean.
shark	Low-Constraint Sentence	The men were walking along the path talking when they suddenly saw a scary **shark** in the ocean.
shark	Jumbled version of LC sentence	Talking the along suddenly path saw the men when a walking were they scary shark ocean in the.
rope	High-Constraint Sentence	When climbing up the mountain, the climbers and guide were attached to each other by a **rope** made of nylon.
rope	Low-Constraint Sentence	To prepare for his adventures, Simon went to the sports equipment store and bought a **rope** made of nylon.
rope	Jumbled version of LC sentence	Sports his store went prepare bought for to the adventures, to equipment Simon and a **rope** nylon of made.
mountain	High-Constraint Sentence	The fearless hikers climbed all the way up to the top of the **mountain** in the Alps.
mountain	Low-Constraint Sentence	All the eager students in my class learnt the fascinating history of the **mountain** in the book.
mountain	Jumbled version of LC sentence	History my students the eager in learnt fascinating all class of the the **mountain** the in book.
recipe	High-Constraint Sentence	When planning the dinner for his girlfriend’s birthday, he decided to try out a brand new **receipe** she had found online.
recipe	Low-Constraint Sentence	When planning an activity for the weekend, he decided to try out a brand new **recipe** he had found online.
recipe	Jumbled version of LC sentence	Activity when to try decided planning a new brand an he the weekend, for out **recipe** found he had online
bike	High-Constraint Sentence	It would be better for the environment if more people parked their car and started using a **bike** to get to work.
bike	Low-Constraint Sentence	In order to see the lights on our last holiday abroad we decided to try using a **bike** to get around.
bike	Jumbled version of LC sentence	Activity when to try decided planning a new brand an he the weekend, for out **bike** get to around.
advantage	High-Constraint Sentence	I know your mother has offered to babysit, but I don't want her to think we're taking **advantage** of her.
advantage	Low-Constraint Sentence	During our holiday we were driving from cost to cost in the United States and the **advantage** of prebooking became so clear.
advantage	Jumbled version of LC sentence	Our in holiday United States driving cost were to and cost the during we from the **advantage** clear of prebooking so became.
skin	High-Constraint Sentence	If you forget to put on plenty of sunscreen at the beach, you can damage the **skin** quite badly.

skin	Low-Constraint Sentence	The large factory nearby produces noxious chemicals that can damage the **skin** quite badly.
skin	Jumbled version of LC sentence	Nearby chemicals damage that noxious the large produces factory can the **skin** badly quite.
teacher	High-Constraint Sentence	The graduate student went straight to school where he entered the classroom to ask the **teacher** for help with his assignment.
teacher	Low-Constraint Sentence	Mary was very confused about what she had just heard and wanted to ask the **teacher** for help after class.
teacher	Jumbled version of LC sentence	She wanted what and heard confused Mary was ask just very had about to the **teacher** class after help for.
wedding	High-Constraint Sentence	The bride was so disappointed in her father that she refused to invite him to the **wedding** for some reason.
wedding	Low-Constraint Sentence	Her sister's lazy teenage son decided to stay at home and refused to go to the **wedding** for some reason.
wedding	Jumbled version of LC sentence	At to decided to stay lazy son refused home sister's to teenage and her go the **wedding** reason some for.
air	High-Constraint Sentence	In some of the world's most polluted cities, it is barely possible to breathe the **air** outside the building.
air	Low-Constraint Sentence	The scientists at the university suspected there was something wrong with the **air** outside the building.
air	Jumbled version of LC sentence	Something with scientists at wrong the suspected the there university was the **air** building the outside.
stage	High-Constraint Sentence	The disappointed audience kept shouting "boo!" until the poor actor walked off the **stage** all by himself.
stage	Low-Constraint Sentence	When we stepped inside the building and entered the room, we all saw Jonathan on the **stage** all by himself.
stage	Jumbled version of LC sentence	the we the all room stepped when on and Jonathan inside building entered saw we the stage himself by all.

Appendix D: Target word and sentence details (Norwegian)

Target word Norwegian	Target word position	Target word syllable position	Total of words in sentence	Duration 1 (Praat measures)	Duration 2 (Praat measures)	Target word (Praat measures)	Word-Frequency NoWac
røver	5	8	13	1,34	1,75	0,42	0,4
røver	5	8	12	1,40	1,70	0,57	0,4
røver			12	1,34	1,78	0,53	0,4
skuff	5	5	9	0,76	0,89	0,47	1,7
skuff	4	5	7	0,86	1,02	0,55	1,7
skuff			7	0,90	1,05	0,48	1,7
tallerken	6	6	12	1,32	1,77	0,65	1,8

tallerken	6	6	12	1,37	1,65	0,71	1,8
tallerken			12	1,39	1,80	0,68	1,8
skjørt	5	9	11	1,30	1,49	0,35	3,6
skjørt	5	9	9	1,16	1,39	0,39	3,6
skjørt			9	1,29	1,55	0,38	3,6
hale	4	6	8	0,72	1,10	0,47	3,8
hale	4	6	9	0,81	1,04	0,44	3,8
hale			9	1,24	1,50	0,35	3,8
formue	7	10	10	1,60	1,82	0,54	10,6
formue	9	10	14	1,67	1,82	0,55	10,6
formue			14	1,84	2,12	0,49	10,6
herre	5	7	10	1,08	1,61	0,38	14,0
herre	4	7	9	1,00	1,24	0,34	14,0
herre			9	1,26	1,43	0,38	14,0
haug	7	9	9	1,70	2,10	0,23	17,3
haug	6	9	8	1,36	1,76	0,30	17,3
haug			8	1,72	2,06	0,26	17,3
pølse	7	9	15	1,36	1,60	0,44	31,7
pølse	7	9	16	1,33	1,48	0,41	31,7
pølse			16	1,46	1,67	0,44	31,7
beskjed	7	10	11	1,45	1,97	0,29	48,9
beskjed	7	10	11	1,23	1,76	0,32	48,9
beskjed			11	1,35	1,68	0,29	48,9
skyld	5	8	10	1,25	1,75	0,30	50,1
skyld	6	8	11	0,97	1,39	0,33	50,1
skyld			11	1,04	1,29	0,27	50,1
møte	4	8	9	0,82	1,29	0,46	76,4

møte	4	8	9	0,93	1,31	0,49	76,4
møte			9	0,83	1,16	0,37	76,4
rett	6	10	8	1,53	1,99	0,22	81,2
rett	7	10	9	1,89	2,19	0,22	81,2
rett			9	1,82	2,06	0,21	81,2
skole	5	8	10	0,71	0,90	0,45	128,2
skole	5	8	9	0,76	0,88	0,45	128,2
skole			9	0,93	1,03	0,39	128,2
bilde	8	10	12	1,50	1,73	0,26	143,5
bilde	8	10	11	1,31	1,37	0,34	143,5
bilde			11	1,34	1,42	0,28	143,5
svulst	8	14	10	2,10	2,19	0,46	0,9
svulst	9	14	11	1,92	2,05	0,43	0,9
svulst			11	2,01	2,07	0,41	0,9
pensel	8	12	15	1,75	1,84	0,44	1,1
pensel	9	12	18	1,70	1,87	0,40	1,1
pensel			18	1,79	1,97	0,45	1,1
konvolutt	8	14	14	2,08	2,23	0,53	1,5
konvolutt	10	14	16	2,12	2,31	0,44	1,5
konvolutt			16	2,50	2,52	0,40	1,5
paraply	11	13	15	1,60	2,21	0,48	1,8
paraply	10	13	13	1,68	2,01	0,47	1,8
paraply			13	1,85	1,94	0,45	1,8
pil	9	12	11	1,96	2,65	0,20	3,3
pil	9	12	11	1,77	2,48	0,30	3,3
pil			11	1,97	2,36	0,34	3,3
bamse	12	15	16	2,33	2,77	0,46	3,5

bamse	10	15	14	2,11	2,45	0,56	3,5
bamse			14	2,30	2,88	0,56	3,5
fiende	7	11	9	1,35	1,56	0,44	7,3
fiende	8	11	11	1,51	1,70	0,41	7,3
fiende			11	1,83	2,08	0,37	7,3
billett	8	11	11	1,35	1,74	0,44	8,5
billett	9	11	11	1,31	1,73	0,44	8,5
billett			11	1,92	2,12	0,39	8,5
vits	11	14	16	1,87	2,05	0,32	12,7
vits	10	14	17	1,87	2,03	0,28	12,7
vits			17	2,28	2,49	0,30	12,7
ønske	11	14	16	2,00	2,20	0,41	41,9
ønske	9	14	15	2,01	2,16	0,44	41,9
ønske			15	2,19	2,35	0,42	41,9
selskap	9	13	12	1,85	2,07	0,50	55,5
selskap	10	13	12	2,51	2,59	0,53	55,5
selskap			12	2,93	3,12	0,35	55,5
regel	9	14	16	1,86	1,99	0,42	58,6
regel	10	14	15	1,91	2,01	0,41	58,6
regel			15	2,20	2,31	0,34	58,6
mor	10	13	13	1,58	1,77	0,21	80,9
mor	8	13	11	1,69	1,88	0,23	80,9
mor			11	2,07	2,14	0,32	80,9
ansvar	9	11	11	1,57	1,87	0,41	117,2
ansvar	10	11	14	1,64	1,90	0,39	117,2
ansvar			14	2,09	2,34	0,64	117,2
sted	8	12	12	1,57	1,78	0,31	199,8

sted	5	12	11	1,44	1,73	0,26	199,8
sted			11	1,51	1,97	0,24	199,8
kiste	9	17	12	2,18	2,31	0,44	0,7
kiste	14	17	19	2,12	2,30	0,42	0,7
kiste			19	2,73	2,96	0,50	0,7
gaffel	13	19	15	2,59	2,73	0,87	1,4
gaffel	14	19	15	2,49	2,63	0,31	1,4
gaffel			15	3,15	3,29	0,25	1,4
greve	12	17	16	2,48	2,59	0,35	1,7
greve	11	17	15	2,17	2,34	0,37	1,7
greve			15	2,52	2,64	0,36	1,7
plakat	11	16	15	2,35	2,55	0,51	2,8
plakat	11	16	15	2,61	2,79	0,53	2,8
plakat			15	3,07	3,33	0,33	2,8
nøkkel	14	16	18	2,40	2,77	0,31	4,4
nøkkel	12	16	14	2,23	2,65	0,37	4,4
nøkkel			14	2,64	2,90	0,35	4,4
hjerne	13	16	17	2,01	2,15	0,28	5,6
hjerne	11	16	13	2,28	2,47	0,36	5,6
hjerne			13	2,91	2,95	0,32	5,6
sikring	11	17	14	2,33	2,51	0,48	7,0
sikring	12	17	15	2,58	2,74	0,48	7,0
sikring			15	2,75	2,93	0,41	7,0
advarsel	15	18	17	2,65	2,89	0,48	9,9
advarsel	15	18	16	2,46	2,72	0,50	9,9
advarsel			16	3,03	3,22	0,44	9,9
premie	11	16	12	1,92	2,04	0,40	10,5

premie	11	16	12	2,54	2,71	0,48	10,5
premie			12	2,49	2,67	0,49	10,5
handel	13	19	15	2,55	2,63	0,38	24,6
handel	14	19	16	2,36	2,53	0,40	24,6
handel			16	2,84	2,99	0,34	24,6
klem	14	16	19	2,26	2,88	0,37	24,6
klem	12	16	18	1,92	2,37	0,35	24,6
klem			18	2,36	2,68	0,31	24,6
menneske	12	18	17	2,04	2,27	0,40	45,0
menneske	14	18	15	2,15	2,39	0,42	45,0
menneske			15	2,89	3,21	0,37	45,0
gutt	12	17	14	2,27	2,53	0,26	52,5
gutt	12	17	14	2,10	2,23	0,32	52,5
gutt			14	2,58	2,73	0,33	52,5
sak	7	18	9	2,01	2,13	0,29	121,5
sak	11	18	13	2,12	2,14	0,32	121,5
sak			13	2,60	2,74	0,26	121,5
behov	10	16	13	2,22	2,50	0,21	144,5
behov	14	16	17	2,64	2,97	0,24	144,5
behov			17	3,05	3,45	0,24	144,5
møll	17	22	20	3,37	3,81	0,33	0,4
møll	16	22	19	3,07	3,72	0,30	0,4
møll			19	3,38	6,61	0,26	0,4
åker	13	23	16	2,84	3,46	0,33	0,9
åker	14	23	17	2,89	3,37	0,33	0,9
åker			17	3,73	3,96	0,35	0,9
kalkun	9	21	13	3,02	3,30	0,37	1,4

kalkun	12	21	14	2,80	3,22	0,41	1,4
kalkun			14	3,07	3,50	0,37	1,4
kurv	15	23	18	3,05	3,53	0,26	1,7
kurv	15	23	19	3,12	3,50	0,25	1,7
kurv			19	3,46	3,69	0,26	1,7
drage	19	21	22	3,10	3,16	0,34	2,0
drage	17	21	19	2,68	2,73	0,35	2,0
drage			19	3,80	3,88	0,32	2,0
hummer	15	23	18	3,30	3,41	0,39	3,0
hummer	15	23	21	2,97	3,09	0,32	3,0
hummer			21	3,57	3,67	0,32	3,0
elg	17	26	19	3,34	3,48	0,29	6,3
elg	16	26	19	3,44	3,52	0,29	6,3
elg			19	3,65	3,70	0,21	6,3
skap	12	23	14	3,43	3,73	0,36	6,7
skap	16	23	18	3,37	3,52	0,38	6,7
skap			18	4,21	4,39	0,34	6,7
tvang	13	24	19	3,33	3,59	0,31	8,6
tvang	14	24	21	3,41	3,71	0,35	8,6
tvang			21	3,16	3,43	0,31	8,6
hatt	16	22	20	2,90	3,04	1,15	9,9
hatt	12	22	14	2,88	3,11	0,21	9,9
hatt			14	3,25	3,50	0,21	9,9
fengsel	15	24	21	3,48	3,90	0,39	36,5
fengsel	16	24	22	3,38	3,77	0,44	36,5
fengsel			22	3,68	3,84	0,47	36,5
ferie	17	24	17	3,38	3,84	0,24	42,0

ferie	13	24	17	3,20	3,34	0,29	42,0
ferie			17	3,59	3,71	0,29	42,0
høst	15	25	17	3,09	3,18	0,29	57,9
høst	16	25	18	3,95	4,08	0,28	57,9
høst			18	4,42	4,87	0,34	57,9
vekt	17	24	21	3,69	3,71	0,24	91,0
vekt	15	24	17	2,75	2,99	0,25	91,0
vekt			17	3,20	3,51	0,22	91,0
ord	16	22	18	2,81	3,11	0,21	168,6
ord	17	22	19	2,94	3,18	0,25	168,6
ord			19	3,54	3,76	0,25	168,6
linjal	7	9	10	1,83	2,22	0,54	199,8
linjal	7	9	10	1,92	2,04	0,54	0,7
linjal			10	1,77	2,11	0,52	0,7
blyant	4	5	10	0,76	0,91	0,56	0,7
blyant	4	5	10	1,02	1,20	0,33	0,9
blyant			10	0,93	1,13	0,40	0,9
dam	5	8	12	1,19	1,48	0,40	0,9
dam	8	8	11	1,25	1,45	0,33	1,4
dam			11	1,44	1,63	0,34	1,4
skinke	7	8	11	1,35	1,67	0,57	1,4
skinke	5	8	9	1,30	1,63	0,45	1,4
skinke			9	1,34	1,60	0,65	1,4
veske	7	10	11	1,57	1,71	0,38	1,4
veske	9	10	13	1,68	1,83	0,49	1,7
veske			13	1,97	2,16	0,47	1,7
etappe	6	9	9	1,53	1,92	0,52	1,7

etappe	7	9	11	1,38	1,70	0,52	2,1
etappe			11	1,62	1,78	0,49	2,1
trussel	5	9	8	1,25	1,40	0,41	2,1
trussel	7	9	12	1,47	1,62	0,41	2,3
trussel			12	1,51	1,68	0,34	2,3
himmel	6	8	9	1,40	1,64	0,43	2,3
himmel	5	8	7	1,09	1,19	0,44	2,8
himmel			7	1,28	1,47	0,42	2,8
regjering	3	5	6	0,68	0,94	0,53	2,8
regjering	3	5	9	0,65	1,09	0,42	4,4
regjering			9	0,78	1,12	0,52	4,4
skatt	5	9	10	1,03	1,16	0,36	4,4
skatt	7	9	12	1,07	1,34	0,35	4,6
skatt			12	1,03	1,31	0,28	4,6
alder	4	5	9	0,75	1,01	0,32	4,6
alder	5	5	10	0,59	1,09	0,36	5,5
alder			10	0,55	1,08	0,35	5,5
kvinne	5	8	9	1,30	1,70	0,42	5,5
kvinne	5	8	11	1,30	1,47	0,42	5,6
kvinne			11	1,15	1,36	0,42	5,6
kveld	6	7	11	1,24	1,52	0,23	5,6
kveld	5	7	13	1,13	1,38	0,28	7,0
kveld			13	1,15	1,41	0,30	7,0
brann	7	8	9	1,55	1,73	0,34	7,0
brann	7	8	10	1,31	1,38	0,31	7,7
brann			10	1,55	1,73	0,28	7,7
arbeid	7	10	11	1,40	1,61	0,39	7,7

arbeid	8	10	13	1,07	1,23	0,37	8,9
arbeid			13	1,61	1,77	0,35	8,9
klynge	8	12	11	1,57	1,77	0,34	8,9
klynge	9	12	14	1,98	2,05	0,38	9,9
klynge			14	1,90	1,97	0,32	9,9
nisse	11	14	17	1,65	1,77	0,31	9,9
nisse	9	14	12	1,90	2,00	0,30	10,5
nisse			12	1,90	2,02	0,30	10,5
gren	10	13	13	2,10	3,10	0,34	10,5
gren	8	13	14	1,57	2,24	0,40	11,0
gren			14	1,89	2,32	0,25	11,0
bekk	10	14	14	2,00	2,66	0,25	11,0
bekk	10	14	14	2,04	2,65	0,25	24,2
bekk			14	2,03	2,50	0,26	24,2
sitron	9	13	12	1,94	2,22	0,48	24,2
sitron	10	13	12	1,74	2,21	0,41	24,6
sitron			12	1,75	2,30	0,41	24,6
teppe	9	12	15	1,61	2,17	0,42	24,6
teppe	9	12	17	1,56	1,77	0,48	24,6
teppe			17	2,19	2,54	0,43	24,6
vask	7	10	12	1,32	1,65	0,32	24,6
vask	8	10	13	1,47	1,73	0,25	38,4
vask			13	1,56	1,87	0,31	38,4
vegg	9	14	16	1,90	2,19	0,24	38,4
vegg	9	14	13	1,94	2,11	0,20	40,0
vegg			13	2,35	20121,00	0,33	40,0
mage	8	13	13	1,60	1,91	0,34	40,0

mage	8	13	11	1,68	1,87	0,36	45,0
mage			11	1,87	2,04	0,35	45,0
stein	7	11	12	1,67	1,83	0,42	45,0
stein	9	11	16	1,61	1,79	0,34	52,5
stein			16	1,66	1,85	0,30	52,5
øl	10	15	12	2,09	2,21	0,19	52,5
øl	10	15	14	2,12	2,25	0,18	54,2
øl			14	2,56	2,67	0,23	54,2
tro	8	14	14	1,66	1,85	0,17	54,2
tro	8	14	14	1,93	2,04	0,20	65,3
tro			14	1,96	2,12	0,23	65,3
jente	11	14	18	2,00	2,16	0,46	65,3
jente	9	14	14	1,81	1,98	0,39	121,5
jente			14	2,02	2,14	0,39	121,5
rekke	8	12	13	1,83	1,95	0,24	121,5
rekke	8	12	13	1,68	1,78	0,24	144,5
rekke			13	2,08	2,19	0,33	144,5
uke	7	14	10	1,69	1,87	0,20	144,5
uke	9	14	12	1,54	1,79	0,18	173,0
uke			12	2,33	2,55	0,25	173,0
frakk	15	19	17	2,90	3,35	0,39	173,0
frakk	15	19	16	2,61	2,77	0,31	0,4
frakk			16	3,27	3,46	0,26	0,4
kirurg	7	16	12	2,22	2,85	0,34	0,4
kirurg	8	16	13	2,25	2,41	0,38	0,4
kirurg			13	2,48	2,65	0,42	0,4
sprøyte	10	18	12	2,54	2,78	0,44	0,4

sprøyte	13	18	16	2,50	2,62	0,50	0,9
sprøyte			16	2,92	3,04	0,40	0,9
appelsin	15	19	17	2,91	3,02	0,59	0,9
appelsin	15	19	17	3,27	3,54	0,56	1,0
appelsin			17	3,65	3,79	0,47	1,0
genser	15	19	17	2,59	2,75	0,32	1,0
genser	13	19	15	2,43	2,55	0,39	1,3
genser			15	2,96	3,16	0,29	1,3
hjelm	11	17	18	2,00	2,10	0,24	1,3
hjelm	13	17	20	2,62	2,77	0,26	1,4
hjelm			20	3,45	3,69	0,19	1,4
kjole	12	16	14	1,82	2,12	0,35	1,4
kjole	11	16	15	2,37	2,64	0,39	1,7
kjole			15	2,50	2,79	0,41	1,7
stol	13	16	21	2,10	2,47	0,32	1,7
stol	11	16	19	1,96	2,16	0,36	1,9
stol			19	2,60	2,76	0,31	1,9
ulv	12	17	15	1,89	2,12	0,56	1,9
ulv	11	17	14	2,37	2,51	0,33	1,9
ulv			14	2,98	3,11	0,32	1,9
kunde	8	16	13	1,93	2,03	0,41	1,9
kunde	11	16	14	1,81	2,07	0,30	2,0
kunde			14	2,15	2,33	0,29	2,0
skade	10	18	12	2,47	3,66	0,42	2,0
skade	12	18	14	2,13	2,37	0,46	3,0
skade			14	2,35	2,57	0,38	3,0
bolig	11	17	13	1,99	2,20	0,42	3,0

bolig	13	17	15	2,24	2,46	0,45	5,3
bolig			15	2,28	2,56	0,36	5,3
måned	12	18	13	2,20	2,36	0,41	5,3
måned	10	18	14	2,49	2,60	0,38	5,4
måned			14	2,74	2,87	0,36	5,4
omgang	9	16	13	2,28	2,46	0,38	5,4
omgang	11	16	15	2,16	2,35	0,39	6,3
omgang			15	2,48	2,66	0,36	6,3
navn	10	17	16	2,28	2,60	0,34	6,3
navn	12	17	16	2,31	2,66	0,26	6,7
navn			16	2,56	2,81	0,25	6,7
kommode	16	24	20	3,36	3,47	0,48	6,7
kommode	16	24	19	3,10	3,49	0,42	6,9
kommode			19	3,54	4,19	0,47	6,9
frisyre	16	22	20	3,34	4,06	0,56	6,9
frisyre	15	22	20	3,07	3,25	0,58	7,9
frisyre			20	3,86	4,11	0,45	7,9
bunad	15	23	17	3,34	3,86	0,35	7,9
bunad	14	23	17	3,37	3,86	0,28	8,6
bunad			17	3,47	3,58	0,28	8,6
perm	15	23	20	2,86	3,04	0,25	8,6
perm	15	23	19	3,45	3,95	0,31	9,9
perm			19	3,55	3,77	0,33	9,9
flis	15	23	17	3,16	3,28	0,35	9,9
flis	14	23	19	3,02	3,09	0,40	17,6
flis			19	3,02	3,08	0,38	17,6
gris	15	22	18	2,69	2,74	0,36	17,6

gris	14	22	17	2,65	2,74	0,29	34,1
gris			17	3,33	3,44	0,28	34,1
kanin	15	21	17	3,36	3,42	0,39	34,1
kanin	15	21	22	2,71	2,77	0,31	36,5
kanin			22	2,85	2,92	0,32	36,5
dugnad	11	21	18	2,91	3,05	0,44	36,5
dugnad	13	21	17	2,77	2,85	0,50	42,0
dugnad			17	2,96	3,02	0,39	42,0
jeger	16	24	20	3,40	3,51	0,37	42,0
jeger	17	24	22	3,24	3,34	0,31	49,9
jeger			22	3,67	3,74	0,26	49,9
dommer	13	23	14	3,44	3,63	0,37	49,9
dommer	15	23	18	3,06	3,21	0,33	53,3
dommer			18	3,42	3,85	0,25	53,3
ansatt	13	22	17	3,07	3,30	0,38	53,3
ansatt	15	22	18	3,30	3,58	0,42	57,9
ansatt			18	3,47	3,66	0,39	57,9
verdi	12	22	16	2,48	2,81	0,33	57,9
verdi	12	22	16	2,74	3,27	0,31	91,0
verdi			16	2,98	3,16	0,30	91,0
retning	19	25	20	3,07	3,21	0,34	91,0
retning	14	25	16	3,78	4,10	0,36	144,4
retning			16	3,80	4,14	0,43	144,4
forslag	13	23	15	2,88	3,11	0,40	144,4
forslag	16	23	18	3,06	3,61	0,40	149,0
forslag			18	3,50	3,75	0,40	149,0
kamp	10	23	15	3,86	4,14	0,34	149,0

kamp	15	23	19	3,13	3,37	0,36	168,6
kamp			19	3,25	3,50	0,35	168,6

Appendix E: Target word and sentence details (English)

Target word English	Target word position	Target word syllable position	Total of words in sentence	Duration 1 (Praat measures)	Duration 2 (Praat measures)	Target word (Praat measures)	Word-Frequency NoWac
spatula	7	8	10	1,35	1,65	0,62	0,9
spatula	7	8	14	1,42	1,54	0,55	0,9
spatula			14	1,60	1,83	0,59	0,9
veil	8	9	11	1,87	2,49	0,33	2,8
veil	8	9	11	2,07	2,66	0,37	2,8
veil			11	2,29	2,73	0,41	2,8
shovel	6	7	9	0,91	1,04	0,40	3,4
shovel	7	7	10	1,15	1,34	0,39	3,4
shovel			10	1,23	1,51	0,38	3,4
stove	8	9	11	1,70	2,25	0,46	4,2
stove	7	9	9	1,56	1,78	0,53	4,2
stove			9	1,63	1,86	0,57	4,2
ink	9	9	12	1,92	2,09	0,30	7,6
ink	8	9	10	1,67	1,87	0,37	7,6
ink			10	1,73	1,95	0,40	7,6
shelf	7	8	10	1,40	1,63	0,39	10,5
shelf	7	8	10	1,37	1,56	0,41	10,5
shelf			10	1,22	1,29	0,37	10,5
carrot	6	7	9	1,02	1,12	0,51	11,5
carrot	7	7	10	1,03	1,18	0,51	11,5

carrot			10	1,42	1,59	0,57	11,5
spider	9	9	12	1,92	2,38	0,57	14,0
spider	8	9	11	1,76	2,21	0,60	14,0
spider			11	1,81	2,16	0,59	14,0
curtain	7	9	12	1,80	2,29	0,53	14,5
curtain	8	9	12	1,63	2,00	0,62	14,5
curtain			12	1,87	2,22	0,57	14,5
pool	6	7	10	1,03	1,48	0,46	32,5
pool	10	7	13	1,13	1,49	0,48	32,5
pool			13	1,25	1,61	0,45	32,5
army	7	10	9	1,55	1,88	0,41	51,5
army	7	10	9	1,67	2,11	0,35	51,5
army			9	1,70	2,18	0,34	51,5
cheese	7	8	14	1,43	1,74	0,56	60,1
cheese	6	8	16	1,22	1,97	0,46	60,1
cheese			16	1,48	1,96	0,44	60,1
truth	10	10	12	2,03	2,46	0,41	80,2
truth	9	10	11	1,68	2,02	0,49	80,2
truth			11	1,89	2,24	0,55	80,2
floor	8	10	12	1,70	2,31	0,44	108,7
floor	8	10	12	1,72	2,16	0,46	108,7
floor			12	1,76	2,29	0,53	108,7
kitchen	8	8	15	1,51	2,35	0,62	165,5
kitchen	6	8	9	1,36	2,63	0,57	165,5
kitchen			9	1,46	2,06	0,55	165,5
bleach	11	14	14	2,41	2,50	0,45	1,6
bleach	11	14	14	2,39	2,46	0,42	1,6

bleach			14	2,63	3,13	0,45	1,6
puddle	9	14	12	2,14	2,36	0,46	2,4
puddle	10	14	14	2,43	2,63	0,46	2,4
puddle			14	2,76	3,07	0,42	2,4
couch	11	13	14	2,54	2,66	0,53	4,0
couch	10	13	13	2,37	2,43	0,48	4,0
couch			13	2,63	2,73	0,45	4,0
dice	10	14	14	2,32	2,51	0,48	4,7
dice	10	14	16	2,58	2,90	0,45	4,7
dice			16	2,84	3,38	0,45	4,7
pillow	12	14	15	2,39	2,90	0,46	5,3
pillow	11	14	14	2,39	2,95	0,46	5,3
pillow			14	2,38	2,91	0,47	5,3
chalk	12	13	15	2,62	3,39	0,45	6,8
chalk	11	13	15	2,38	2,54	0,48	6,8
chalk			15	2,79	3,59	0,57	6,8
spell	9	12	12	2,57	3,10	0,45	12,5
spell	9	12	12	2,17	2,51	0,41	12,5
spell			12	2,32	2,96	0,54	12,5
lane	8	12	11	2,27	2,90	0,37	15,5
lane	10	12	16	2,24	2,77	0,35	15,5
lane			16	2,52	3,42	0,44	15,5
farmer	11	13	14	2,45	2,91	0,55	19,0
farmer	10	13	13	2,37	2,94	0,58	19,0
farmer			13	2,77	3,26	0,62	19,0
flour	12	14	15	2,73	3,47	0,50	22,9
flour	13	14	16	2,43	3,03	0,51	22,9

flour			16	2,67	3,08	0,56	22,9
suit	12	14	15	2,23	2,40	0,46	30,0
suit	11	14	14	2,28	2,58	0,42	30,0
suit			14	2,50	2,76	0,40	30,0
border	10	14	12	2,73	2,84	0,48	36,8
border	10	14	12	2,68	2,83	0,51	36,8
border			12	2,95	3,30	0,49	36,8
farm	9	14	11	2,36	2,42	0,30	55,0
farm	9	14	11	2,51	2,56	0,38	55,0
farm			11	2,67	3,07	0,39	55,0
sauce	9	13	12	2,15	2,22	0,48	60,7
sauce	8	13	11	2,01	2,15	0,51	60,7
sauce			11	2,39	2,88	0,47	60,7
south	10	12	12	2,31	2,40	0,45	117,6
south	9	12	11	2,31	2,38	0,41	117,6
south			11	2,64	2,72	0,44	117,6
nappy	14	17	16	3,74	4,38	0,44	2,1
nappy	10	17	12	3,20	3,42	0,47	2,1
nappy			12	3,54	3,89	0,58	2,1
candy	10	17	12	3,23	3,85	0,61	6,8
candy	12	17	14	2,90	3,50	0,58	6,8
candy			14	3,29	3,62	0,53	6,8
lawn	15	17	20	3,52	4,00	0,35	8,4
lawn	14	17	19	2,89	3,56	0,44	8,4
lawn			19	3,34	3,88	0,51	8,4
tooth	12	17	15	3,39	3,89	0,40	11,3
tooth	10	17	13	2,96	3,54	0,42	11,3

tooth			13	3,16	3,50	0,37	11,3
spoon	14	17	18	3,49	3,95	0,47	16,3
spoon	12	17	16	3,21	3,84	0,59	16,3
spoon			16	3,32	3,67	0,57	16,3
desk	13	17	16	3,12	3,64	0,40	21,5
desk	13	17	16	2,99	3,47	0,43	21,5
desk			16	3,68	4,34	0,44	21,5
sentence	13	16	16	2,75	2,96	0,62	21,7
sentence	12	16	15	2,92	3,11	0,63	21,7
sentence			15	3,30	3,59	0,67	21,7
flower	12	17	15	3,16	3,41	0,51	28,3
flower	13	17	16	3,13	3,14	0,56	28,3
flower			16	3,31	3,52	0,59	28,3
relief	12	17	15	3,40	3,60	0,50	29,7
relief	12	17	15	3,09	3,36	0,50	29,7
relief			15	3,45	3,54	0,41	29,7
memory	13	18	15	3,50	3,84	0,52	38,0
memory	12	18	15	2,87	3,21	0,59	38,0
memory			15	3,33	3,56	0,59	38,0
plane	12	16	14	2,84	3,38	0,41	38,4
plane	11	16	15	2,72	3,09	0,34	38,4
plane			15	2,90	3,45	0,41	38,4
rubbish	12	16	19	2,77	2,94	0,51	50,3
rubbish	15	16	19	3,20	3,65	0,46	50,3
rubbish			19	3,67	4,21	0,43	50,3
collection	13	16	19	2,83	3,24	0,71	59,6
collection	12	16	17	2,78	2,92	0,64	59,6

collection			17	3,30	3,78	0,65	59,6
goal	10	16	13	2,72	3,31	0,32	93,8
goal	13	16	16	2,83	3,29	0,35	93,8
goal			16	3,00	3,57	0,37	93,8
art	10	16	13	2,90	3,12	0,41	112,0
art	11	16	14	2,85	3,19	0,32	112,0
art			14	3,04	3,49	0,36	112,0
squid	13	21	16	3,56	4,17	0,39	3,8
squid	12	21	15	3,51	3,94	0,36	3,8
squid			15	3,79	4,57	0,44	3,8
chimney	18	21	21	4,39	5,26	0,42	7,9
chimney	16	21	18	3,83	4,24	0,41	7,9
chimney			18	4,30	5,08	0,44	7,9
revenge	14	23	20	4,01	4,99	0,49	10,0
revenge	16	23	21	4,02	4,79	0,49	10,0
revenge			21	4,68	5,68	0,58	10,0
cave	15	24	18	4,00	4,38	0,37	12,4
cave	14	24	17	3,59	3,78	0,39	12,4
cave			17	4,25	4,60	0,49	12,4
shelter	16	23	19	4,18	4,85	0,53	15,0
shelter	16	23	19	4,13	4,50	0,54	15,0
shelter			19	4,18	4,62	0,53	15,0
valley	14	21	17	4,14	7,71	0,41	16,6
valley	17	21	20	3,82	4,29	0,41	16,6
valley			20	4,56	4,98	0,48	16,6
forest	15	23	23	4,50	5,30	0,58	38,2
forest	15	23	18	3,93	4,71	0,61	38,2

forest			18	4,42	5,26	0,62	38,2
attempt	17	26	20	4,89	5,35	0,55	42,4
attempt	20	26	23	4,40	4,83	0,40	42,4
attempt			23	6,10	7,33	0,47	42,4
favour	18	21	20	3,35	4,12	0,48	49,5
favour	17	21	23	3,56	4,08	0,47	49,5
favour			23	4,26	4,65	0,54	49,5
vehicle	15	23	18	3,89	4,41	0,50	50,0
vehicle	16	23	19	3,64	4,38	0,51	50,0
vehicle			19	4,18	5,21	0,53	50,0
bottle	14	21	17	3,78	4,28	0,35	60,0
bottle	15	21	19	3,92	4,37	0,45	60,0
bottle			19	4,05	4,61	0,46	60,0
voice	14	22	17	4,24	4,50	0,39	71,5
voice	13	22	16	3,88	3,94	0,34	71,5
voice			16	4,02	4,12	0,33	71,5
office	17	26	19	4,75	5,23	0,41	95,2
office	17	26	18	5,05	5,81	0,43	95,2
office			18	5,38	5,84	0,50	95,2
bed	17	22	20	4,48	4,61	0,23	128,5
bed	17	22	20	3,71	3,85	0,33	128,5
bed			20	4,92	5,12	0,36	128,5
garden	11	23	14	3,96	4,19	0,63	202,6
garden	15	23	17	4,03	4,21	0,53	202,6
garden			17	4,50	4,63	0,51	202,6
thimble	6	8	12	1,65	1,88	0,40	1,0
thimble	7	8	20	1,51	1,91	0,48	1,0

thimble			20	1,46	1,73	0,55	1,0
napkin	8	10	12	1,82	2,06	0,51	2,0
napkin	9	10	12	1,96	2,10	0,54	2,0
napkin			12	2,27	2,53	0,57	2,0
broom	9	10	13	2,04	2,76	0,43	3,6
broom	8	10	14	2,03	2,49	0,40	3,6
broom			14	2,31	2,78	0,43	3,6
pumpkin	8	10	12	1,93	2,53	0,60	4,1
pumpkin	8	10	12	1,81	2,26	0,64	4,1
pumpkin			12	2,50	3,23	0,62	4,1
drought	8	9	10	1,60	1,68	0,38	7,6
drought	8	9	10	1,43	1,66	0,40	7,6
drought			10	1,84	2,05	0,52	7,6
towel	7	8	11	1,55	1,68	0,43	10,4
towel	6	8	10	1,25	1,47	0,43	10,4
towel			10	1,63	1,88	0,45	10,4
sponge	9	9	15	1,76	1,98	0,64	12,7
sponge	8	9	14	1,45	1,59	0,49	12,7
sponge			14	1,78	1,91	0,68	12,7
throat	9	10	12	1,67	1,82	0,43	13,2
throat	9	10	11	1,64	1,70	0,56	13,2
throat			11	1,90	1,84	0,58	13,2
iron	8	10	11	1,89	2,23	0,38	23,2
iron	8	10	11	1,56	1,91	0,47	23,2
iron			11	1,88	2,23	0,49	23,2
smoke	7	10	13	1,86	2,46	0,56	23,6
smoke	10	10	16	1,96	2,43	0,61	23,6

smoke			16	2,40	2,75	0,59	23,6
frame	8	10	11	1,92	2,34	0,40	54,3
frame	8	10	12	1,89	2,44	0,45	54,3
frame			12	2,12	2,40	0,54	54,3
beach	8	9	11	1,71	2,14	0,50	55,3
beach	8	9	12	1,89	2,28	0,43	55,3
beach			12	1,90	2,04	0,38	55,3
star	7	7	11	1,28	1,50	0,48	87,3
star	7	7	12	1,32	1,56	0,57	87,3
star			12	1,68	2,01	0,60	87,3
letter	7	7	11	1,06	1,53	1,89	106,9
letter	5	7	11	1,23	1,89	0,50	106,9
letter			11	1,33	1,62	0,53	106,9
street	8	10	13	1,84	1,92	0,44	158,9
street	9	10	14	1,52	1,72	0,37	158,9
street			14	1,65	1,74	0,41	158,9
scripture	9	13	11	2,43	2,73	0,67	0,8
scripture	9	13	11	2,40	2,75	0,68	0,8
scripture			11	2,45	2,73	0,63	0,8
paw	13	14	17	2,84	2,98	0,32	3,5
paw	10	14	14	2,44	2,65	0,42	3,5
paw			14	2,77	2,95	0,45	3,5
hose	10	13	13	2,26	2,40	0,38	3,5
hose	10	13	13	2,19	2,45	0,39	3,5
hose			13	2,67	2,82	0,39	3,5
shield	10	13	13	2,73	3,12	0,57	4,9
shield	9	13	12	2,48	2,62	0,49	4,9

shield			12	2,59	2,70	0,57	4,9
cart	9	12	14	2,66	3,49	0,36	5,3
cart	9	12	13	2,30	2,99	0,44	5,3
cart			13	2,29	2,81	0,46	5,3
attic	12	16	14	3,18	3,79	0,45	10,1
attic	12	16	14	2,84	3,45	0,48	10,1
attic			14	3,33	4,12	0,44	10,1
slice	10	12	13	2,13	2,49	0,45	11,1
slice	10	12	14	2,05	2,45	0,42	11,1
slice			14	2,45	3,41	0,50	11,1
lawyer	11	15	13	2,50	2,85	0,46	16,8
lawyer	10	15	12	2,40	2,92	0,53	16,8
lawyer			12	2,87	3,67	0,58	16,8
library	11	15	14	2,57	2,97	0,61	17,6
library	11	15	14	2,31	2,61	0,63	17,6
library			14	3,29	3,92	0,56	17,6
nest	11	14	14	2,36	2,97	0,46	24,4
nest	9	14	12	2,61	3,42	0,54	24,4
nest			12	2,71	3,21	0,50	24,4
paint	12	14	15	2,69	3,08	0,50	29,4
paint	11	14	14	2,43	2,94	0,42	29,4
paint			14	2,24	2,48	0,42	29,4
wood	11	13	14	2,85	3,11	0,30	46,3
wood	11	13	14	2,77	2,94	0,34	46,3
wood			14	3,13	3,24	0,34	46,3
sugar	15	15	18	3,23	3,43	0,42	52,9
sugar	12	15	14	2,74	2,90	0,36	52,9

sugar			14	3,02	3,22	0,44	52,9
court	10	13	12	2,34	2,45	0,38	90,0
court	10	13	12	2,52	2,65	0,44	90,0
court			12	2,63	2,73	0,48	90,0
election	9	13	13	2,11	2,45	0,57	115,9
election	10	13	14	2,42	2,81	0,57	115,9
election			14	2,65	2,81	0,55	115,9
turtle	13	16	17	3,32	3,69	0,51	5,9
turtle	14	16	18	2,99	3,78	0,51	5,9
turtle			18	3,26	3,59	0,45	5,9
glove	11	16	15	2,88	3,56	0,44	6,0
glove	11	16	14	3,10	3,52	0,47	6,0
glove			14	3,12	3,67	0,47	6,0
liar	12	17	15	3,12	3,49	0,45	8,9
liar	12	17	15	2,80	3,36	0,47	8,9
liar			15	3,23	3,63	0,50	8,9
coin	13	16	15	3,01	3,38	0,57	11,2
coin	14	16	17	2,96	3,29	0,44	11,2
coin			17	3,29	3,56	0,51	11,2
leaf	14	16	16	3,05	3,57	0,40	17,3
leaf	13	16	17	3,09	3,79	0,39	17,3
leaf			17	3,82	4,23	0,43	17,3
snake	10	16	13	2,68	3,19	0,58	20,3
snake	13	16	16	2,88	3,14	0,58	20,3
snake			16	2,53	2,59	0,43	20,3
possession	15	17	22	3,57	3,89	0,69	23,0
possession	14	17	20	2,70	3,03	0,64	23,0

possession			20	3,12	3,44	0,70	23,0
nurse	11	18	14	3,05	3,25	0,34	26,7
nurse	13	18	16	3,22	3,74	0,39	26,7
nurse			16	3,42	3,45	0,29	26,7
equipment	16	17	14	3,03	3,33	0,69	33,4
equipment	16	17	17	3,11	3,49	0,74	33,4
equipment			17	3,36	3,66	0,68	33,4
vision	14	18	16	3,70	4,18	0,48	37,9
vision	13	18	15	3,29	3,64	0,46	37,9
vision			15	3,87	4,12	0,39	37,9
vegetable	12	16	15	2,72	3,11	0,58	39,8
vegetable	10	16	13	2,94	3,17	0,61	39,8
vegetable			13	2,79	3,02	0,62	39,8
speech	11	16	13	2,58	3,01	0,42	48,6
speech	11	16	13	2,83	3,24	0,47	48,6
speech			13	2,74	3,04	0,42	48,6
sign	11	16	14	3,18	3,54	0,51	63,1
sign	11	16	14	2,78	3,22	0,50	63,1
sign			14	2,96	3,64	0,51	63,1
island	13	16	15	3,24	3,43	0,48	65,7
island	13	16	15	3,28	3,47	0,50	65,7
island			15	3,46	3,63	0,48	65,7
animal	10	16	18	2,97	3,33	0,64	184,4
animal	11	16	16	3,05	3,37	0,53	184,4
animal			16	3,56	4,21	0,46	184,4
utensil	15	21	19	3,84	4,25	0,66	0,8
utensil	17	21	20	3,39	4,23	0,59	0,8
utensil			20	4,48	5,38	0,63	0,8

poison	14	21	16	3,84	4,11	0,54	8,2
poison	17	21	18	3,35	3,61	0,57	8,2
poison			18	4,20	4,60	0,68	8,2
witch	16	22	18	4,14	4,55	0,34	9,9
witch	14	22	16	4,10	4,41	0,34	9,9
witch			16	4,09	4,56	0,29	9,9
hook	18	23	22	4,11	4,60	0,40	13,3
hook	16	23	20	3,97	4,26	0,33	13,3
hook			20	4,54	4,99	0,43	13,3
shark	15	21	18	3,59	3,97	0,48	14,4
shark	15	21	18	3,60	3,85	0,46	14,4
shark			18	4,12	4,45	0,52	14,4
rope	17	22	20	4,05	4,71	0,44	19,7
rope	16	22	19	4,18	4,77	0,47	19,7
rope			19	4,62	5,24	0,39	19,7
mountain	14	21	17	2,77	3,23	0,49	36,3
mountain	14	21	17	3,67	4,55	0,50	36,3
mountain			17	4,06	4,76	0,55	36,3
recipe	17	23	21	4,58	5,44	0,58	44,2
recipe	16	23	20	4,12	4,62	0,60	44,2
recipe			20	4,85	5,57	0,52	44,2
bike	18	25	22	4,32	5,10	0,40	47,5
bike	18	25	21	4,27	4,78	0,42	47,5
bike			19	4,82	5,20	0,51	47,5
advantage	18	23	20	4,05	4,77	0,62	51,3
advantage	17	23	22	4,07	4,79	0,55	51,3
advantage			22	4,82	5,35	0,71	51,3

skin	17	21	19	3,87	4,69	0,49	56,4
skin	12	21	14	3,92	4,33	0,46	56,4
skin			14	4,24	5,07	0,47	56,4
teacher	16	21	21	4,03	4,30	0,46	77,3
teacher	16	21	20	3,85	4,32	0,47	77,3
teacher			20	4,14	4,65	0,52	77,3
wedding	17	23	20	4,35	4,52	0,46	88,2
wedding	17	23	20	3,85	4,32	0,47	88,2
wedding			20	5,14	5,49	0,47	88,2
air	16	22	19	4,27	4,43	0,28	149,2
air	18	22	16	3,91	4,13	0,33	149,2
air			16	4,49	4,75	0,26	149,2
stage	14	22	17	4,96	5,07	0,49	150,5
stage	17	22	20	4,20	4,25	0,56	150,5
stage			20	4,96	5,11	0,52	150,5

Appendix F: Original factor analysis

Factor 1 - English proficiency	**RC1**	**Factor 2** - Spoken English proficiency and usage	**RC4**	**Factor 3** -Informal learning of English	**RC3**	**Factor 4**- Age of English acquisition	**RC2**
Q4n.Grammar_Eng	0.84	Q4b.Speaking_L2	0.68	Q2m.Contrib_TV_Eng	0.74	Q5h.FluentReading_Age_Eng	0.69
Q4m.Writing_Eng	0.82	Q5b.FluentSpeaking_Age_Norsk	0.60	Q2n.Contrib_Music_Eng	0.65	Q5e.StartHearing_Age_Eng	0.65
Q4l.Reading_Eng	0.82	Q5d.FluentReading_Age_Norsk	0.59	Q3k.Expos_TV_Eng	0.61	Q5f.FluentSpeaking_Age_Eng	0.62
Q4o.Vocab_Eng	0.78	Q6b.Choice_L2	0.59	Q3l.Expos_Music_Eng	0.56	Q5g.StartReading_Age_Eng	0.61
Q4k.Listening_Eng	0.74	Q3b.Exposure_L2	0.57	Q2j.Contrib_Reading_Eng	0.49	Q2h.Contrib_InteractFriend_Eng	0.51
Q4i.Speaking_Eng	0.71	Q2i.Contrib_InteractFamily_Eng	0.44	Q3b.Exposure_L2	0.46	Q2c.Contrib_Reading_Norsk	0.48
Q4j.Pronoucing_Eng	0.69	Q3g.Expos_InteractFriend_Eng	0.41	Q6.Switch_Proficiency	0.44	Q2f.Contrib_TV_Norsk	0.47
Q3i.Expos_Reading_Eng	0.65	Q7a.Accident_Mix_Words_Freq	0.37	Q3g.Expos_InteractFriend_Eng	0.35	Q7b.Accident_Norsk_Intrude_Eng	-0.37
Q6.Switch_Proficiency	0.60	Q4o.Vocab_Eng	0.33	Q2l.Contrib_SelfInstruct_Eng	0.35	Q8a.Intentional_SubIn_Eng	-0.58
Q2j.Contrib_Reading_Eng	0.59	Q4j.Pronoucing_Eng	0.33	Q5b.Read_L2	0.31		
Q2d.Contrib_School_Norsk	0.43	Q5b.Read_L2	0.33	Q5b.FluentSpeaking_Age_Norsk	-0.30		
Q7a.Accident_Mix_Words_Freq	0.41	Q2c.Contrib_Reading_Norsk	-0.37	Q5h.FluentReading_Age_Eng	-0.40		
Q2c.Contrib_Reading_Norsk	0.41	Q2d.Contrib_School_Norsk	-0.40				
Q5b.Read_L2	0.38	Q3c.Expos_Reading_Norsk	-0.44				
Q5b.FluentSpeaking_Age_Norsk	0.36	Q3e.Expos_TV_Norsk	-0.71				
Q5d.FluentReading_Age_Norsk	0.35						
Q3g.Expos_InteractFriend_Eng	0.35						
Q3l.Expos_Music_Eng	0.35						
Q2k.Contrib_School_Eng	0.33						
Q6b.Choice_L2	0.31						
Q2i.Contrib_InteractFamily_Eng	0.31						
Q3k.Expos_TV_Eng	0.31						
Proportion Var	**0.19**	**Proportion Var**	**0.11**	**Proportion Var**	**0.09**	**Proportion Var**	**0.09**
Cumulative Var	**0.19**	**Cumulative Var**	**0.30**	**Cumulative Var**	**0.39**	**Cumulative Var**	**0.47**

Appendix G: Practice items in English and Norwegian

Norwegian Test Items
I tillegg til kanel og sukker så trenger man **smør** til risgrøten.
I spindelvevet så hun en **flue** som ikke klarte å komme løs.
Siri dro avsted for å finne en **butikk** der hun kunne kjøpe lykter og **vaser** til verandaen sin.
Hun krysset gaten og ville gjøre en **innsats** for å snakke med dem.
Å av **krabber** i angrepet bli badet ungdommene mens sjøen var for redde de.
Munnen som men friske alle var et bakerst **sår** fortennene det stort var måtte i behandles mine.
På gården bodde en **biolog** som var veldig glad i alle dyrene sine.
I kommunen skulle ungdomsskoleelevene flyttes over til en ny **avdeling** etter ferien.
Gamle **låver** finnes overalt her i bygda.
Som **kokk** tror jeg også at jeg kan lage litt mer spennende og bedre mat enn det de har gjort tidligere.
English Test Items
All of the fifth-graders had to get in a room together for the story.
Apples are definitely his favorite type of food as well.
While searching around in the garage, the man found a piece of paper on the floor.
His last and very clever move ended their game of cards abruptly.
In shower the corner mould found she in and the panicked.
The day on to his way breakfast that the lost was cafeteria.
The biologist used the microscope to see inside of the hideout of the tiny bug.
My wife said that she didn't like that kind of muffin for dessert.
Laurence woke up early to make his own loaf before breakfast.
Camels can travel across the hot sands of the outskirts of Algeria.

Appendix H: Filler items in Norwegian and English

No-response fillers - Norwegian	**TW -> changed TW**
Prøven var vanskelig, men hun gjorde en **innsats** uansett.	*forsøk -> innsats*
For å komme til leiligheten måtte hun ta trappene opp et **stykke** fordi heisen var ødelagt.	*etasje -> stykke*
Hun mislikte bilkøen på vei til jobb, så for å bli mer miljøvennlig kjøpte hun en brukt **båt** på finn.no.	*sykkel -> båt*
Han lette etter penger i lommeboken og fant bare sedler, men ingen **pollett** til automaten.	*mynt -> polett*
Kubeinet var laget av **plast** og var egentlig en leke.	*jern -> plast*
Hun hang opp bildet på en **spiker** på veggen og tok et skritt tilbake.	*krok -> spiker*
Tannlegen oppdaget et hull i **tunga** og sendte ham til legen.	*tann -> tunga*
På grunn av tørken er det bare lov å vanne plenen med en håndholdt **kanne** om sommeren.	*spreder -> kanne*
Jeg gikk for å hente en **pose** i postkassa fra min tante.	*brev -> pose*
To gamle venner som kom på overraskelsesbesøk, hadde med en fin **årgang** vin i gave.	*flaske -> årgang*
De to søsknene ville ikke ha hver sin **madrass** i julegave i år.	*seng -> madrass*
Hun bestemte seg for å kjøpe en fin **hund** fra naboens valpekull.	*hage -> hund*
På benken lå det mange biter med **mat** som skulle i musefellene.	*ost -> mat*
Han hadde vært i byen og funnet en fin **sopp** som var av porselen.	*blomst -> sopp*
Jentene spiste opp en **løvetann** de fant i hagen.	*gulrot -> løvetann*
Min eldste bror dro på tur for å finne visdom i en **landsby** oppi fjellene.	*hule -> landsby*
I gikk **bilder** både så inn rommet ligge og på og gulvet duk hun.	*vase -> bilder*
De seg til og som kledd en som hadde var ekte sett hadde jenta pyntet bursdagen **heks** TV på ut.	*prinsesse -> heks*
Hun at på hadde **bok** oppdaget plutselig mistet kom inn matbutikken og hun tidligere en.	*hanske -> bok*
Flue det som ikke i hjørnet lenger fly innerst satt en orket å.	*edderkopp -> flue*
Gikk skapene kunne nøye brukes **laken** gjennom de som men et fant alle ikke.	*gardin -> laken*

Hyggelige stort i mennesker et god en **rom** å liker frokost jeg med nyte.	*krus -> rom*
Sigar ned kvelden og demonstrasjonstoget til sin seg med tok møttes de hver om.	*fakkel -> sigar*
Meg frem det stor på når at jeg byll vokser er jeg det verste kjenner vet går på ikke hull som.	*jeksel -> byll*
Early response fillers -Norwegian	***TW***
Gode forsøk på å stupe fra timeteren gikk rett i vasken da tårnet stengte tidlig.	*forsøk*
Vakker hage er det eneste jeg ønsker meg når jeg flytter.	*hage*
Første etasje er litt mer upopulær på grunn av innsyn.	*etasje*
Stekt kylling kan brukes i utrolig mange middagsretter.	*kylling*
Våt avis er ikke lett å lese fordi sidene klistrer seg sammen.	*avis*
Mange forhold er med på å bestemme hva som er best å gjøre.	*forhold*
Mange maur i blomsterbed og plener skaper mye bryderi om sommeren.	*maur*
Stor kurv er nødvendig for å få plass til alt vi skal ha med.	*kurv*
På dekke er som mange settes pris kan behov noe et som utvalg.	*utvalg*
Spørsmål intervjuer kan både man og åpent når være noen lukket et.	*spørsmål*
Og er hjem familien godt hele sted et et trygt for.	*hjem*
Dyr hule skogen i inneholde en kan forskjellige.	*hule*

No-response fillers - English	**TW -> changed TW**
In the story, the wolf chased the three little **frogs** behind the house.	*pig -> frogs*
The girl bought a pink tutu because she wanted to learn **painting** from an expert.	*ballet -> painting*
The neighborhood dog always kept her awake by **whining** through the night.	*barking -> whining*
The animal in the zoo enclosure was trying to clean its **toes** and fur.	*beak -> toes*
Because the work was repetitive, he thought it was **exciting** and not dull.	*boring -> exciting*
Instead of the accelerator, Maria stepped on a **rock** next to the pedal.	*brake -> rock*
The cashier asked the customer to swipe his **thumb** once again.	*card -> thumb*

Melissa asks for decaf when ordering her cup of **tea** at the restaurant.	*coffee -> tea*
My father scared away the burglars with his **sword** which he had inherited.	*axe -> sword*
After several rounds of auditions, she never heard back from the **team** again at all.	*band -> team*
Jan accidentally dropped her things into her **lap** at the meeting.	*bowl -> lap*
We watched my nephew try to ride his bike after the **rain** stopped.	*storm -> rain*
Elizabeth didn't want to attend the church **festival** this year.	*choir -> festival*
The boyscout always carried a first-aid kit and a **GPS** on his trips.	*compass -> GPS*
Timmy wanted to hear another bedtime story about the **workers** in Santa's workshop.	*elves -> workers*
The man who lived downstairs bought a new **diary** for his daughter.	*book -> diary*
Checked away the but outside see that little **kitten** Bill ran couldn't.	*dog -> kitten*
Knew time **singing** they that awake her all Harry by the kept.	*snoring -> singing*
Visited around he crawling **rat** saw a catacombs the and.	*mouse -> rat*
Security the inspect his needed **pockets** at properly to guards.	*bag -> pockets*
The replaced the for heist battery **robot** trip in the their after they bank.	*drone -> robot*
Rule were learning another **monopoly** of important they that evening.	*life -> monopoly*
Mother wear that adamant every to has her **scarf** day a she was.	*hat -> scarf*
Didn't dessert wife **soup** she for that said kind of that my like.	*pudding -> soup*
Early response fillers - English	**TW**
After the **goose** injured its wing, it could no longer fly or move around.	*goose*
The **visitor** said hello, but refused to shake my hand at the office.	*visitor*
The **sandwich** made with peanut butter and lots of jelly was delicious.	*sandwich*
Before the **meeting**, she put on black eyeliner and some red lipstick that looked nice.	*meeting*
The **editor** had a change of heart and decided to switch the pictures of the front page.	editor
The **ice** on the floor made the family shiver as they huddled in the cold cottage.	ice
The **juice** poured out of the bottle and over the table.	juice
The **hammer** was lost and she had been looking everywhere for it.	hammer

The **breakfast** day on to his way that the lost was cafeteria.	breakfast
Was **body** burned down building in the next the discovered door.	body
In **bird** of corner saw was the his the eye he badly saw hurt.	bird
The **honey** year particularly this delicious tasted and sweet.	honey

Appendix: I. Removed variables from factor analysis

Variable
Q3a.Exposure_L1
Q5a.Read_L1
Q6a.Choice_L1
Q4p.Spelling_Eng
Q2g.Contrib_Music_Norsk
Q8b.Intentional_SubIn_Norsk

Appendix: J. Syntax of the LMM model fitted to RT

Mean Response time

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	378.89	10.42	36.37	**<.01**
language [en, -0.5; no, 0.5]	**-41.13**	**8.73**	**-4.71**	**<.01**
mixed.lowCons	**70.10**	**3.86**	**18.17**	**<.01**
lowCons.highCons	**31.87**	**3.87**	**8.25**	**<.01**
frequency	**-14.32**	**4.93**	**-2.90**	**<.01**
mixed.lowCons:frequency	-9.59	5.98	-1.60	0.11
lowCons.highCons:frequency	**13.98**	**5.92**	**2.36**	**0.02**
language:mixed.lowCons	-0.40	7.86	-0.05	0.96
language:lowCons.highCons	3.79	7.88	0.48	0.63

The syntax of the model is: lmer(depM ~ 1 + language + mixed.lowCons + lowCons.highCons + frequency + +mixed.lowCons:frequency + lowCons.highCons:frequency+ language:mixed.lowCons + language:lowCons.highCons + (1 | subj) + (1 | item) + (0 + language | subj), data = dataset, control = lmerControl(optimizer ="Nelder_Mead"))