UiT The Arctic University of Norway

Faculty of Humanities, Social Sciences and Education

Number Specification in L2 processing of Norwegian adult L2 English speakers

Time-frequency representation (TFR) analysis

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Master's thesis in English Linguistics, ENG-3991, October 2022

I dedicate this thesis to my wonderful children Eflatun and Gün Suna. You made me stronger and better with your endless love; you provided the inspiration and motivation I needed to complete this process. I love you deeply with all my heart!

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Acknowledgements

I would like to thank my supervisors Vincent DeLuca, Fatih Bayram and Aleksandra Tomic for their guidance and assistance in the design, data collection and data analysis of this thesis project.

I would also like to thank Jason Rothman, the director of PoLaR Lab, for providing young scientists like me the opportunity to obtain hands-on experience with psycholinguistic data. Special thanks go to Alicia Luque and Maki Kubota for their support during the time I received EEG training at the PoLaR Lab.

I also offer my sincere thanks to AcqVA Aurora Centre for creating a supportive and encouraging research environment as well as their financial support for participant compensation.

I extend my thanks to Natalia Mitrofanova and Yulia Rodina not only for their enlightening lectures within this MA program, but also for their understanding when I had to bring my newborn baby with me to the classes. I will never ever forget how Natalia carried my baby in her arms while I was attempting to make syntax trees and how Yulia warned the whole class not to applause after the presentations because my baby was sleeping.

I give very special thanks to those who are not associated with this thesis in an official capacity, but played a significant role during the tough times I have had above the Arctic circle: My lovely mother Nesrin Sancak for always being there, believing in me on every occasion; and my dear friends Brechje van Osch, Deniz Tat, Diana Marcela Stokkan Henden, and Ømur Caglar-Ryeng for all the nice times we spent together in the last three years. It has meant a lot to me to get together with each of you every single time, because you made me take a deep breath from my rushed life, reminded me of my capabilities as a woman, and set a good example of combining motherhood with a career. I am grateful to have all these women in my life.

Last but certainly not least, I would like to express my deepest gratitude to my beloved husband Fatih Sert. Thank you for your unconditional support and assistance in every step of my thesis, for your patience and tremendous encouragement to complete this work. You have been a great mentor to me during my entire postgraduate career and a great father to our kids during the days and nights I had to work. I could not have taken this journey without you.

Abstract

This thesis investigates the processing of non-local agreement violations and whether they are affected by double marking from a determiner-number specification in Norwegian L2 speakers of English. We tested non-local subject-verb agreement, a mismatch between Norwegian and English, and the double marking on the number of the noun that is a common feature of the two languages by using online Grammaticality Judgement test (GJT) during EEG (electroencephalogram) recording. There were four conditions to test the participants' sensitivity towards determiner number specification: (1) Grammatical unspecified, (2) ungrammatical unspecified, (3) grammatical specified, (4) ungrammatical specified. The EEG data were analyzed with TFRs (time-frequency references) to observe the changes in different frequency bands of neural oscillations. Behavioural and neural responses to the sentences were compared to understand the neural mechanisms regarding the interaction between non-local agreement violations and determiner-number specification. The results showed no evidence for an interaction between specificity and grammaticality. The specificity did not seem to affect participants' judgment of the grammaticality. That is, we did not see any change in the theta band (4-8 Hz); however, a relative decrease in the activation for the ungrammatical items vs grammatical items in the alpha band (8-12 Hz) and a relative decrease in the activation for the number-specified items vs number-unspecified items in alpha bands (8-12 Hz) was observed.

The alpha band reactivity observed during language comprehension does not necessarily reflect the linguistic analyses but the attention. Alpha band decrease is explained as the engagement of the additional attentional resources to explain a faulty representation. The results of the behavioural data showed that the participants were better when judging the grammatical sentences than the ungrammatical sentences, and the unspecified grammatical sentences were judged more accurately than the other three conditions. The findings of the current study suggest that the agreement violation in GJT led the participants to have increased attentional process demands as they needed to judge the mismatching property between their L1 Norwegian and L2 English.

1 Introduction

It is a matter of debate if second language (L2) processing is essentially different from first language (L1) processing concerning syntactic integration processes (Alemán Bañón & Rothman, 2016; Cheng et al., 2021; Bialystok & Miller, 1999; McDonald, 2006; Slabakova, 2016). During the comprehension of their L1, native speakers (NS) need to combine diverse information like lexical features of various words, morphosyntactic structures and contextual factors synchronously. This information influences the overall meaning of the sentence. Comprehending the whole information is effortless and natural for native speakers. However, this process can be much more challenging for L2ers, especially when the languages differ regarding their typology (Armstrong et al., 2017). Several studies suggest that L2 processing differs from L1 concerning different parsing mechanisms (Clahsen & Felser, 2017; Sorace, 2011; Hawkins & Liszka, 2003). For instance, the Shallow Structure Hypothesis (SSH; Clahsen & Felser, 2017), and Interface Hypothesis (Sorace, 2011) predict qualitative differences between L1 and L2 processing. These two suggest that L2ers either have difficulty during the acquisition of a unique grammatical feature that their native language lacks, or they do not use the syntactic information properly during the real-time processing. However, they claim that L2ers perform like an NS during offline tasks when they are exposed to L2 to a certain degree. Contrarily, various studies suggest that L1 and L2 processing are similar: they follow the same process to build a syntactic representation (Cunnings, 2017; Hopp, 2014; McDonald, 2006; Kaan, 2014), and the similarity is explained by working memory capacity. These theories also claim that proficient L2ers represent differences when quantitative differences occur between L1 and L2, which can be due to memory retrieval interference (Cunnings, 2017), participant-level individual differences (Tanner et al., 2014) or lexical processing efficiency (Hopp, 2014).

Even though the literature provides us with a wide range of sources regarding whether L1 vs L2 processing are similar, the answer to the question if L2 speakers acquire morphosyntactic properties of L2 in a native-like manner when their L1 lacks these features (i.e., Chinese vs Norwegian), remains controversial. However, some studies suggest that formulating the relationship between subject and verb is one of the most critical parts of producing syntactic representations and their comprehension (Clahsen & Felser, 2006; Jensen et al., 2020; Westergaard, 2003). Accordingly, subject-verb agreement processing in the production and comprehension of L2 speakers has picked psycholinguists´ interest (Alemán Bañón & Rothman, 2016; Cheng et al., 2021; Franck et al., 2002; Schlueter, 2019; Wagers et al., 2009).

In English, subjects and verbs agree in number and person. When a noun is in subject position, with *-s* as an inflectional morpheme, it is interpreted as a plural noun and generates agreement with the verb (1). The sentence is considered grammatical only when the subject and verb agree with each other. Additionally, third person singular *-s* marks the verb in present tense overtly to generate agreement (2a). The verbs and subjects in contexts like (2a, b) are directly contiguous to each other, so they are local. On the other hand, contexts, as represented in (2c), consist of a non-local linguistic dependency because the intervening noun phrase "the cabinets" is embedded between the subject "the key" and the verb "are".

1 a. The cat is sleeping.
  b. The cats are sleeping.
  c. *The cat are sleeping.
  d. *The cats is sleeping.
2 a. The cat sleeps deeply.
  b. *Cats sleeps deeply. (local agreement violation).
  c. *The key to the cabinets were rusty. (non-local agreement violation).

While English exhibits subject-verb-object (SVO) word order with an obligatory and overt subject-verb (SV) agreement, another language like Norwegian lacks this phenomenon, as it does not require overt SV agreement morphology (3a, b). In Norwegian, the sentence structure also differs from English as it is constructed with verb-second (V2) word order where the finite verb is required to appear in the second position of a main clause (4). There are some exceptions regarding specific adverbs (Bentzen, 2014) and –wh- questions in different dialects (Westergaard et al., 2017). Accordingly, there is a mismatch between Norwegian and English regarding functional morphology.

3 a. Gun og Karianne bor i Tromsø.
  Gun and Karianne live in Tromsø.
  `Gun and Karianne live in Tromsø.´
  b. Karianne bor i Tromsø.
  Karianne live in Tromsø.
  `Karianne lives in Tromsø.´

4 I Tromsø bor Karianne.
In Tromsø live Karianne.
`In Tromsø lives Karianne.´

Looking at the typological differences from an L2 processing point view, Jensen (2017) and Garshol (2019) propose that Norwegian speakers of English as L2 experience difficulties in SV agreement processing and this difficulty is explained based on Slabakova´s Bottleneck Hypothesis (BH; Slabakova, 2008, 2013). The BH argues that the most challenging part of the acquisition of L2 is functional morphology because the differences among the languages become prominent here. Therefore, Jensen et al. (2017) propose that the acquisition of SV agreement is a bottleneck for Norwegian L2 English speakers.

Furthermore, previous literature suggests that the number of the intervening noun (the closest noun to the verb) affects the long-distance agreement both in L1 and in L2 acquisition (Bock & Miller, 1992; Bock & Cutting, 1992; Franck et al., 2002). The speakers often tend to produce agreement errors by making the verb agree with its preceding noun instead of the subject. This phenomenon is called *agreement attraction*, and it usually occurs in sentences where the subject and the intervening verb contradict with the number as exemplified in (2c).

Various reasons may lead to agreement attraction error production, such as linear distance between the head noun and the verb (Gibson, 2000), the structural distance (Wagers et al., 2009), and faulty or ambiguous encoding of feature values (Pearlmutter et al. 1999; Franck et al., 2002; Hammerly et al., 2019). These studies showed that the marking of the head noun was the determinant on agreement attraction effect. Moreover, the double-marked head noun was observed to cause both L1ers and L2ers to display sensitivity towards agreement violation (Tanner & Bulkes, 2015).

Agreement attraction has been evidenced to have an essential role in memory construction that governs language comprehension (Wagers et al., 2009; Dillon et al., 2013; Jäger et al., 2017). This gave rise to an increasing interest in agreement attraction effects in language comprehension, and a broad range of existing research investigated agreement processing by using various online and offline methods (Pearlmutter et al., 1999; Wagers et al., 2009; Tanner et al., 2014; Schlueter et al., 2018; Gonzales Alonso et al., 2021). Since language comprehension is based on an infinite number of various processes engaged in distributed

brain networks, there is a growing interest in analysing neural oscillations (rhythmic patterns of neural activity in the nervous system) in psycholinguistics research (Prystauka & Lewis, 2016). The brain signals measured with EEG reflect the mean activity of medium to large-sized neuron populations (Cohen, 2017). Oscillations vary in amplitude over time, either gradually or rapidly reflecting the coordinated computations in these neuron populations over different timescales (Klimesch, 1999). Measuring the frequency-specific power in the EEG signal provides the approximate calculation of the *ongoing oscillatory dynamics* (Verela et al., 2001). The power captures both evoked oscillatory dynamics (time- and phase-locked to an event of interest) and induced oscillatory dynamics (time-locked to an event of interest) (Klimesch, 1999). Power capturing of evoked oscillatory dynamics reflect the frequency-domain representation of event-related potentials (ERPs) which is a different phenomenon than ongoing oscillatory dynamics over time (Bastiaansen, Mazaheri & Jensen, 2012; Cohen, 2017). There are five classical frequency bands: Delta (1.2 Hz), theta (3-7 Hz), alpha (8-12 Hz), beta (13-30 Hz), and gamma (30-200 Hz). The alpha, beta and gamma bands are usually divided into high and low ranges regarding the cognitive or perceptual phenomenon under the study, and the alpha frequency varies between individuals at the same age and changes remarkably with age (Prystauka, Lewis, 2018). Each frequency band is associated with various perceptual and cognitive phenomena (Buzsaki, 2006).

Neural oscillations are modulated by gender and number violations, an emerging pattern of alpha/beta power decreases, and theta power increases elicited by agreement violations (Bastiaansen, Van berkum & Hagoort, 2002; Bastiaansen & Hagoort, 2015; Lewis et al., 2016; but see Schneider et al., 2016 for theta power decreases). Theta oscillations have been suggested to have an essential role in lexical semantic retrieval (Bastiaansen & Haagort, 2003), and beta and gamma oscillations are linked explicitly to syntactic and semantic structure building (Bastiaansen & Hagoort, 2015). Alpha and delta oscillations are less investigated in sentence comprehension, but alpha is claimed to have a task-specific working memory function and has a critical role in the inhibition of competing or task-irrelevant information in short-term memory (Bastiaaansen & Hagoort, 2006; Meyer, 2017).

Recalling that double-markedness has been observed to cause L1ers and L2ers to show sensitivity for the agreement violations in the previous literature, I aim to address a recent study on the double-marking effect on L2 vs L1 processing of non-local agreement where L1 lacks the relevant morphosyntactic feature. Cheng et al. (2021) is the only study that examines the double-number marking effect between L1 English speakers and Chinese-English L2

learners whose L1 lacks number agreement using ERPs. They manipulated number marking with determiners (*the vs that/these*, as exemplified in 5) to see how determiner-specification affects both L1 and L2 processing for verb-number agreement. Behavioural and ERP results suggested that both L1ers and L2ers detected nonlocal agreement violations, and the manipulation of determiner-number specification elicited a facilitation effect in grammaticality judgement and ERP responses for both groups. Furthermore, contrary to previous investigations, the results suggest that L1 and L2 speakers show similar ERP responses during the agreement process, even when L1 lacks the relevant feature.

5 a. The window of the house is really clean. (Grammatical, Number-Unspecified)
  b. *The windows of the house is really clean. (Ungrammatical, Number-Unspecified)
  c. That window of the house is really clean. (Grammatical, Number-Specified)
  d. *Those windows of the house is really clean. (Ungrammatical- Number-Specified)

6 Dette vinduet er rent.
  ´This window is clean.´

Like Chinese, the Norwegian language does not represent overt subject-verb agreement either. However, it allows double-number marking shown in (6). The mismatch between Norwegian and English regarding the SV agreement representing functional morphology is an interesting issue to investigate L2 processing of nonlocal agreement in Norwegian-English language pair using the analysis of neural oscillations. To do so, this study adopted Cheng et al.'s (2021) methodology to examine the number specification in L2 processing of Norwegian adult L2 English speakers.

Whether L2 processing is essentially different from L1 processing concerning morphosyntactic integration processes is a broadly discussed subject. Previous research on acquisition of syntax and functional morphology proposed that functional morphology is not only a more challenging part of L2 acquisition but also it is a more constant problem as the learners become more advanced speakers of English (Ionin and Wexler, 2002; Haznedar, 2001). I find it interesting to address this issue because the methodology of this study provides insight into the neurolinguistic aspect of SV agreement processing in L2 advanced English of Norwegian native speakers. The methodology will bring us closer to understanding the basis of neural computations that support language function in the brain and the

associations between band-specific oscillations and higher-level cognitive processes. The main purpose of this thesis is to contribute to the current knowledge on L2 morphosyntactic processing in the field of psycholinguistics. Based on this, the hypothesis in the current thesis is that advanced English L2 speakers of Norwegian L1ers´ performance on L2 morphosyntactic processing is similar to L1 processing despite the mismatch between English and Norwegian with respect to SV agreement. To examine this, we recorded EEG (*electroencephalogram*) with ERP time-locked concurrent with a grammaticality judgement task (GJT) to test participants´ online processing and comprehension of nonlocal subject-verb agreement. The sentences represented during the online GJT were adopted from Cheng et al. (2021) with four target conditions: Grammatical unspecified, grammatical specified, ungrammatical unspecified, and ungrammatical specified.

This thesis is divided into the following sections: Section 2 offers an overview of the theoretical background, section 3 presents the research questions, predictions and methodology, section 4 shows the results from the current experiment, and section 5 discusses the research questions and predictions, and section 6 provides a conclusion.

2 Theoretical Background

The following sections present the theoretical background of this thesis. First, in section 2.1, I present the differences between L1 vs L2 processing of subject-verb agreement and various hypotheses and models on first vs second language processing. Section 2.2 presents the previous literature and different accounts in agreement attraction. In section 2.3, I explain the crosslinguistic influence between the two languages. Finally, in section 2.4, I present the previous studies that relate to the current thesis, especially from the view of the neurolinguistic method and analysis.

2.1 First vs Second Language Processing

This section presents two different accounts of first and second language processing: First, the theories/models are given that claim first and second language processing differs from each other regarding different parsing mechanisms. Then, other accounts are explained that claim first and second language processing is similar, but individual differences can be explained with working memory capacity.

The Shallow Structure Hypothesis (SSH; Clahsen & Felser, 2017) and Interface Hypothesis (Sorace, 2011) predict qualitative differences between L1 and L2 processing. These suggest that L2ers either have difficulty during the acquisition of a unique grammatical feature that their native language lacks, or they do not use the syntactic information properly during the real-time processing. These hypotheses, however, claim that L2ers perform like native speakers during offline tasks such as Grammaticality Judgement Task (GJT) when they are exposed to L2 to a certain degree. Contrarily, various studies suggest that L1 and L2 processing are similar; that is, they follow the same process to build a syntactic representation (Cunnings, 2017; Hopp, 2014; McDonald, 2006; Kaan, 2014), and the similarity is explained with working memory capacity. However, these theories claim that proficient L2ers represent differences when quantitative differences occur between L1 and L2. These differences are explained by memory retrieval interference (Cunnings, 2017), participant-level individual differences (Tanner et al., 2014) or lexical processing efficiency (Hopp, 2014).

2.1.1 The Shallow Structure Hypothesis (Clahsen & Felser, 2006)

Clahsen and Felser (2006) suggest that grammatical processing in L2 is essentially different from grammatical processing in L1, and they propose the Shallow Structure Hypothesis (SSH). The SSH argues adult L2 learners compute syntactic representations shallower and

less detailed during comprehension than L1 speakers. They compare different populations (mature native speakers, child L1 and L2 learners, as well as adult L2 learners) and various language elements such as morphology and syntax by using experimental psycholinguistic techniques. The results showed that there was a dramatic difference in adult L2 sentence processing compared to that of native speakers. Through the experiment, lexical-semantic cues guided adult L2 learners during parsing, but the syntactic representations they computed during comprehension were less detailed and shallower compared to child and adult L1 speakers. The SSH proposes that adult L2 speakers can perform native-like behavioural assessment requiring linguistic background; however, the difference occurs between L1 and L2 speakers when L2ers are supposed to perform a language processing test. This might be explained as the difficulty of using the syntactic information effectively during the real-time process.

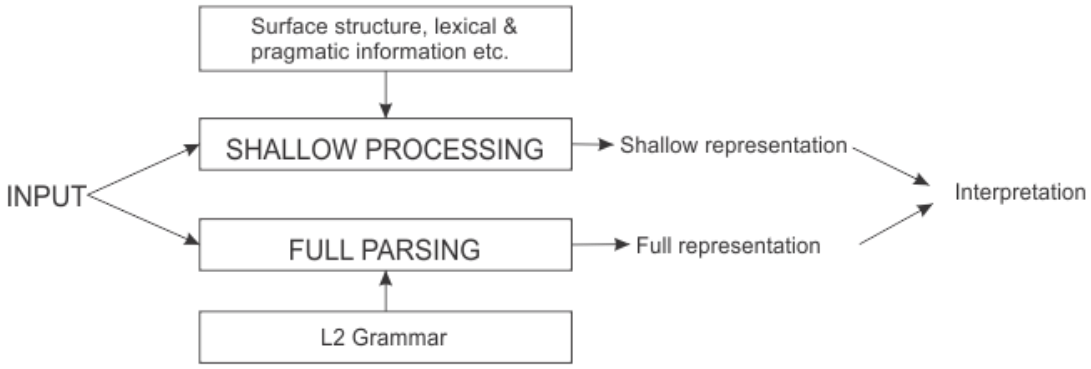

Figure 1: Adopted from Clahsen & Felser (2006) illustrating the model of L2 processing according to the shallow structure hypothesis. Original citation: "Figure 1. Of the two routes to interpretation available in principle, full parsing is restricted in L2 sentence processing because of inadequacies of the L2 grammar."

2.1.2 The Interface Hypothesis (Sorace, 2011)

The Interface Hypothesis (IH) was first proposed by Sorace and Filiaci (2006). The IH suggests that advanced adult L2 learners have more difficulty in acquiring the structures entirely, which are sensitive to conditions with an interface between linguistic domains such as syntax and the other cognitive domains like pragmatics when compared to the structures that do not consist of such an interface. They tested the interpretation of Italian pronominal subjects in near-native speakers of L2 Italian and observed that the participants gave relatively different responses from the monolingual Italian speakers regarding overt subject pronouns while they performed native-like on null-subject pronouns. The IH has been developed over time and extended to early bilingual acquisition and the very early stages of

individual L1 attrition (Sorace, 2011). Within this extension, the IH predicts that both syntactic and pragmatic conditions can be acquired, but then integrating both domains becomes less efficient as it increases the likelihood of optionality. The IH is based originally on offline experiments; however, the most recent form of the hypothesis claims that the difficulty related to the interfaces derives from the L2 speakers´ reduced ability to integrate syntactic and other information during online processing.

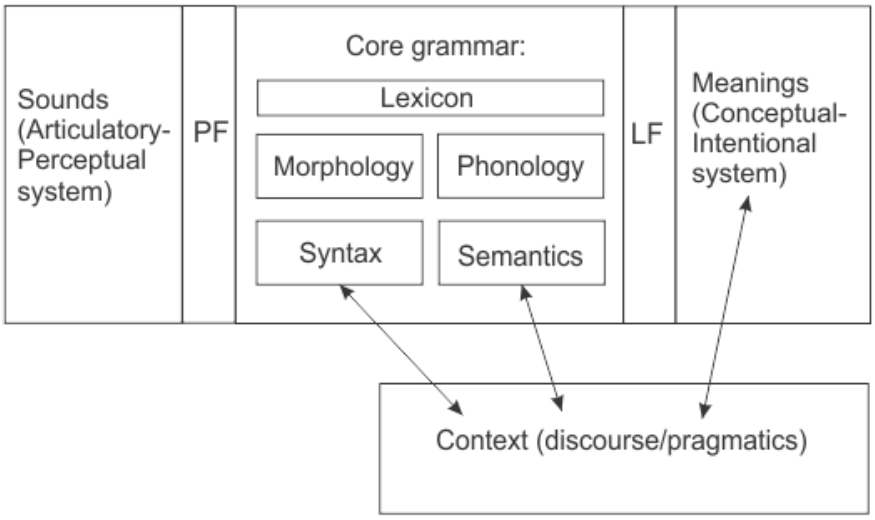

Figure 2 Adopted from Rothman & Slabakova (2011) illustrating the interface model of language. Original citation: "Figure 3. A working interface depiction from White (2009)"

2.1.3 The Declarative/Procedural Model (Ullman, 2001, 2005, 2012, 2020)

The Declarative/Procedural model (D/P; Ullman, 2001, 2005, 2012, 2020) describes how the brain's two most important long-term memory systems, *declarative* and *procedural memory*, play a role in language acquisition. Ullman (2001) posits that language learning, use and storage are crucially dependent on long-term memory systems, namely declarative and procedural memory systems. In other words, lexicon and language are based on these two neural systems. That is, declarative memory applies to the activation of meaning, whereas procedural memory involves grammatical structure building, including syntax, morphology and phonology. Furthermore, the declarative memory system is hypothesized not only to be related to the brain structures underlying the learning of new memories but also to the entire system associated with learning, representation, and use of the relevant information. Knowledge is acquired explicitly in the declarative memory system. On the other hand, the procedural memory system is the brain system that controls the long-established motor and

cognitive skills and habits and other procedures such as typing or riding a bicycle. The knowledge in the procedural memory system is hypothesized to be implicit.

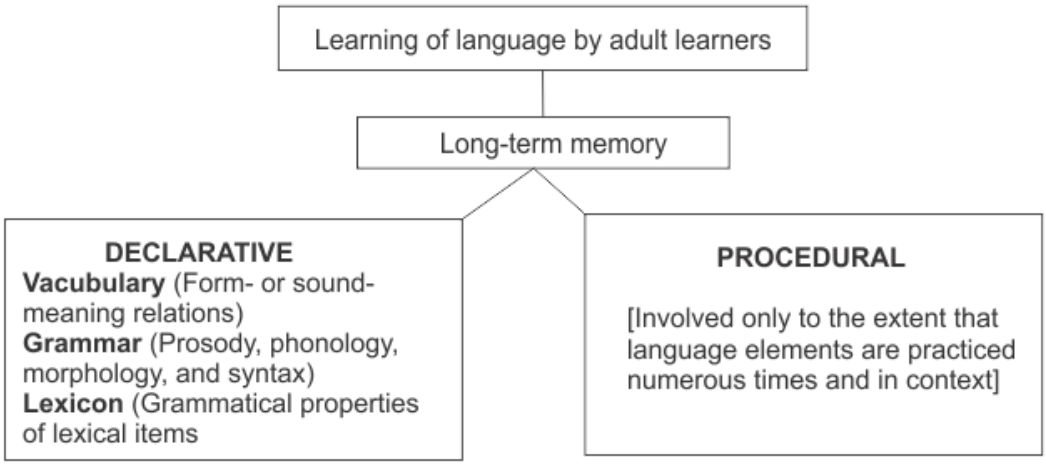

Figure 3 Adopted from Bolgun & McCaw (2019) illustrating the relation between language acquisition and long-term memory types based on the D/P model. Original citation: "Figure 1. Involvement of long-term memory types in language acquisition (based on the DP model).

Each system plays a vital role in its linguistic and non-linguistic functions. The D/P model makes various specific predictions about the neurocognitive basis of lexicon and grammar in accordance with their computation, localization, separability, and domain generality. Since the knowledge is implicit in the declarative memory, the D/P model predicts that L2 learning in procedural memory should be better in childhood than in adulthood. That being the case, grammar should be easier to acquire in childhood both in L1 and L2 than in adulthood L2 acquisition. Accordingly, the D/P model hypothesizes that L2 acquisition initially differs from L1 acquisition; however, L2 learners are expected to rely more on native-like neurocognitive mechanisms with increased experience or proficiency. Although the D/P model and SSH are similar in certain respects, these two models also differ from each other. The SSH offers less of an expectation that grammar processing can become native-like. Furthermore, the SSH focuses on psycholinguistic processing accounts, whereas the D/P model relies on the neurolinguistic basis of language processing. The SSH and the IH describe L1/L2 differences in terms of types of information that can or cannot be utilized during processing despite the fact that both theories make different predictions about when the differences in two languages may begin. Instead, Ullman (2001, 2005, 2012) describes the differences regarding the reliance on declarative memory by subserving lexical storage and procedural memory.

2.1.4 Working Memory and L2 processing

The SSH, the IH and the D/P model propose that L2 processing differs from L1 in respect of different parsing mechanisms; however, these theories/models propose that L2ers are expected to perform native-like with enough exposure and experience. On the other hand, some approaches claim that L1 and L2 processing are basically similar, and the differences result from individual differences/capacity-based limitations or limited lexical access routines. The role of working memory in language acquisition arouses a growing interest within this account. Baddeley and Hitch (1974) explain *working memory* as the memory we are forming now, which is similar to short-term memory as they both hold a limited number of items accessible only for some seconds. However, short-term memory is a single system without subsystems where the information goes into a single store. In contrast, working memory is a multi-component system that includes subsystems such as auditory and visual. While working memory can retain for a short period and process the information by performing mental operations, short-term memory can only hold information.

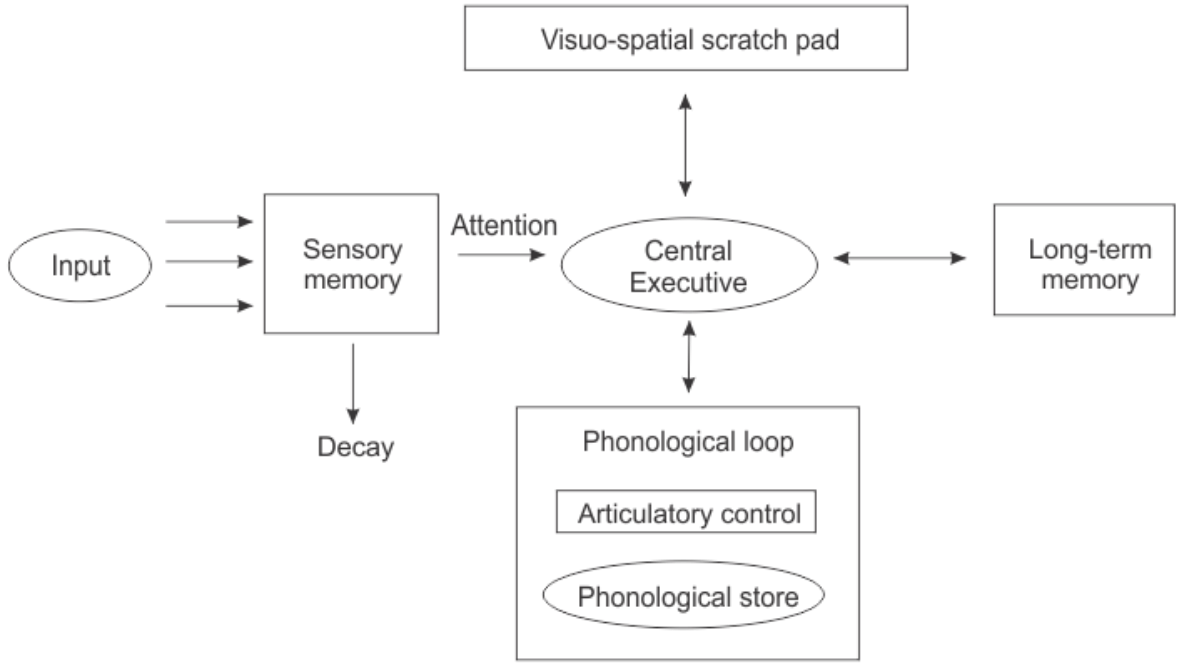

Figure 4 The Working Memory Model Components (Baddeley and Hitch, 1974)

In their model, Baddeley and Hitch (1974) explain working memory as a multi-component system with the following major components: (i) *Phonological loop* where the spoken language and written material are processed, (ii) visuospatial sketchpad where visual and spatial information is conducted such as keeping track of where we are in relation to the other

objects during when we move through our environment, and (iii) *the central executive* which is the most critical component of the system as it controls the attentional process by monitoring and coordinating the operation of the other components, then it relates them to *the long term memory*. However, this model failed to explain the results of various experiments, and Baddeley (2000) updated the model with an additional component: Episodic buffer. This is the component that functions as a backup store by leading the communication between long-term memory and the other components of working memory.

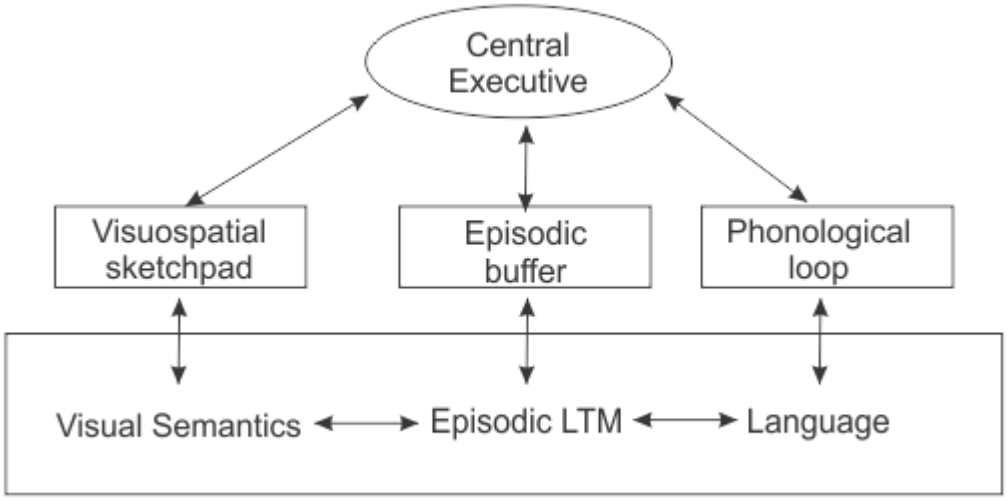

Figure 5 The updated model including episodic buffer. (Baddeley, 2000)

A considerable amount of literature on the role of working memory in L2 acquisition has been influenced by Baddeley and Hitch´s working memory model. Some of these studies are considered tripartite models and consist of a narrow focus of attention, a working memory component and a separate long-term memory store (Cunnings, 2017). Individual differences are defined by the *capacity limitations* in the amount of information a person can hold in working memory at one time. Hopp´s comparative studies on L2 processing (2006, 2010, 2014) suggest that L2 processing and native processing are fundamentally similar. However, the differences during non-native processing occur due to different proficiency levels, L1 transfer, and lexical efficiency that underlie the differences in working memory capacity. Similarly, Mc Donald (2006) reported some successful late L2 learners cases and explained poor grammaticality judgement and processing difficulties/differences again with individual differences in L2 memory capacity, decoding or processing speed.

Other models assume that working memory is not a separate component and only a limited amount of information can be activated in the focus of attention at one time, but all the information needs to be retrieved from the memory (Cowan, 2001; McElree, 2006 as cited in Cunnings, 2017). These are activation-based models that underlie the process involved in memory encoding, storage, and retrieval, as well as in attention switch between information that is brought in and out of focal attention. Lewis et al. (2006) and Lewis & Vasishth (2005) describe sentence comprehension as involving skilled memory retrieval and propose that the activation levels of an item would decay when it is first encoded in memory during the time the other items are encoded; however, retrieval operations still boost activation subsequently. Additionally, Gibson (1998) proposes that the distance affects dependency resolution and that the linear distance causes increased processing efficiency during memory retrieval. According to Gibson (1998), there are two specific cost components that can be described as *i) integration cost* and *ii) memory cost.* Integration cost is mainly associated with the new input that integrates into the structures already built at a given stage in the computation. In contrast, memory cost is primarily associated with storing the parts of the input which might be used in parsing the subsequential parts of an input. In the Dependency Locality Theory (DLT), Gibson (1998, 2002) describes the different pieces of evidence he gathered for his theory and explains his experimental observations for explicit structures that should be elucidated in a computational resource. Gibson exemplifies increasingly complex sentences as below:

7 a. The reporter disliked the editor.
  b. The reporter [s' who the senator attacked] disliked the editor.
  c. The reporter [s' who the senator [s' who John met] attacked] disliked the editor.

There is no lexical material that intervenes between the subject noun phrase (NP) (the reporter) and the verb (disliked) in (7a). In (7b), the relative clause (RC) *who the senator attacked* occurs between the NP and the verb. As a result, the RC is nested between the NP (the reporter) and the verb (disliked). In (7c), there is another relative clause nested between the subject NP (the senator) and the verb (attacked) of the first RC. Therefore, this RC (who John met) is nested twice.

8 John met the senator [s' who attacked the reporter [s' who disliked the editor]].

Gibson suggests that the difficulty related to the processing of nested structures might be caused by the quantity of resources required during their processing. He proposes that there is no local ambiguity in (7c); therefore, the processing difficulty linked to this sentence is not related to ambiguity confusions and that the difficulty in understanding (7c) is not related to the lexical frequency or plausibility. Even though sentence (8) that is presented below contains the same words and expresses the same opinion as (7c), it is much easier to understand where the RCs are not nested as they are in (7c); thus, (8) is easy to understand. Gibson points out the problems about nesting complexity and discusses the other problems with the incomplete dependency approaches while he presents further evidence for the DLT, focusing on the lack of complexity in the examples (9).

9 a. A book [that some Italian [that I have never heard of] wrote] will be published soon by MIT Press. (Frank,1992).

b. The reporter who everyone that I met trusts said the president won't resign yet. (Bever, 1974)

Both sentences exemplified in (9) contain an RC nested within the main clause of the sentence just like it is in (8) but (9a) and (9b) are much easier to understand than (8) as there is a highlighting difference between (9a, b) and (8) as the former contains a pronoun as the most embedded RC, on the other hand, the most embedded subject is a proper name in (8). As a consequence, Gibson proposes that it is much easier to understand or process a structure when the most embedded subject of a nested RC structure is a pronoun, stating that

> "Complexity theories that rely on incomplete dependencies do not predict the observed complexity difference. Changing the content of the most embedded subject NP to a pronoun does not change the maximal number of incomplete syntactic dependencies in the structures" (Gibson, 2000).

The DLT proposes that the linear distance between the words that consist of dependencies should be as short as possible such that dependency length is minimized. This results in increased processing efficiency as minimizing the dependency length means minimizing the difficulty during the processing that is associated with working memory retrievals (Gibson et al., 2019)

Alternatively, other studies on language processing suggest a cue-based memory retrieval mechanism where memory retrieval compares a set of retrieval cues against all items in memory. Cue-based models reported that computational based elements basically regulate the working memory operations and individual differences are explained by the differences in the success of memory retrieval operations instead of differences in processing capacity (Van Dyke & Johns, 2012; Cunnings, 2017). Differently from the accounts that describe L1/L2 differences regarding shallow parsing or capacity limitations, Cunnings (2017) proposed that L2 speakers are more sensitive to memory interference when they need to access information from memory for successful comprehension. According to Cunnings (2017), the differences that remain even at high proficiency levels in L2 sentence processing can be defined as increased sensitivity to interference during memory retrieval operations. In their revision of difficulty in language comprehension, Van Dyke & Johns (2012) address retrieval-based research and claim the retrieval-interference paradigm to be consistent with behavioural and neuropsychological memory phenomena. That is, individual differences in sentence comprehension can be derived from individual differences in sensitivity to interference.

Agreement attraction is an important example of the interference effect, a fruitful resource that gives us a broad spectrum of information on morphosyntactic processing which has been studied widely to understand L1/L2 processing mechanisms better (Bock & Cutting, 1992; Pearlmutter et al., 1999; Frack et al., 2002; Wagers et al., 2009; Tanner & Bulks, 2015; Alemán Bañón el at., 2017; Cheng et al, 20121, Gonzales Alonso et al, 2021).

10 a. *Turtles moves slowly. (local agreement violation)
   b. *The key to the cabinet/s are rusty. (non-local agreement violation) (Cheng et al., 2021)

In English, verbs agree with their subject in number and person in the present tense. We see this subject-verb agreement clearly in the third person singular *-s* marking. There are two types of subject-verb agreement regarding the distance between subject and verb as *local* and *non-local* SV agreement. The verb is preceded by the subject noun phrase (NP), and they are directly adjacent to each other in local subject-verb agreement (10a). In contrast, non-local subject-verb agreement consists of a prepositional phrase (PP) or a relative clause (RC) between the subject NP and the verb, so they are considered to be more complicated (10b). As a result, both native and L2 speakers produce agreement errors, known as *agreement*

attraction. Agreement attraction errors occur when a word participating in agreement, such as a verb agrees with a nearby distractor that is grammatically inaccessible and fails to match its grammatical controller that contains the right agreement features (Wagers et al., 2009).

Previous literature has broadly investigated L1 vs L2 processing of non-local agreement violations using EEG and behavioural experiments (Alemán Bañón & Rothman, 2019; Tanner, 2011; Tanner & Bulkes, 2015; Molinaro et al., 2011; Wagers, Lau, & Phillips, 2009). These studies show that L2ers consistently detect agreement violations. This can be seen through long reading times and a P600 effect (an event-related potential (ERP) component elicited by reading or hearing grammatical errors) on the structures that contain agreement violations (e.g., 11b, 11d) compared to grammatical controls. However, even English native speakers can sometimes misjudge these structures as grammatical when the intervening noun phrase erroneously matches the verb. Agreement violations are influenced by number marking as well. The number is marked both morphologically (e.g. "kids") and lexically by using the words such as "many" (e.g. many kids). In this case, we mark the nominal head overtly by using the plural marker "-s" as well as using the quantified determiner "many", which forms double marking. This factor was manipulated by Tanner and Bulkes (2015) to see if double marking using quantifiers (e.g., 11c, d) facilitates the concept of local agreement violations in comparison with the cases without double marking (e.g. 11a, b).

11 a. The kids like painting.
   b. *The kids likes painting.
   c. Many kids like painting.
   d. *Many kids likes painting.

Both behavioural and EEG data showed heightened sensitivity to agreement violations when quantification provided an additional indication of the grammatical number of the subject NP. The following section will represent the theories regarding the agreement attraction effect.

2.2 Agreement attraction accounts

Described and experimentally elicited first in production (Bock & Miller, 1991), agreement attraction errors have been broadly investigated in language comprehension; specifically, the subject-verb agreement has been focused on widely in the literature (Alemán Bañón & Rothman, 2016; Dillon et al., 2013; González Alonso et al., 2021; Lago et al., 2019; Nevins et

al., 2007; Schlueter, 2019; Tanner & Bulkes, 2015; Wagers et al., 2009). Agreement attraction is described as differences in reading or listening times and sentence acceptability in comprehension (Gonzalez Alonso et al., 2021). It is seen in the sentences where the head nouns and the attractor nouns demonstrate the same or different marking that agrees or disagrees with marking in the verb consecutively.

Recent studies suggest that L2ers can represent native-like performance with typologically similar language pairs while processing local and non-local agreement violations (Alemán Bañón, Miller & Rothman, 2017; Tanner, McLaughlin, Herschensohn, & Osterhout, 2013). On the other hand, whether L2ers show native-like performance with the language pairs where L1 lacks morphological agreement represents ambiguity. Previous behavioural studies suggest both similarities to L1ers and differences in means of detecting agreement violation (Jiang, Novokshanova, Masuda, & Wang, 2011; Lim & Christianson, 2015; Jensen et al., 2020). ERP studies also report that L2ers with mismatching languages provide either similar or different neural responses to agreement violations, showing that the picture is also unclear within ERP investigations. Armstrong et al. (2018) investigated how native Chinese speakers process subject-verb agreement in English, using neural measures and how sentence-internal clues to grammatical number effects the process. The study shows that both English native controls and Chinese English L2ers demonstrated a P600 effect to local violations. This indicates that L2ers with an L1 that lacks the relevant morphological agreement can show native-like neural responses to agreement violations in certain circumstances as immersion (Cheng et al., 2021).

There are two different accounts of attraction: Representation based accounts (Pearlmutter et al., 1999; Hammerly et al., 2019) and retrieval-based accounts (Wagers et al., 2009; Jager et al., 2017). Representational based approach proposes that attraction occurs due to the representation of a faulty or ambiguous representation of the number marking of the subject (*the key to the cabinets*) when the two nouns (*the key and the cabinets*) contain different number specifications. On the other hand, retrieval-based approaches explain attraction as dependent on the agreement between the number marking of the verb (were) and the previous nouns in the sentence. Wager et al. (2009) investigated these accounts further and reported longer reading times for ungrammatical sentences, as shown in (12).

12 a. The key to the cell (unsurprisingly) was rusty from many years of disuse.
b. The key to the cells (unsurprisingly) was rusty from many years of disuse.
c. * The key to the cells (unsurprisingly) were rusty from many years of disuse.
d. * The key to the cell (unsurprisingly) were rusty from many years of disuse

Furthermore, attraction effects were seen in ungrammatical sentences rather than grammatical sentences. Wagers et al. (2009) propose that the retrieval process might affect agreement processing in two ways: (i) a cue-based retrieval process manifests normal agreement processing; that is, verb number is used as a cue for searching the subject in the memory. (ii) a mismatch between the verb and subject number triggers a reanalysis process by employing cue-based retrieval to find a matching antecedent. Wagers et al. (2009) explain the difference in attraction effects in grammatical and ungrammatical conditions with *grammatical asymmetry* in agreement attraction. Various studies reported grammatical asymmetry (Dillon et al., 2013; Tanner et al., 2014; Schlueter et al., 2018). Wagers et al. (2009) argue that this pattern supports a retrieval-based account within the cue-based memory retrieval framework. According to this framework, the constituents are encoded in the memory during the sentence process. Each of the constituents that mark the tail-end in a long-distance dependency triggers the retrieval of a potential antecedent which may function as the controller of that dependency. Retrieval occurs through a query which specifies a set of cues that must be satisfied by the antecedent. When the retrieval is conducted, the retrieval cues available at the retrieval site are used to reach the target item in memory. The activation is transferred from each cue to each item with a matching feature. Finally, the highest activated item is retrieved, and the retrieval is completed. Retrieval cues at the verb involve specification for an antecedent with specific morphological and structural features for a subject-verb agreement. If there is a partial mismatch between the target's cues and features, this may result in the mis-retrieval of the item that is not targeted, which is known as *similarity-based interference* (Schlueter et al., 2019).

Contrary to the retrieval-based approach, representational-based accounts explain the agreement attraction effects with the faulty or ambiguous encoding of feature values instead of a retrieval error. These models were mainly improved for the attraction effect in production, but some studies extended their predictions to comprehension as well (Pearlmutter et al., 1999; Hammerly et al., 2019). *Feature Percolation* account (Nicol, Foster, & Veres, 1997; Franck et al. 2002) predicts that in sentences with a complex subject including

a singular head noun which is followed by a second, plural noun phrase (NP) as in (12a, b), the number property of the subject NP (*the key to the cells*) is specified erroneously as plural rather than following its singular head noun (*the key*). Marking and Morphing model (M&M; Eberhard et al. 2005; Bock & Middleton, 2011), on the other hand, suggests that the number specification of the subject NP is not definitely singular or plural, but it adopts a gradient value in a place in between negative and positive that is called as the *singular and plural value* (SAP) by Bock and colleagues.

2.3 Transfer

Odlin (2012) explains the crosslinguistic influence (CLI) as the influence of one language upon another, essentially during the second language acquisition. According to Odlin (2012), CLI is actually synonymous with some other terms, such as *language transfer* and *interference*; however, the terms are used in a broad spectrum for various cases, each of which is a unique phenomenon. Thus, some other terms, such as *positive transfer*, and *negative transfer*, are used to express various divergences as a result of dissimilarities between the target language and the source language (usually native language). Facilitating effects of one language to another one during acquisition (e.g., German vocabulary in acquiring Norwegian) is defined as the positive transfer. On the other hand, variance composed of the differences between the target and source languages (e.g., the mismatch between English and Norwegian in subject-verb agreement) is defined as the negative transfer. Alternatively, Rothman et al. (2019) define crosslinguistic influence as the effect on linguistic representations *above* and *beyond* their use in receptive or productive language processing. They propose that *transfer* and *crosslinguistic influence* can cooccur. They disentangle the terms transfer and crosslinguistic influence from each other by using *transfer* for referring to representation and *crosslinguistic effect* (CLE, also called interference; Herdina & Jessner, 2002 as cited in Rothman et al., 2019) for referring to the crosslinguistic influence at other levels that covers mental lexicon access and language processing effects. Rothman et al. (2019) propose that in sequential bi-/multilingualism, namely, when all the languages are acquired separately, the linguistic information from the pre-acquired language(s) is stimulated as a consequence of not having the target linguistic representations enough to parse the target input. This circumstance is called ´underspecification´, which causes difficulties in parsing the input. Underspecification occurs in two different ways: First, the lack an interlanguage representation affects the whole interlanguage system in the initial stage of exposure to L2 or the L3 in the form of *wholesale* transfer. Second, the lack of an

interlanguage representation for a given grammatical property motivates the emergence of a new representation to be copied from the pre-acquired language. This might be exemplified by the mismatch between Norwegian and English in present tense subject-verb agreement.

13 a. I drink milk.
   b. She drinks milk.
   c. They drink milk.

The third person singular verb of the simple present tense is inflected with –(e)s suffix in English, while a bare infinitive form of the verb is used for the other subject pronouns (13). On the other hand, Norwegian marks the present tense with –(e)r suffix (3), and Norwegian subject-verb agreement does not require overt agreement morphology. The verb form is the same, whatever the number and person of the subject is.

2.4 Electroencephalogram (EEG) and time-frequency representations (TFRs)

Electroencephalography is a technique used for recording and interpreting the electrical activity of the brain by applying electrodes on the scalp. The nerve cells in the brain produce electrical impulses that oscillate rhythmically in distinct patterns. Neural oscillations are the synchronized rhythmic patterns produced by the neurons in the brain. The instrument that records and measures these neural oscillations/brainwaves is called electroencephalogram (EEG). Electrodes are placed on the scalp to record the electrical activity of the brain so that a signal is transferred to a recording channel of the electroencephalograph which comprises the difference in the voltage. The rhythmic oscillation of this potential difference is demonstrated by the recording channel as peaks and throughs on a line graph as shown in figure (6).

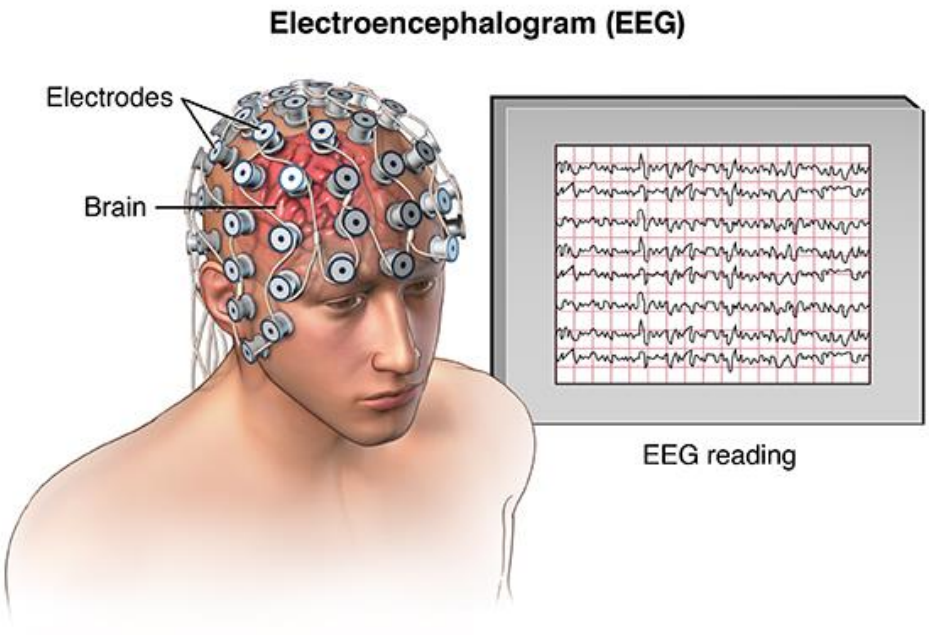

Figure 6 Electroencephalogram (https://speakingofresearch.com/tag/eeg/)

Oscillations are defined by their frequency, amplitude, and phase. Time and frequency domains are provided by a time-frequency representation which can be extracted from the neural recordings using time-frequency analysis (Cohen, 1995). The speed of the oscillations is measured in Hertz (Hz; cycles per second), and there are five frequency bands of neural oscillations: Delta (1-4 Hz), theta (4-8 Hz), alpha (8-12 Hz), beta (13-30 Hz), gamma (30-150 Hz).

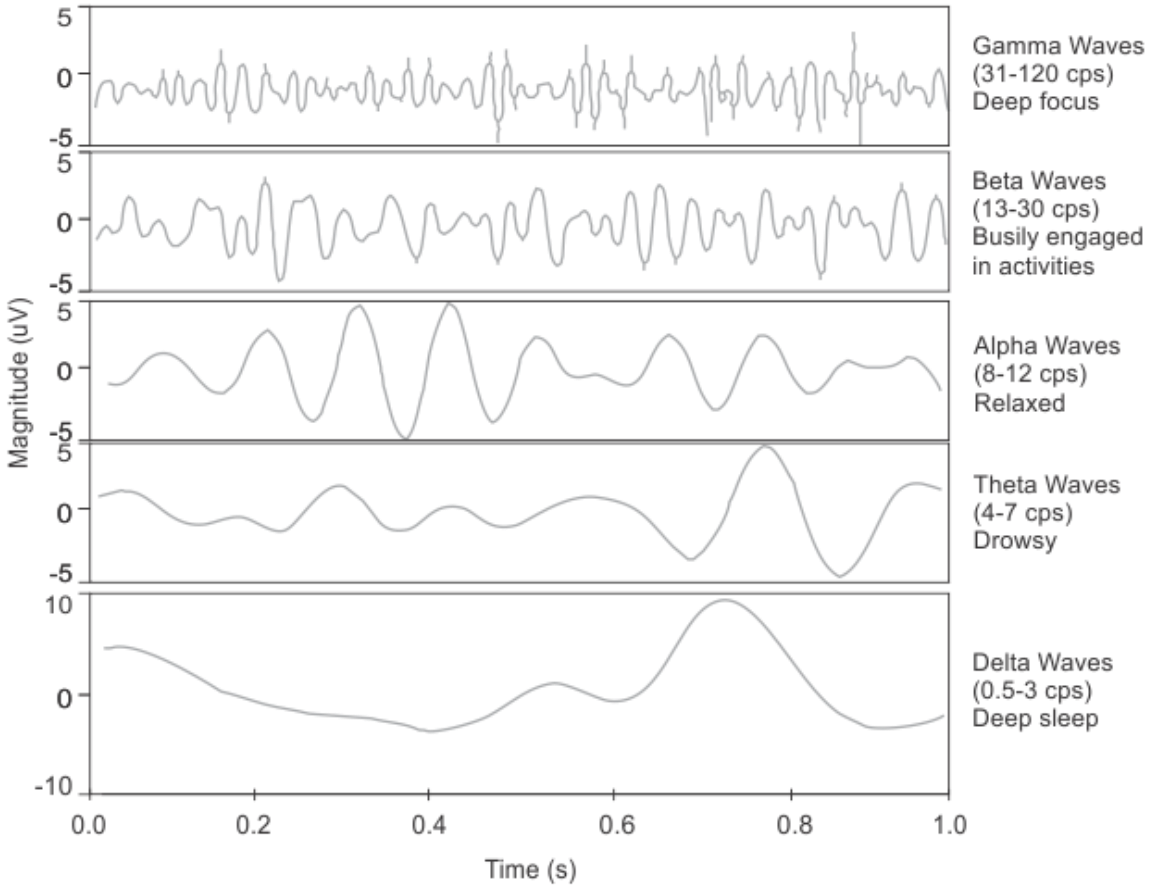

Figure 7 EEG frequency bands.

The brainwaves change due to the task, reaction, and affection. An individual might feel exhausted, apathetic, or prostrated on the occasion that the low-frequency brainwaves are dominant. In opposition, the dominance of higher frequencies conduces to feel hyper-alert and vigilant. *Delta (1-4 Hz)* oscillations are the largest-amplitude waves in the low-frequency range, generated in the cerebral cortex region, which is correlated with sight and hearing, and these waves are present during non-REM sleep. *Theta (4-7 Hz)* oscillations are associated with learning, memory and intuition, and they dominate the hippocampal-entorhinal system during spatial navigation and memory processing. *Alpha (8-12 Hz)* oscillations are dominant above the occipital cortical area when the eyes are closed, and they facilitate entire mental coordination such as alertness, calmness, mind/body integration and learning. *Beta (13-30 Hz)* oscillations are present during the normal waking state of consciousness, specifically when we are alerted and engaged in problem-solving and decision-making. They are dominant when we focus on cognitive tasks and the outer environment. *Gamma (>30 Hz)* oscillations are the fastest brainwaves with high frequency and generate during the information process from various brain regions. A greater presence of gamma is associated with expanded

consciousness. These brainwaves can coexist in the same parts of the brain or occur in different parts and interact with each other; however, they might also reflect various aspects.

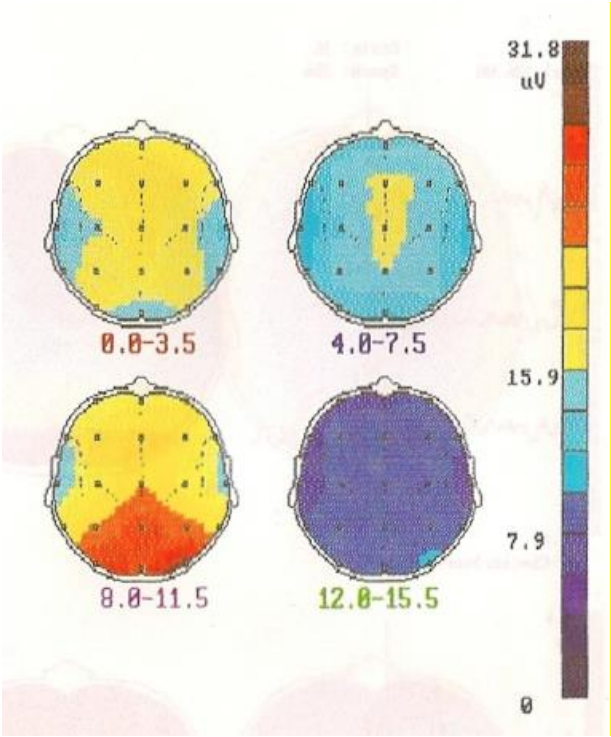

Figure 8 Topographies of resting EEG spectral amplitude density averaged across 43 individuals in delta (upper left), theta (upper right), alpha (lower left), and beta (lower right) frequency bands (Maurer & Dierks, 1991)

There is an increasing interest in analysing neural oscillations in psycholinguistics (Prystauka & Lewis, 2018). Since language comprehension involves numerous processes that are accomplished in parallel in distributed brain networks, it is hoped that this methodology helps to understand more of the basic neural computations that support the language function in the brain (Prystauka & Lewis, 2018).

A growing body of research has investigated the neural oscillatory mechanisms related to certain types of linguistic processing to have a better understanding of the neural computations supporting language function (Prystauka & Lewis, 2018). Comparing behavioural and neural responses between the sentences, including a specific type of violation and the sentences that are not violated, allows us to understand the neural mechanisms associated with ongoing structure-building operations. Power decreases in the alpha (8-12 Hz) elicited by agreement violations have been observed in the previous literature. (Davidson & Indefrey, 2007; Kielar et al., 2014; Lewis et al., 2016; Pérez et al., 2012; J. M. Schneider et al., 2016). These studies linked the functional role of power decreases in the alpha band to

different aspects of syntactic processing. For example, Davidson and Indefrey (2007) investigated the relation between event-related and time-frequency violation responses in sentence processing, and they reported alpha power decreases associated with subject-verb number agreement violations. They tested the link between neural oscillations and phrase structure violations and again observed alpha/beta decreases at the critical word. They investigated ERP-power relations suggesting various functional relationships between activity in connection with the violation of ERP response and oscillatory power. One of their assumptions was that the state of that network was mainly influenced by the participants' attentional control demands during the course of time they were represented the sentences on the screen. They observed that the alpha and beta power were relatively low in response to the violation during the time the participants were actively engaged in the task. Pérez et al. (2012) reported a decreased alpha band oscillatory power for an agreement. They also explain this from the attentional perspective: The motion of judging whether the sentences are correct requires attention. If a sentence contains a mismatching verb, the participants might need to engage more attentional resources compared to a sentence containing an agreeing verb to be able to distinguish carefully between an agreeing and a disagreeing verb.

Power decreases in the alpha frequency band are also associated with the processing of semantic anomalies (M. Bastiaansen et al., 2010; Klimesch, 1999; Willems et al., 2008). Previous studies suggest that oscillations in the alpha frequency range might be more connected with the linguistic information process than theta frequency range, even though alpha and beta power decreases are observed less regarding the sentence-embedded semantic anomalies (M. Bastiaansen et al., 2010; Willems et al., 2008). For example, Willems et al. (2008) reported an alpha decrease following sentence-embedded semantic anomalies. They suggest that this effect was precisely connected with linguistic information processing because alpha power decrease was stronger in response to semantic mismatches within the sentence compared to the mismatching of the pictures. We can explain this with studies in the memory domain, which propose that alpha and beta power decreases have an important role in semantic coding and long-term memory retrieval (Hanslmayr et al., 2012; Klimesch et al., 2005). The findings showed that, as an effective encoding strategy, semantic processing was robustly followed by alpha and beta power decreases.

Table 1: Summary of the studies with syntactic violations

Study	**Delta** δ (0.1-3,5 hZ)	**Theta** θ (4-8 Hz)	**Alpha** α (8-12 Hz; Low 12-15 Hz, Mid 15-18 Hz, High 18+)	**Beta** β (above 12 Hz)	**Gamma** γ (above 30)
Bastiaansen et al. (2002)	increase	increase	no difference		
Bastiansen & Haagort (2006)				larger (syntactically correct)	larger (semantically coherent)
Devidson & Indefrey (2007)			decrease	decrease (phrase structure violations)	
Lewis et al. (2016)		increase (native speakers) No increase (L2)		decrease (L2)	
Perez et al. (2012)		increase	decrease	decrease (lower)	
Regel et al. (2014)		increase	decrease		
Schneider et al. (2016)		decrease (retrieval of lexical semantic information)	decrease	decrease	
Kielar et al. (2014,2015,2018)	increase (semantic anomalies)	increase	decrease	decrease	

3 The present study

In this thesis, I aim to partially replicate Cheng et al. (2021). Different from the original study, which investigated L2 English of Chinese, I focused on adult native Norwegian speakers of L2 English. In Chinese, nouns are not morphologically marked; however, they are marked by quantifiers as well as demonstratives. As a result, Chinese does not allow double marking. On the other hand, both Norwegian and English are languages that allow double marking on nouns. To our knowledge, no existing EEG studies investigate non-local agreement attraction processing of Norwegian advanced L2 speakers of English using TFR analysis. This study will help us understand more about the lexical and morphological cues that play a role in parsing L2 by examining double marking. The methodology will bring us closer to understanding the basis of neural computations that support language function in the brain and the associations between band-specific oscillations and higher-level cognitive processes. The main purpose of this thesis is to contribute to the current knowledge of L2 morphosyntactic processing in the field of psycholinguistics. Based on this, the hypothesis in the current thesis is that advanced English L2 speakers of Norwegian L1ers´ performance on L2 morphosyntactic processing is similar to L1 processing despite the mismatch between English and Norwegian with respect to the subject-verb agreement. I pose my research questions as follows:

> RQ1: Will there be an increase in theta power and a decrease in alpha power associated with non-local violations in Norwegian advanced L2 English speakers?
> RQ2: Does number specification in L2 processing of subject-verb agreement have an important role for Norwegian advanced English speakers?

In connection with the previous findings, Cheng et al. (2021) proposed, I expect that the participants will detect syntactic violations in the Grammaticality Judgment Test (GJT) during the EEG recording and that the number specification can facilitate the detection of non-local violations both in behavioural and in neuropsychological evaluation. Even though the ungrammatical sentences are expected to be judged poorly, number marking can make the number violation clearer as it marks the NP double. Consequently, the participants show higher sensitivity towards non-local number violations because their native language, Norwegian in our case, matches with English in double marking.

4 Method

4.1 Participants

The experiment was conducted with 12 Norwegian – advanced English L2ers who acquired English in school settings starting from the age of six in Norway. One of the participants was removed during the EEG data analysis after the participant reported being diagnosed with Tourette syndrome. However, we included 12 participants in the behavioural data analysis as this was done before the EEG data was analysed. The participants were born and raised in Norway and were all undergraduate students at UiT the Arctic University of Norway, during the time of testing. The mean age of 11 participants was 24,7 and 7 out of 11 participants were female. Their English proficiency was measured by a short version of the Oxford Quick Placement Test (Oxford University Press, 2004). The mean proficiency score for all the participants was 48,3 out of 60. Accordingly, our participants were advanced L2 speakers of English with Norwegian L1. All participants, except one, were right-handed and had normal or corrected to normal vision.

Table 2: Descriptive statistics of the participants

Participants	**Age**	**QPT Score**
Mean	24,7	48,3
SD	2,1	15
Min	22	29
Max	30	58

4.2 Materials

4.2.1 Language Social Background Questionnaire

I used the Language Social Background Questionnaire (LSBQ; Anderson, Mak, Chahi & Bialystok, 2018) to measure bilingualism. The LSBQ is an extensive and corroborated tool that suits well with the propose of this study as it measures bilingualism from various aspects such as language use in different contexts, proficiency, and code switch. The LSBQ provides various combined scores related to different aspects of bilingualism, where every single item is evaluated with its relevant contribution to the concept. The questions are represented in four groups in the LSBQ: The first part provides demographic information and the participants' socioeconomic, neurological and/or psychological status. The second part is the Language Background, where the participants are asked about their ability of understanding

and speaking other languages and where and when they acquired them. The third part is about language proficiency, where the participants are asked to evaluate themselves on four basic skills as reading, writing, speaking, and listening from 0 (no ability) to10 (native fluency). The frequency of language use is also assessed in the third part, ranging from 'none' to 'all'. The fourth and last part is the Community Language Use Behaviour, where the participants are asked about their native language use in various contexts, and code-switching ranges from 'all Norwegian' to 'only other language'. All the details are provided online in the LSBQ results (https://docs.google.com/forms/d/1hN7oGimeZhUOq88bNOdE2Rj54nelZn8nkKtelhgNWo8/edit?ts=6035198a#responses).

4.2.2 EEG sentences

The participants' online processing and comprehension of the non-local subject-verb agreement were tested by a grammaticality judgement task (GJT) in EEG. For this task, 128 critical items, as in (14), were used. The items were mainly created for the previous study (Cheng et al.). The critical items had four target conditions, including 32 trials per condition distributed across four separate lists so that the participants see only one condition of each item. There were 128 critical items and 128 filles in each list. The sentences contained either "to be" verb in the 3rd person singular form or "to have" in the present tense as a critical word, and sentence grammaticality was manipulated as grammatical vs ungrammatical. The subject was either singular or plural so that half of the sentences were grammatical and half of them were ungrammatical, as shown in (14). The intervening noun was always singular so that it matched the number properties of the verb. Number specification on the determiner was also manipulated by using four demonstratives: ``this´´, ``that´´, ``these´´, and ``those´´. Conditions (a/b) had a number - unspecified determine "the", while conditions (c/d) had a demonstrative that specified number (This/That, These/Those). The demonstratives were used an equal number of times across the items. There were 200 fillers created, half grammatical and the other half ungrammatical. Some of the fillers contained a similar structure to the critical items but had a plural verb, so the participant could not be strategic in judging the sentences by considering that all critical items contained singular verbs. All the sentences were displayed word by word on the screen.

14 a. The window of the house is really clean. (Grammatical, Number – Unspecified)
   b. *The windows of the house is really clean. (Ungrammatical, Number – Unspecified)
   c. That window of the house is really clean. (Grammatical, Number – Specified)
   d. *Those windows of the house is really clean. (Ungrammatical, Number – Specified)

The participants were presented with the sentences on the screen and asked to judge whether they were grammatical or ungrammatical. They did the judgement by pressing the left arrow (grammatical) and right arrow (ungrammatical) on the keyboard. Correct answers are coded as 1, and the incorrect responses are coded as 0, so a value closer to 1 indicates a higher accuracy.

4.2.3 QPT (Oxford Quick Placement Test)

We evaluated the language proficiency of our participants with the Oxford Quick Placement Test (QPT, version 1, 2001), a reliable and time-saving test developed by the Oxford University Press and the Cambridge ESOL (English for speakers of other languages). The QPT is designed to measure L2 English learners/speakers' language ability quickly and accurately, according to the Common European Framework of Reference (CEFR) scale. The test is divided into three parts: The first two parts consist of 60 multiple choice questions, and there is a writing section in the last part. Our participants were asked to do the first two parts, and the answers were recorded on an answer sheet per participant. The first part consists of 40 questions, and it is designed for all levels of L2 English speakers. The second part consists of questions between 40-60 and is intended for higher levels of L2 English speakers. The participants were supposed to match the pictures with the correct description for the first five questions, and the rest was a cloze test where the participants were supposed to choose the correct answer that fits best in the text. They get one point for each correct answer; the highest possible proficiency score is 60. The test provides us with the following chart (Table 3) to find the level of the participants accurately. The results of the QPT show that the mean proficiency score of our participants is 48, so they are considered advanced English speakers.

Table 3: Classification of the participants based on the Oxford Quick Placement Test

Level	Paper and pen test score		Council of Europe Level
	Part 1 score out of 40	Part 1 score out of 60	
0 Beginner	0-15	0-17	A1
1 Elementary	16-23	18-29	A2
2 Lower intermediate	24-30	30-39	B1
3 Upper intermediate	31-40	40-47	B2
4 Advanced		48-54	C1
5 Very advanced		54-60	C2

4.3 Data Acquisition and Analyses

4.3.1 Procedure

The study was conducted in one session. The participants were asked to sign a consent form and complete the LSBQ to provide information about their language background. This was followed by the main EEG experiment presented by rapid serial visual presentation (RSVP), and in the meantime, the participant's EEG activity was recorded. The experiment started with a resting state EEG recording where the brain's electrical activity is monitored in the absence of tasks and instructions. The resting state EEG was recorded for 5 minutes with eyes open and another 5 minutes with eyes closed, and the order of these recordings was counterbalanced. Participants were then asked to read each of the sentences carefully without moving their head or body and without blinking when they read the sentences. A fixation marker appears on the screen before each sentence; the participants could blink when they see the fixation mark on the screen to minimize actions like blinking, chewing or head movement during sentence reading. Participants were presented with five practice trials before the main experiment started so that they were oriented to the procedure. Each word of the sentences was displayed one at a time for 450ms with an inter-stimulus interval of 200ms. The participants were asked to make a judgement as quickly and precisely as possible about whether the sentence they read was grammatically correct or not. They were supposed to click the right and left arrow buttons on the keyboard with their right hand (left arrow for grammatical, right arrow for ungrammatical). The participants were given 3 seconds per judgement; otherwise, the next sentence was presented on the screen. Following these, a 1000 ms black screen is shown before the next sentence is given. As the final step, the participants completed QPT.

4.3.2 Pre-Processing

We recorded the EEG activity by a 32-channel active cap system using Brain Vision Recorder and a BrainAmpDC amplifier system (Brain Products, Germany). The electrodes named Fp1 and Fp2 monitor the eye movements. The data was recorded with reference to FCz, and re-reference was done offline to the average of mastoids. The impedance level was set under 5 Ω for all channels. The EEG signals were modified at a sampling rate of 1000 Hz with a bandpass filter of 0.016 to 200 Hz. The raw EEG data were pre-processed using Brain Vision Analyzer software 1.05 (Brain Products, Germany). A 1 Hz high-pass filter was applied before the data was segmented. Epochs from 300 ms before to 1200 ms after sentence onset were selected to evaluate power changes across the sentences. The baseline was corrected for all the epochs as 100 ms pre-stimulus. Artefacts caused by blinks and movements were removed with Independent Component Analysis (ICA; Common, 1994; Bell & Sejnowski, 1995); then, a semiautomatic artefact rejection procedure was applied for any artefacts that were not accounted for during ICA.

We used Matlab toolbox Fieldtrip (Oostenveld, Fries, Maris, & Schoffelen, 2011) for the time-frequency analysis of the EEG data. We used word onset-locked data with the following strategy: Time-frequency analysis was done for each subject separately, for all conditions one by one. We had four conditions, including responses with grammaticality, ungrammaticality, specificity and unspecificity. We calculated the output separately for each condition to compare the two cases: Ungrammaticality vs grammaticality and specificity vs unspecificity. We calculated time-frequency representations of power by using Fourier transform analysis so that we can compute and visualize event-related changes. Fourier transform analysis allows us to decompose the raw EEG signal to different frequencies (on the x-axis) and to get information about the power: We can see how much activation there is in a particular time-frequency. As mentioned before, we used sliding time windows to calculate the power, and the window size is related to the frequency of interest. We used a 5-cycle window for 10 Hz (500 ms). We applied Hanning taper during the Fourier analysis, which allowed us a better control for smoothing the time and frequency. In this way, we protected our specific point of interest in a Fourier transform window from being affected by activation at the edge of the window. In order to minimize noise, we averaged the results across trials within a participant and within a channel. By doing this, we get the information about the activation mostly related to a particular condition, and we see how that particular condition is processed rather than anything else connected to the trial, i.e., some specific words.

5 Results

5.1 Behavioural data

Data analysis and statistical test of the behavioural data were implemented using R (R Core Team, 2018). Reaction time and accuracy values from participants for each category of sentence have been transformed to a vertical type of data table for further analysis. In the end, we obtained a data table of three categorical variables (subject, condition, accuracy) and one numeric variable (reaction time) versus observations (number of rows = participants* number of critical items). First ten rows of the data table and a summary of the data variables are given in the Table 4 and 5.

Table 4: First ten rows of the behavioural data.

No	*Subject*	*Condition*	*Accuracy*	*RT (ms)*
1	Participant01	ungram_spec	0	4505
2	Participant01	gram_unspec	1	12052
3	Participant01	gram_spec	1	12712
4	Participant01	ungram_unspec	0	16640
5	Participant01	ungram_unspec	1	22268
6	Participant01	gram_spec	0	11558
7	Participant01	gram_unspec	1	10805
8	Participant01	ungram_spec	0	19753
9	Participant01	ungram_spec	0	5953
10	Participant01	ungram_unspec	1	23956

Table 5: Summary and the descriptive statistics of the behavioral data.

Subject	*Condition*	*Accuracy*	*RT*
Categorical: 12 levels	Categorical: 4 levels gram_spec :383 gram_unspec :383 ungram_spec :381 ungram_unspec:382	Categorical: 2 levels 0 (incorrect response): 615 1 (correct response): 914	Numeric: integer Min. : 292 Median : 7541 Mean : 9466 Max. :32203

As the only numeric value in our data set, the reaction time (the time passed until the participant sees the last word of each sentence in a millisecond) was investigated further with

descriptive statistics along with the other categorical variables. Our results showed that the reaction time significantly differed between subjects ($p < 0.001$) yet did not show a significant difference within the condition ($p > 0.1$). Furthermore, accuracy did not seem to be affected by the reaction time of the respondents ($p > 0.05$). A summary of the results for descriptive statistics and corresponding boxplot figures are given in Figure 9 and Figure 10.

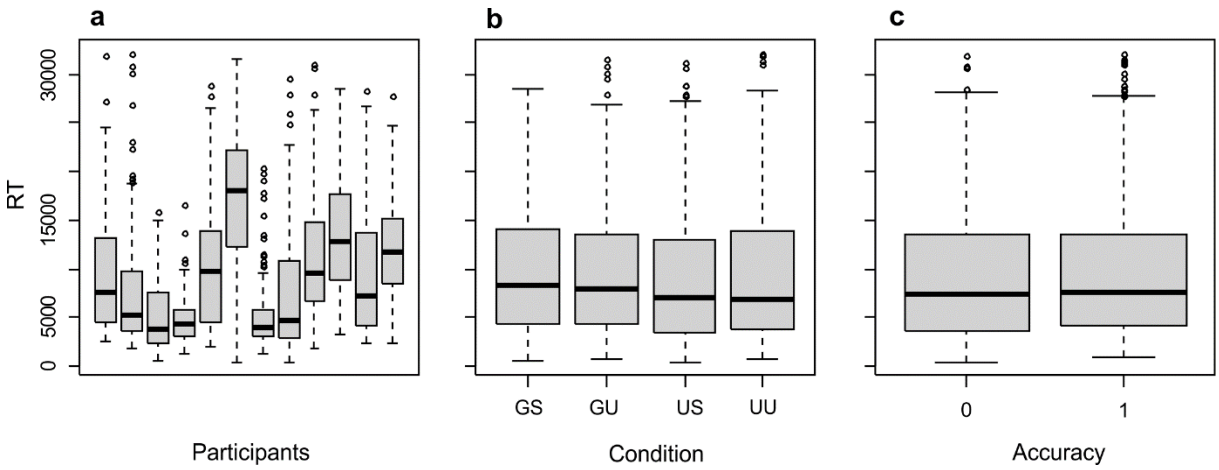

Figure 9: Boxplot of the categorical variables of the behavioural data against reaction time. Abbreviations: GS: grammatical specified, GU: grammatical unspecified, US: ungrammatical specified, UU: ungrammatical unspecified.

Binary evaluation of the accuracy (i.e., true or false) was compared with different conditions of the Grammaticality Judgement Task (GJT) sentences regarding the four conditions (grammatical specified, grammatical unspecified, ungrammatical specified, ungrammatical unspecified). We observed that participants had much higher percentage of accuracies for the grammatical sentences while they score low in ungrammatical sentences (Fig 9). Similarly, accuracies were higher for unspecified sentences compared to specified sentences. Among all compared conditions, grammatical unspecified sentences were the most accurately judged sentences (85.6 %).

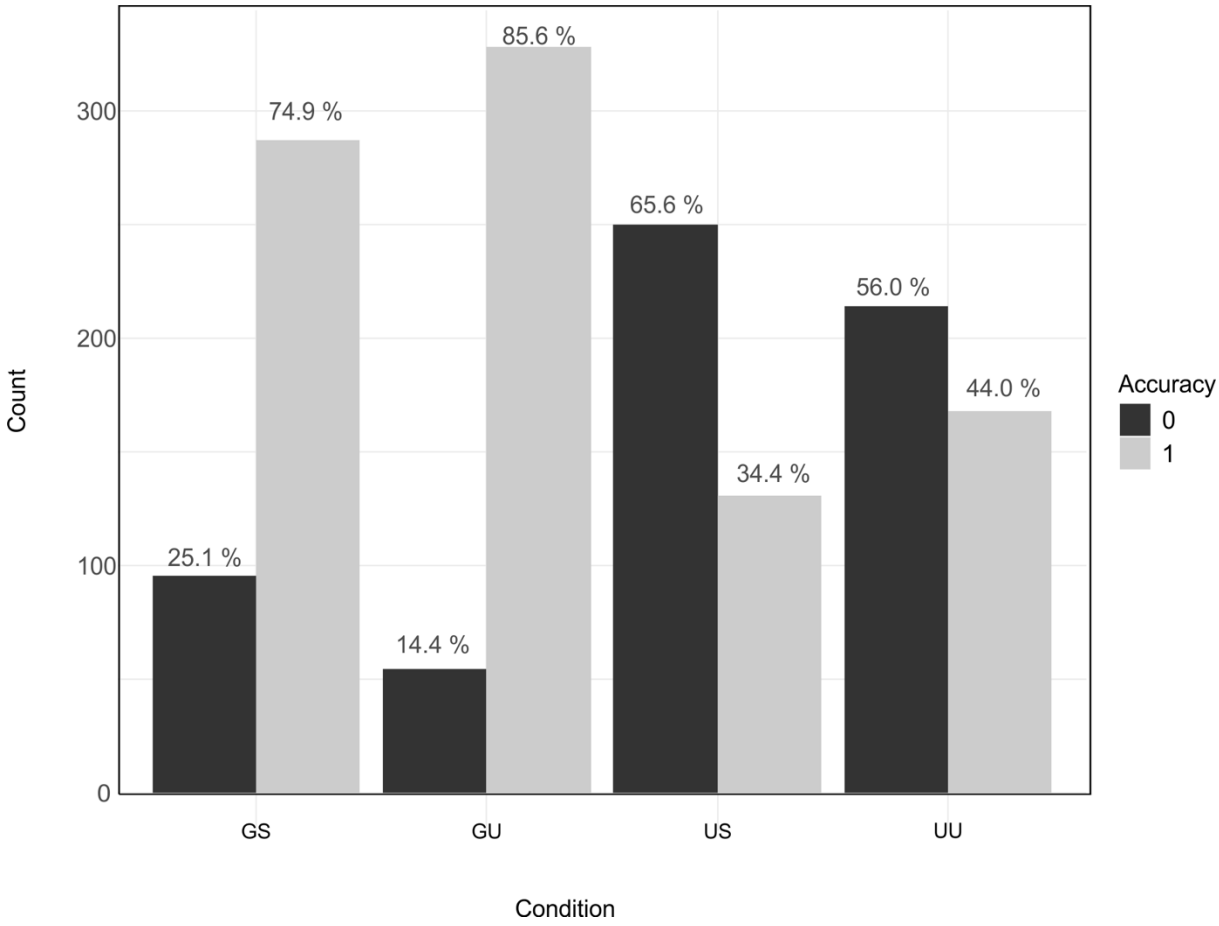

Figure 10 Accuracy of the grammaticality judgement within the four different conditions. Abbreviations: GS: grammatical specified, GU: grammatical unspecified, US: ungrammatical specified, UU: ungrammatical unspecified.

A generalized linear mixed effect model (GLMM) was implemented for our GJT data to obtain a predicting capability of accuracy by maximum likelihood with *glmer* function from *lme4* package (version 1.1-29, Bates et al. 2015) in R. By using GLMM, we incorporated a linear mixed model of a random variable (subject in our case) and a generalized linear model of fixed variables (binomial variables: specificity and grammaticality) to predict accuracy. As opposed to general linear models, GLMM offers more flexibility in terms of fitting non-normal data families into linear models (Bono et al. 2021). Our model results showed that both specificity and grammaticality were significant predictors (p<0.001) on accuracy under randomly selected participants. Model results also suggested that the grammaticality and specificity were negatively correlated (Table 6).

Table 6: Summary of the generalized linear mixed model

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation)
Family: Binomial
Formula: Accuracy ~ Specificity * Grammaticality + (1 | Subject)

AIC	*BIC*	*logLik*	*deviance*	*df.resid*
1664.6	1691.2	-827.3	1654.6	1524

Scaled residuals:

Min	*1Q*	*Median*	*3Q*	*Max*
-4.9641	-0.6323	0.3147	0.6845	2.4487

Random effects:

Groups Name	*Variance*	*Std.Dev.*
Subject (Intercept)	0.5206	0.7215
Number of obs: 1529, groups: Subject, 12		

Fixed effects:

	Estimate	*Std.*	*Error*	*z value*	*Pr(>|z|)*
(Intercept)	1.222	0.2429	5.03	4.89E-07	***
Specificityunspec	0.7402	0.1939	3.818	0.000135	***
Grammaticalityungram	-1.9383	0.1713	-11.315	<2.00E-16	***
Specificityunspec: Grammaticalityungram	-0.2878	0.2499	-1.151	0.249624	
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1					

Correlation of Fixed Effects:

	(Intr)	*Spcfct*	*Grmmtc*
Spcfctynspc	-0.317		
Grmmtcltyng	-0.382	0.446	
Spcfctyns:G	0.249	-0.774	-0.656

5.2 TFR

Consistent with the previous literature (Davidson & Indefrey, 2007; Perez et al., 2012), we obtained a decreased alpha band oscillatory power in activation for the ungrammatical vs grammatical items in the alpha TF range of interest (8-12 Hz; -200 – 400 ms relative to word onset). Figure 11 shows the topographic map of the cluster in the Alpha band (8.12 Hz). A relative decrease in activation for the ungrammatical items vs. grammatical items can be seen here. We see the difference between grammatical and ungrammatical conditions within the number specified condition in Figure 12 and the difference between ungrammatical and grammatical conditions within the number unspecified condition in Figure 13.

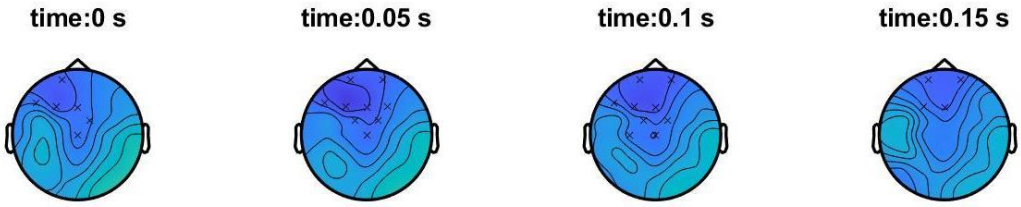

Figure 11 Topographic map of the cluster in the alpha band (8-12 Hz) showing relative decrease in (negative) activation for the ungrammatical items vs. grammatical items.

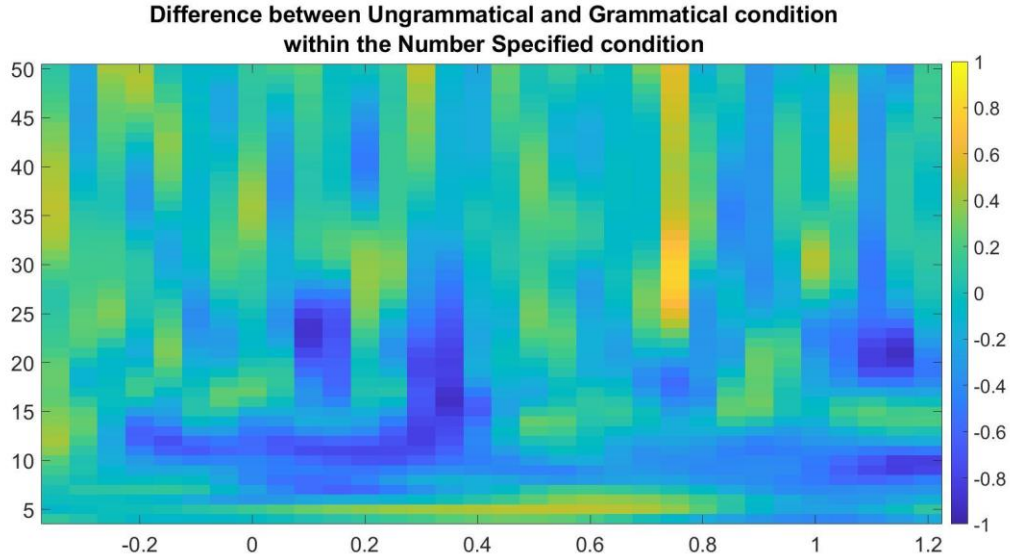

Figure 12 Results of the TF analysis showing the difference between grammatical and ungrammatical condition (grammatical- ungrammatical) within the number specified condition.

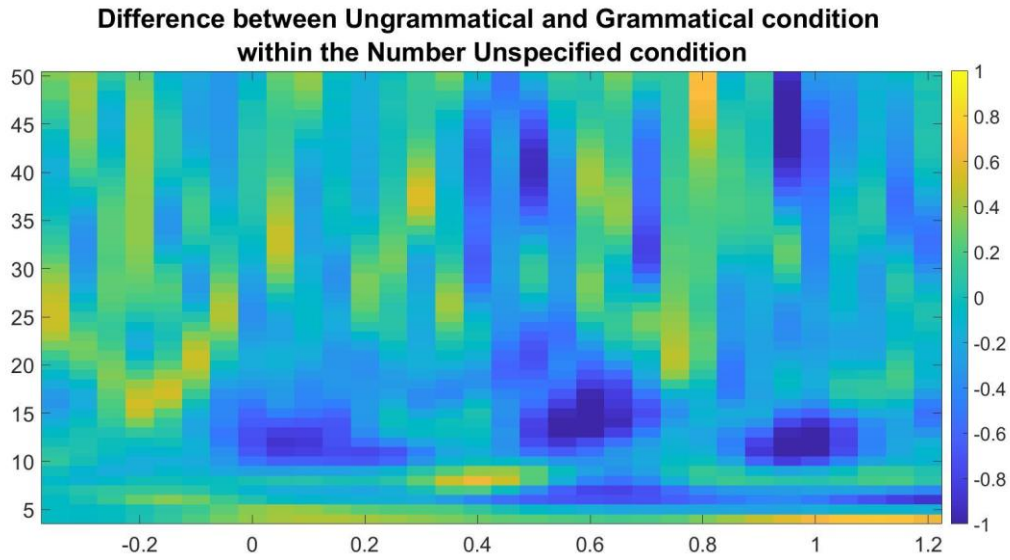

Figure 13 Results of the TF analysis showing the difference between grammatical and ungrammatical condition within the number unspecified condition.

6 Discussion

6.1 General Discussion

This study aimed to investigate the processing of non-local agreement violations and whether it is affected by double marking from a determiner-number specification in Norwegian L2 speakers of English. We had four conditions to test the participants' sensitivity towards determiner number specification: (1) Grammatical unspecified, (2) ungrammatical unspecified, (3) grammatical specified, (4) ungrammatical specified. Syntactic violations interfere with grammatical structure processing. Comparing behavioural and neural responses to sentences including a particular type of violation and sentences without violation allows us to understand the neural mechanisms regarding the relevant structure-building operation. Previous studies showed that there is a link between oscillatory neural activity in different frequency bands and the comprehension of sentences, as well as linguistically more complex structures (Prystauka & Lewis, 2019). It is proposed that processing local syntactic violations usually induces an increase in the theta and a decrease in the alpha and/or beta frequency bands (Bastiaansen et al., 2002; Bastiaansen & Hagoort, 2015; Lewis et al., 2016; Pérez et al., 2012; Regel et al., 2014; Schneider et al., 2016).

In this study, I did not find evidence for an interaction between specificity and grammaticality. The specificity did not seem to affect participants' judgment of the grammaticality. That is, we did not see any change in the theta band (4-8 Hz) as we expected. We saw, however, a relative decrease in the activation for the ungrammatical items vs grammatical items in the alpha band (8-12 Hz) and a relative decrease in the activation for the number-specified items vs number-unspecified items in alpha bands (8-12 Hz). The results of the behavioural data showed that the participants were better when judging the grammatical sentences than the ungrammatical sentences, and the unspecified grammatical sentences were judged more accurately than the other three conditions. In the following section, I will discuss the behavioural and EEG data and the implications for future research on agreement attraction theories and adult L2 sentence processing.

6.2 EEG Grammaticality Judgement Test

The behavioural results showed that L2 speakers could detect syntactic errors in sentences containing non-local agreement violations. However, there were more incorrect judgements on ungrammatical sentences compared to grammatical sentences (see figure 9), which is

consistent with previous findings (Armstrong et al., 2017, Cheng et al., 2021). The fact that ungrammatical specified sentences display a relatively stronger attraction effect compared to ungrammatical unspecified sentences supports grammatical asymmetry found in previous literature on subject-verb agreement (Schlueter et al., 2019; Tanner et al., 2014; Wagers et al., 2009). This pattern of results seems to be more consistent with retrieval-based approaches (e.g., Wagers et al., 2009; Jäger et al., 2017) rather than representational-based ones (e.g., Pearlmutter et al., 1999; Hammerly et al., 2019). The mismatch between the verb and the subject number in our ungrammatical sentences might have triggered a reanalysis process for the participants such that cue-based retrieval was employed to find a matching antecedent. When the number of the subject is represented wrongly in the presence of a plural attractor, it is expected that the grammatical sentences might be judged as if they contained an agreement violation. However, if the subject´s number feature is not misrepresented before the verb, but because of detecting a plural verb, this would result in the absence of grammatical asymmetry. As a result, attraction effects disappear in grammatical sentences, but they are visible in ungrammatical sentences, which might explain our results regarding the ungrammatical sentences.

The higher accuracy rate for the grammatical sentences might also be explained by the intervening NP as well as the consistent usage of singular verbs through all the four conditions we had. The head and the intervening noun phrases and verbs were in the singular form in the grammatical sentences, but we manipulated the head NP for the ungrammatical condition. Because the head NP and the intervening NP check with the verb in the grammatical sentences, the attraction effects caused by the intervening NP led participants to judge the sentences accurately. However, the intervening NP always checked with the singular verb while the head NP was plural in the ungrammatical sentences. This attraction might be the reason for the judgment errors as the intervening NP checks with the verb rather than the head NP which is consistent with the findings proposed by Cheng et al. (2021) and Pearlmutter et al. (1999).

I did not observe a facilitative effect of number specification during the judgment of non-local agreement violations. This might be explained by the participants' low attention level on the number-specified determiners. That is, the lexical cues were not dependable for them no matter how their L1 employed double marking, but because the verb is not marked overtly for numbers in Norwegian. Accordingly, the attraction effect of the intervening noun was more

robust than the facilitative effect of the determiners for our participants. Jensen et al. (2020) suggest that the acquisition of subject-verb agreement is the most challenging part of L2 processing, even for the advanced L2ers. This can also explain why our participants were attracted by the intervening noun with the representation of the verb, but the determiners did not have a facilitative effect. Furthermore, the participants were more accurate in judging the unspecified sentences compared to the specified sentences for the ungrammatical condition that shows again that number specification did not have any effect on accuracy, which is also consistent with the result of the original study by Cheng et al. (2021). This might be explained by the high attention level of the participants during sentence comprehension. Jensen et al. (2020) proposed that subject-verb agreement is a bottleneck for Norwegians. However, their participants were good at identifying the subject in long-distance agreements even though there was a noticeable difference in difficulty between local and long-distance agreements. They explain this with the speaker´s attention to the syntactic cues and the challenges that are involved in acquiring accurate functional morphology in English. The results of the EEG data also support this assumption, as we observed a relative decrease in the alpha power band. Previous literature proposes that alpha power decreases depend on the attentional control demands during the spatial cueing tasks where the alpha amplitude is modulated according to the direction of spatial attention (Davidson & Indefrey, 2007; Thut et al., 2006; Worden et al., 2000). When the violation word appears on the screen, the alpha and beta power change is supposed to be relatively less in response to the violation as it is already relatively low due to the high attention level. On the other hand, the alpha and beta power should be relatively high when the participants are not actively involved in the task. Even though our participants were paying attention to each constituent, they might be attracted mostly by the intervening noun when they see the verb.

6.3 Oscillatory Dynamics

The decrease in alpha band power was consistent with our predictions and results from previous research where sentence-level oscillatory patterns were investigated using the frequency-domain approach (e.g., Bastiaansen & Haagort, 2006, 2010; Davidson & Indefry, 2007; Kielar et al. 2014, 2015, 2016). Bastiaansen & Haagort (2006) proposed that the amplitude changes of oscillatory activity in a particular frequency range might be explained as the reflection of diverse neurocognitive processes associated with language comprehension, suggesting that alpha band reactivity that is observed during language comprehension does not necessarily reflect the linguistic analyses, but the attention: Alpha

band decrease is explained as the engagement of the additional attentional resources to provide an explanation to a faulty representation. The alpha decrease obtained for the agreement violations might be caused by the additional attentional resources needed due to the larger semantic processing demands. The alpha and beta power decreases are also expected to indicate an increase in the cortical area that is engaged with grammatical processing soon after a violation is detected (Davidson & Indefry, 2007). Bastiaansen et al. (2010) found an alpha decrease in response to word category violations where they manipulated word category to elicit syntactic violation. Additionally, they observed a gradual beta increase in syntactically structured sentences. The increase was disrupted after the occurrence of violation when the beginning of the sentence was time-locked instead of the critical word. They indicated that beta is important specifically for syntactic integration operations. Kielar et al. (2014,2015, 2018) also supported the importance of beta oscillations during syntactic processing; however, they have constantly received alpha/beta decreases in response to verb tense violations. In their studies, Kielar et al. used a grammaticality judgement task where the participants were asked to show the sentences were unacceptable when they contained a grammatical violation or semantic anomaly. The participants already had enough information to judge the sentences after detecting the violating verb, so lexical-semantic integration would no longer be required. They explain this as a reflection of increased working memory demands. Alternatively, many studies have shown a particular relation between increased attentional process demands and lower alpha band power suppression (Bastiaansen et al., 2002; Klimesch et al., 1997, 1998, 1999, Mazaheri & Jensen, 2010). Specifically relevant to the present findings, two possible cognitive processes could be driving these alpha effects in processing: changes in (working) memory demands and/or increased attentional requirements (see for review Prystauka & Lewis, 2019). As a result, both are likely to be the possible mechanisms for what we see in the present study.

Decreased alpha band power has previously been shown to reflect various cognitive processes as well as demands on spatial attention (Mazaheri & Jensen, 2010). Recall that the participants needed to make the grammaticality judgement according to subject-verb number agreement. As the participants' L1 (Norwegian) lacks this feature, processing violations in the L2 might have necessitated a higher attentional state as they were actively engaged with the task. Alpha activity is a sensitive measure of cognitive processing capacity (Klimesch, 1999). Previous literature defines alpha rhythm as the frequency between 8-13 Hz that is observed over posterior electrode regions of the scalp during changes in states of consciousness. Alpha

rhythms are blocked or decreased by mental effort and attention. Klimesch (1996) explains this as desynchronization, which means that different alpha rhythms start to oscillate with different frequencies in response to a cognitive demand suggesting that alpha frequency changes as a result of memory performance. A significantly higher level of desynchronization occurs due to complex and challenging tasks. These tasks are not only motor tasks, including different complexity and difficulty, but also cognitive tasks that vary in terms of complexity. Language processing is an excellent example of such complex tasks. Vassileiou et al. (2018) suggest a functional role of alpha-band oscillations in encoding sentences into verbal working memory. Long sentences demand relational syntactic information rather than being encoded into working memory as simple word lists. They propose that the left-hemispheric language-related network is activated through alpha-band desynchronization to pursue the syntactic structure. This allows the cortex to encode the sentences into working memory appropriately. There is a strong connection between these findings and our results. Our participants were supposed to judge sentences that included an overt subject-verb agreement, which is not present in their L1. This cognitive task requires the participants to have a higher level of attention to conduct the relevant task demands as there is a mismatch between the two languages.

An alternative explanation for these effects can be explained as the result of increased processing demands. Syntactically complex structures are processed successfully with the presence of alpha desynchronization, and successful processing generates a better memory performance (see for review Prystauka & Lewis, 2019). Memory and attentional resources are the most essential elements for regulating cognitive processing. Alpha activity is known to be correlated positively with working memory performance. In his experiments, Klimesch (1997, 1998, 1999) observed that alpha frequency differs between good and bad performers even in the resting state. However, increasing task and memory demands induce a difference in alpha frequency increases between the two groups. Good memory performers show a slight increase in alpha frequency at the anterior part of the head, whereas bad performers show a significant decrease overall recording points. It is proposed that increasing task demands lead to an increase in frequency within the capacity limits of the cognitive or memory system. However, any further increase in task demands leads to a decrease in alpha frequency if the capacity limits are reached. In other words, the alpha frequency decreases in all recording areas for bad performers; however, the alpha frequency decreases again for bad and good memory performers under a high memory load that exceeds the capacity of short-term

memory. Rommers & Federmeier (2018) also support the relationship between alpha power and memory. They observed a late alpha/beta power decrease during sentence reading due to a previously seen target word throughout the previous trial compared to the new target words. They propose that this effect might reflect the reactivation of short-term memory traces that have been formed previously. Namely, alpha decreases might provide memory-related areas to reactivate memory traces upon repetition.

The fact that the alpha decrease in our results is in line with the previous literature is also supported by the behavioural data as the participants perform like native speakers during the grammaticality judgement. This shows that our participants were good memory performers with high memory load and attention level that resulted in a decrease in alpha frequency because of the increased task demands during the process of number specification and agreement violence in L2 English.

Our findings are also consistent with working memory-based accounts that suggest L2 processing is similar to L1 while individual differences can be explained by the capacity limitations, proficiency and efficiency. As discussed above, alpha oscillations play an important role in working memory as they might have a task-specific working memory function (Bastiaansen & Haagort, 2006). We mentioned that alpha desynchronization is required for a successful processing of syntactically complex structures. This successful processing leads to better memory performance for the participants. This argument is in line with psycholinguistic findings suggesting that computational-based elements basically regulate working memory operations, and individual differences are explained by the differences in the success of memory retrieval operations instead of differences in processing capacity (e.g., Cunnings, 2017). Cunnings (2017) proposed that L2 speakers are more sensitive to memory interference when they need to access information from memory for successful comprehension. According to Cunnings (2017), the differences that remain even at high proficiency levels in L2 sentence processing can be defined as an increased sensitivity to interference during memory retrieval operations. During sentence processing in the brain´s language network, alpha desynchronization has been observed to result in improved subsequent memory performance when the encoded information is inspected after sentence processing, but alpha decreases and increases have also been observed during sentence processing when the sentence is more difficult/complex to process (Vassileiou et al. 2018).

7 Conclusion

In this thesis, I investigated non-local subject-verb agreement and number specification in L2 processing of Norwegian adult L2 English speakers using EEG as the methodology. We analysed the data with TFRs to observe the changes in different frequency bands of neural oscillations. We tested non-local subject-verb agreement, a mismatch between Norwegian and English, and the double marking on the number of the noun that is a common feature of the two languages by using an online GJT during EEG recording.

We observed a decrease in the alpha power band, which was in accordance with our predictions and the findings from the previous literature. An alpha band decrease shows the engagement of the additional attentional resources to explain the faulty representation. Our findings suggest that the agreement violation in our GJT led our participants to have increased attentional process demands as they needed to judge the mismatching property between their L1 Norwegian and L2 English.

This study may be considered an initial attempt to understand the relationship between alpha power and working memory. However, the results and the interpretations offered herein should be taken with a grain of salt mainly because of the small number of participants in the study. Future research investigating similar phenomena with similar language pairings should include more participants as well as an offline task and a working memory test for an elaborate data analysis not only in alpha, but also in the other power band oscillations, thus making the results more generalisable.

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Appendix

Experiment Items

No	Grammatical-Number Unspecified (List 1)	Ungrammatical-Number Unspecified (List 2)	Grammatical-Number Specified (List 3)	Ungrammatical-Number Specified (List 4)
1	"The window of the house *is very clean."	"The windows of the house *is very clean."	"This window of the house *is very clean."	"These windows of the house *is very clean."
2	"The picture of the lake *is unbelievably beautiful."	"The pictures of the lake *is unbelievably beautiful."	"This picture of the lake *is unbelievably beautiful."	"These pictures of the lake *is unbelievably beautiful."
3	"The email from the company *is really boring."	"The emails from the company *is really boring."	"This email from the company *is really boring."	"These emails from the company *is really boring."
4	"The cup on the table *is very dirty."	"The cups on the table *is very dirty."	"This cup on the table *is very dirty."	"These cup on the table *is very dirty."
5	"The gift from the party *is truly nice."	"The gifts from the party *is truly nice."	"This gift from the party *is truly nice."	"These gifts from the party *is truly nice."
6	"The book on the desk *is very heavy."	"The books on the desk *is very heavy."	"This book on the desk *is very heavy."	"These books on the desk *is very heavy."
7	"The film about the scientist *is quite long."	"The films about the scientist *is quite long."	"This film about the scientist *is quite long."	"These films about the scientist *is quite long."
8	"The colleague of the lady *is always kind."	"The colleagues of the lady *is always kind."	"This colleague of the lady *is always kind."	"These colleagues of the lady *is always kind."
9	"The patient of the doctor *is very angry."	"The patients of the doctor *is very angry."	"This patient of the doctor *is very angry."	"These patients of the doctor *is very angry."
10	"The apple on the table *is very sweet."	"The apples on the table *is very sweet."	"This apple on the table *is very sweet."	"These apples on the table *is very sweet."
11	"The train to the city *is quite fast."	"The trains to the city *is quite fast."	"This train to the city *is quite fast."	"These trains to the city *is quite fast."
12	"The name on the post card *is not clear."	"The names on the post card *is not clear."	"That name on the post card *is not clear."	"Those names on the post card *is not clear."
13	"The mistake in the article *is quite obvious."	"The mistakes in the article *is quite obvious."	"That mistake in the article *is quite obvious."	"Those mistakes in the article *is quite obvious."
14	"The picture on the wall *is very funny."	"The pictures on the wall *is very funny."	"That picture on the wall *is very funny."	"Those pictures on the wall *is very funny."
15	"The problem in the school *is extremely serious."	"The problems in the school *is extremely serious."	"That problem in the school *is extremely serious."	"Those problems in the school *is extremely serious."
16	"The photo from the trip *is very nice."	"The photos from the trip *is very nice."	"That photo from the trip *is very nice."	"Those photos from the trip *is very nice."
17	"The building in the street *is quite old."	"The buildings in the street *is quite old."	"That building in the street *is quite old."	"Those buildings in the street *is quite old."
18	"The road in the mountain *is not safe."	"The roads in the mountain *is not safe."	"That road in the mountain *is not safe."	"Those roads in the mountain *is not safe."
19	"The door of the building *is always open."	"The doors of the building *is always open."	"That door of the building *is always open."	"Those doors of the building *is always open."
20	"The notebook on the desk *is quite new."	"The notebooks on the desk *is quite new."	"That notebook on the desk *is quite new."	"Those notebooks on the desk *is quite new."
21	"The key to the room *is very big."	"The keys to the room *is very big."	"That key to the room *is very big."	"Those keys to the room *is very big."
22	"The guitar for the concert *is quite old."	"The guitars for the concert *is quite old."	That guitar for the concert *is quite old.	"Those guitars for the concert *is quite old."
23	"The entrance to the building *is not obvious."	"The entrances to the building *is not obvious."	"That entrance to the building *is not obvious."	"Those entrances to the building *is not obvious."
24	"The student of the teacher *is really smart."	"The students of the teacher *is really smart."	"That student of the teacher *is really smart."	"Those students of the teacher *is really smart."
25	"The bridge to the island *is not safe."	"The bridges to the island *is not safe."	"That bridge to the island *is not safe."	"Those bridges to the island *is not safe."
26	"The guy with the actor *is very rich."	"The guys with the actor *is very rich."	"That guy with the actor *is very rich."	"Those guys with the actor *is very rich."
27	"The lawyer from the company *is very professional."	"The lawyers from the company *is very professional."	"That lawyer from the company *is very professional."	"Those lawyers from the company *is very professional."
28	"The desk in the office *is really small."	"The desks in the office *is really small."	"That desk in the office *is really small."	"Those desks in the office *is really small."
29	"The bridge over the river *is almost old."	"The bridges over the river *is almost old."	"That bridge over the river *is almost old."	"Those bridges over the river *is almost old."
30	"The map of the city *is very detailed."	"The maps of the city *is very detailed."	"That map of the city *is very detailed."	"Those maps of the city *is very detailed."
31	"The window in the kitchen *is always closed."	"The windows in the kitchen *is always closed."	"That window in the kitchen *is always closed."	"Those windows in the kitchen *is always closed."
32	"The jacket on the chair *is very dirty."	"The jackets on the chair *is very dirty."	"That jacket on the chair *is very dirty."	"Those jackets on the chair *is very dirty."

Continue

No	Grammatical-Number Unspecified (List 4)	Ungrammatical-Number Unspecified (List 1)	Grammatical-Number Specified (List 2)	Ungrammatical-Number Specified (List 3)
33	"The exam for the course *is really difficult."	"The exams for the course *is really difficult."	"That exam for the course *is really difficult."	"Those exams for the course *is really difficult."
34	"The knife on the plate *is not sharp."	"The knives on the plate *is not sharp."	"That knife on the plate *is not sharp."	"Those knives on the plate *is not sharp."
35	"The shop in the street *is never busy."	"The shops in the street *is never busy."	"That shop in the street *is never busy."	"Those shops in the street *is never busy."
36	"The computer in the office *is very new."	"The computers in the office *is very new."	"That computer in the office *is very new."	"Those computers in the office *is very new."
37	"The waiter with the manager *is very nice."	"The waiters with the manager *is very nice."	"That waiter with the manager *is very nice."	"Those waiters with the manager *is very nice."
38	"The story about the city *is available online."	"The stories about the city *is available online."	"That story about the city *is available online."	"Those stories about the city *is available online."
39	"The student in the class *is very quiet."	"The students in the class *is very quiet."	"That student in the class *is very quiet."	"Those students in the class *is very quiet."
40	"The movie at the cinema *is really interesting."	"The movies at the cinema *is really interesting."	"That movie at the cinema *is really interesting."	"Those movies at the cinema *is really interesting."
41	"The handbag in the shop *is not cheap."	"The handbags in the shop *is not cheap."	"This handbag in the shop *is not cheap."	"These handbags in the shop *is not cheap."
42	"The hotel near the station *is really busy."	"The hotels near the station *is really busy."	"This hotel near the station *is really busy."	"These hotels near the station *is really busy."
43	"The friend of the girl *is very helpful."	"The friends of the girl *is very helpful."	"This friend of the girl *is very helpful."	"These friends of the girl *is very helpful."
44	"The answer to the question *is really funny."	"The answers to the question *is really funny."	"This answer to the question *is really funny."	"These answers to the question *is really funny."
45	"The song by the singer *is really beautiful."	"The songs by the singer *is really beautiful."	"This song by the singer *is really beautiful."	"These songs by the singer *is really beautiful."
46	"The magazine on the sofa *is very boring."	"The magazines on the sofa *is very boring."	"This magazine on the sofa *is very boring."	"These magazines on the sofa *is very boring."
47	"The customer of the designer *is really rich."	"The customers of the designer *is really rich."	"This customer of the designer *is really rich."	"These customers of the designer *is really rich."
48	"The train to the airport *is always busy."	"The trains to the airport *is always busy."	"This train to the airport *is always busy."	"These trains to the airport *is always busy."
49	"The river near the village *is quite clear."	"The rivers near the village *is quite clear."	"This river near the village *is quite clear."	"These rivers near the village *is quite clear."
50	"The document in the folder *is extremely important."	"The documents in the folder *is extremely important."	"This document in the folder *is extremely important."	"These documents in the folder *is extremely important."
51	"The café outside the mall *is very popular."	"The cafés outside the mall *is very popular."	"This café outside the mall *is very popular."	"These cafés outside the mall *is very popular."
52	"The report from the conference *is really good."	"The reports from the conference *is really good."	"This report from the conference *is really good."	"These reports from the conference *is really good."
53	"The comment about the policy *is quite stupid."	"The comments about the policy *is quite stupid."	"This comment about the policy *is quite stupid."	"These comments about the policy *is quite stupid."
54	"The elephant under the tree *is very tired."	"The elephants under the tree *is very tired."	"This elephant under the tree *is very tired."	"These elephants under the tree *is very tired."
55	"The email about the meeting *is not clear."	"The emails about the meeting *is not clear."	"This email about the meeting *is not clear."	"These emails about the meeting *is not clear."
56	"The poster for the concert *is very creative."	"The posters for the concert *is very creative."	"This poster for the concert *is very creative."	"These posters for the concert *is very creative."
57	"The wall of the flat *is not clean."	"The walls of the flat *is not clean."	"This wall of the flat *is not clean."	"These walls of the flat *is not clean."
58	"The market at the festival *is always busy."	"The markets at the festival *is always busy."	"This market at the festival *is always busy."	"These markets at the festival *is always busy."
59	"The story in the book *is very interesting."	"The stories in the book *is very interesting."	"This story in the book *is very interesting."	"These stories in the book *is very interesting."
60	"The airport outside the city *is quite big."	"The airports outside the city *is quite big."	"This airport outside the city *is quite big."	"These airports outside the city *is quite big."
61	"The office in the school *is usually busy."	"The offices in the school *is usually busy."	"This office in the school *is usually busy."	"These offices in the school *is usually busy."
62	"The house near the park *is really modern."	"The houses near the park *is really modern."	"This house near the park *is really modern."	"These houses near the park *is really modern."
63	"The model with the designer *is very famous."	"The models with the designer *is very famous."	"This model with the designer *is very famous."	"These models with the designer *is very famous."
64	"The dress for the party *is beautifully colorful."	"The dresses for the party *is beautifully colorful."	"This dress for the party *is beautifully colorful."	"These dresses for the party *is beautifully colorful."

Continue

No	Grammatical-Number Unspecified (List 3)	Ungrammatical-Number Unspecified (List 4)	Grammatical-Number Specified (List 1)	Ungrammatical-Number Specified (List 2)
65	"The orange on the tree *is really small."	"The oranges on the tree *is really small."	"This orange on the tree *is really small."	"These oranges on the tree *is really small."
66	"The book for the course *is so good."	"The books for the course *is so good."	"This book for the course *is so good."	"These books for the course *is so good."
67	"The toy in the box *is very dirty."	"The toys in the box *is very dirty."	"This toy in the box *is very dirty."	"These toys in the box *is very dirty."
68	"The monkey behind the tourist *is very cute."	"The monkeys behind the tourist *is very cute."	"This monkey behind the tourist *is very cute."	"These monkeys behind the tourist *is very cute."
69	"The secretary of the manager *is so polite."	"The secretaries of the manager *is so polite."	"This secretary of the manager *is so polite."	"These secretaries of the manager *is so polite."
70	"The book on the shelf *is quite old."	"The books on the shelf *is quite old."	"This book on the shelf *is quite old."	"These books on the shelf *is quite old."
71	"The library in the city *is always busy."	"The libraries in the city *is always busy."	"This library in the city *is always busy."	"These libraries in the city *is always busy."
72	"The doctor of the patient *is very young."	"The doctors of the patient *is very young."	"This doctor of the patient *is very young."	"These doctors of the patient *is very young."
73	"The bus to the school *is really convenient."	"The buses to the school *is really convenient."	"This bus to the school *is really convenient."	"These buses to the school *is really convenient."
74	"The farm near the forest *is so big."	"The farms near the forest *is so big."	"This farm near the forest *is so big."	"These farms near the forest *is so big."
75	"The task in the game *is quite difficult."	"The tasks in the game *is quite difficult."	"This task in the game *is quite difficult."	"These tasks in the game *is quite difficult."
76	"The product of the company *is still popular."	"The products of the company *is still popular."	"This product of the company *is still popular."	"These products of the company *is still popular."
77	"The lady behind the guy *is very loud."	"The ladies behind the guy *is very loud."	"This lady behind the guy *is very loud."	"These ladies behind the guy *is very loud."
78	"The dog behind the girl *is very small."	"The dogs behind the girl *is very small."	"This dog behind the girl *is very small."	"These dogs behind the girl *is very small."
79	"The kid with the volunteer *is very happy."	"The kids with the volunteer *is very happy."	"This kid with the volunteer *is very happy."	"These kids with the volunteer *is very happy."
80	"The ass*istant of the scientist *is really excellent."	"The assistants of the scientist *is really excellent."	"This assistant of the scientist *is really excellent."	"These assistants of the scientist *is really excellent."
81	"The boy with the teacher *is highly educated."	"The boys with the teacher *is highly educated."	"This boy with the teacher *is highly educated."	"These boys with the teacher *is highly educated."
82	"The girl with the boy *is villingly invited."	"The girls with the boy *is villingly invited."	"This girl with the boy *is villingly invited."	"These girls with the boy *is villingly invited."
83	"The computer in the office *is weekly upgraded."	"The computers in the office *is weekly upgraded."	"This computer in the office *is weekly upgraded."	"These computers in the office *is weekly upgraded."
84	"The thief with the policeman *is strongly punished."	"The thieves with the policeman *is strongly punished."	"This thief with the policeman *is strongly punished."	"These thieves with the policeman *is strongly punished."
85	"The spoon on the table *is nicely washed."	"The spoons on the table *is nicely washed."	"This spoon on the table *is nicely washed."	"These spoons on the table *is nicely washed."
86	"The rule in the school *is suddenly changed."	"The rules in the school *is suddenly changed."	"This rule in the school *is suddenly changed."	"These rules in the school *is suddenly changed."
87	"The cinema in the town *is formally closed."	"The cinemas in the town *is formally closed."	"This cinema in the town *is formally closed."	"These cinemas in the town *is formally closed."
88	"The restaurant by the sea *is finally reopened."	"The restaurants by the sea *is finally reopened."	"This restaurant by the sea *is finally reopened."	T"hese restaurants by the sea *is finally reopened."
89	"The seminar of the course *is not cancelled."	"The seminars of the course *is not cancelled."	"This seminar of the course *is not cancelled."	"These seminars of the course *is not cancelled."
90	"The nurse with the doctor *is very helpful."	"The nurses with the doctor *is very helpful."	"This nurse with the doctor *is very helpful."	"These nurses with the doctor *is very helpful."
91	"The requirement of the machine *is clearly described."	"The requirements of the machine *is clearly described."	"This requirement of the machine *is clearly described."	"These requirements of the machine *is clearly described."
92	"The dancer with the trainer *is kindly invited."	"The dancers with the trainer *is kindly invited."	"This dancer with the trainer *is kindly invited."	"These dancers with the trainer *is kindly invited."
93	"The bedroom of the flat *is nicely decorated."	The bedrooms of the flat *is nicely decorated."	"This bedroom of the flat *is nicely decorated."	"These bedrooms of the flat *is nicely decorated."
94	"The bike in the garden *is daily cleaned."	"The bikes in the garden *is daily cleaned."	"This bike in the garden *is daily cleaned."	"These bikes in the garden *is daily cleaned."
95	"The boy with the teacher *is very naughty."	"The boys with the teacher *is very naughty."	"This boy with the teacher *is very naughty."	"These boys with the teacher *is very naughty."
96	"The floor of the building *is weekly cleaned."	"The floors of the building *is weekly cleaned."	"That floor of the building *is weekly cleaned."	"Those floors of the building *is weekly cleaned."

Continue

No	Grammatical-Number Unspecified (List 3)	Ungrammatical-Number Unspecified (List 4)	Grammatical-Number Specified (List 1)	Ungrammatical-Number Specified (List 2)
97	"The baby of the lady *is very beautiful."	"The babies of the lady *is very beautiful."	"That baby of the lady *is very beautiful."	"Those babies of the lady *is very beautiful."
98	"The employee with the manager *is very friendly."	"The employees with the manager *is very friendly."	"That employee with the manager *is very friendly."	"Those employees with the manager *is very friendly."
99	"The girl with the policeman *is so quiet."	"The girls with the policeman *is so quiet."	"That girl with the policeman *is so quiet."	"Those girls with the policeman *is so quiet."
100	"The door of the house *is firmly locked."	"The doors of the house *is firmly locked."	"That door of the house *is firmly locked."	"Those doors of the house *is firmly locked."
101	"The hospital of the city *is really excellent."	"The hospitals of the city *is really excellent."	"That hospital of the city *is really excellent."	"Those hospitals of the city *is really excellent."
102	"The email about the conference *is finally read."	"The emails about the conference *is finally read."	"That email about the conference *is finally read."	"Those emails about the conference *is finally read."
103	"The toilet for the office *is daily cleaned."	"The toilets for the office *is daily cleaned."	"That toilet for the office *is daily cleaned."	"Those toilets for the office *is daily cleaned."
104	"The wall in the house *is previously painted."	"The walls in the house *is previously painted."	"That wall in the house *is previously painted."	"Those walls in the house *is previously painted."
105	"The museum in the town *is usually visited."	"The museums in the town *is usually visited."	"That museum in the town *is usually visited."	"Those museums in the town *is usually visited."
106	"The flat behind the park *is hardly sold."	"The flats behind the park *is hardly sold."	"That flat behind the park *is hardly sold."	"Those flats behind the park *is hardly sold."
107	"The singer near the journalist *is very popular."	"The singers near the journalist *is very popular."	"That singer near the journalist *is very popular."	"Those singers near the journalist *is very popular."
108	"The lesson in the textbook *is regularly taught."	"The lessons in the textbook *is regularly taught."	"That lesson in the textbook *is regularly taught."	"Those lessons in the textbook *is regularly taught."
109	"The book on the shelf *is preferably read."	"The books on the shelf *is preferably read."	"That book on the shelf *is preferably read."	"Those books on the shelf *is preferably read."
110	"The reader of the writer *is always curious."	"The readers of the writer *is always curious."	"That reader of the writer *is always curious."	"Those readers of the writer *is always curious."
111	"The letter for the company *is sent."	"The letters for the company *is sent."	"That letter for the company *is sent."	"Those letters for the company *is sent."
112	"The flat behind the park *is suddenly sold."	"The flats behind the park *is suddenly sold."	"That flat behind the park *is suddenly sold."	"Those flats behind the park *is suddenly sold."
113	"The movie about the war *is finally downloaded."	"The movies about the war *is finally downloaded."	"That movie about the war *is finally downloaded."	"Those movies about the war *is finally downloaded."
114	"The hairdresser in the salon *is not fired."	"The hairdressers in the salon *is not fired."	"That hairdresser in the salon *is not fired."	"Those hairdressers in the salon *is not fired."
115	"The classroom for the exam *is previously cleaned."	"The classrooms for the exam *is previously cleaned."	"That classroom for the exam *is previously cleaned."	"Those classrooms for the exam *is previously cleaned."
116	"The essay for the course *is completely written."	"The essays for the course *is completely written."	"That essay for the course *is completely written."	"Those essays for the course *is completely written."
117	"The presentation for the meeting *is nicely prepared."	"The presentations for the meeting *is nicely prepared."	"That presentation for the meeting *is nicely prepared."	"Those presentations for the meeting *is nicely prepared."
118	"The website about the singer *is monthly updated."	"The websites about the singer *is monthly updated."	"That website about the singer *is monthly updated."	"Those websites about the singer *is monthly updated."
119	"The magazine on the floor *is popularly read."	"The magazines on the floor *is popularly read."	"That magazine on the floor *is popularly read."	"Those magazines on the floor *is popularly read."
120	"The museum near the school *is very popular."	"The museums near the school *is very popular."	"That museum near the school *is very popular."	"Those museums near the school *is very popular."
121	"The flower behind the tree *is regularly watered."	"The flowers behind the tree *is regularly watered."	"That flower behind the tree *is regularly watered."	"Those flowers behind the tree *is regularly watered."
122	"The mirror in the house *is kindly wiped."	"The mirrors in the house *is kindly wiped."	T"hat mirror in the house *is kindly wiped."	"Those mirrors in the house *is kindly wiped."
123	"The interview with the officer *is hardly arranged."	"The interviews with the officer *is hardly arranged."	"That interview with the officer *is hardly arranged."	"Those interviews with the officer *is hardly arranged."
124	"The gym near the mall *is very popular."	"The gyms near the mall *is very popular."	"That gym near the mall *is very popular."	"Those gyms near the mall *is very popular."
125	"The cat of the neighbour *is usually fed."	"The cats of the neighbour *is usually fed."	"That cat of the neighbour *is usually fed."	"Those cats of the neighbour *is usually fed."

126	"The superstar with the policeman *is not arrested."	"The superstars with the policeman *is not arrested."	"That superstar with the policeman *is not arrested."	"Those superstars with the policeman *is not arrested."
127	"The painting on the wall *is finally sold."	"The paintings on the wall *is finally sold."	"That painting on the wall *is finally sold."	"Those paintings on the wall *is finally sold."
128	"The project about the research *is now started."	"The projects about the research *is now started."	"That project about the research *is now started."	"Those projects about the research *is now started."

Oxford Quick Placement Test

Oxford University Press
and
University of Cambridge Local Examinations Syndicate

Name: .....

Date: .....

quick placement test

Version 1

This test is divided into two parts:

Part One (Questions 1 – 40) – All students.

Part Two (Questions 41 – 60) – Do not start this part unless told to do so by your test supervisor.

Time: 30 minutes

Part 1

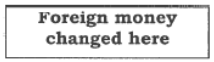
Questions 1 – 5

- Where can you see these notices?
- For questions **1** to **5**, mark **one** letter **A**, **B** or **C** on your Answer Sheet.

1

A in a shop
B in a hotel
C in a taxi

2

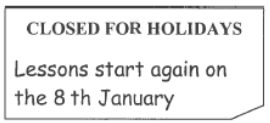


A in a library
B in a bank
C in a police station

3

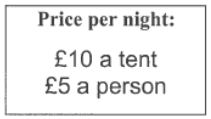
A outside a theatre
B outside a supermarket
C outside a restaurant

4



A at a travel agent's
B at a music school
C at a restaurant

5



A at a cinema
B in a hotel
C on a camp-site

Questions 6 – 10

- In this section you must choose the word which best fits each space in the text below.
- For questions **6** to **10**, mark **one** letter **A**, **B** or **C** on your Answer Sheet.

Scotland

Scotland is the north part of the island of Great Britain. The Atlantic Ocean is on the west and the North Sea on the east. Some people **(6)** ..... Scotland speak a different language called Gaelic. There are **(7)** ..... five million people in Scotland, and Edinburgh is **(8)** ..... most famous city.

Scotland has many mountains; the highest one is called 'Ben Nevis'. In the south of Scotland, there are a lot of sheep. A long time ago, there **(9)** ..... many forests, but now there are only a **(10)** ..... .

Scotland is only a small country, but it is quite beautiful.

6	A	on	B	in	C	at	
7	A	about	B	between	C	among	
8	A	his	B	your	C	its	
9	A	is	B	were	C	was	
10	A	few	B	little	C	lot	

Questions 11 – 20

- In this section you must choose the word which best fits each space in the texts.
- For questions **11** to **20**, mark **one** letter **A**, **B**, **C** or **D** on your Answer Sheet.

Alice Guy Blaché

Alice Guy Blaché was the first female film director. She first became involved in cinema whilst working for the Gaumont Film Company in the late 1890s. This was a period of great change in the cinema and Alice was the first to use many new inventions, **(11)** ..... sound and colour.

In 1907 Alice **(12)** ..... to New York where she started her own film company. She was **(13)** ..... successful, but, when Hollywood became the centre of the film world, the best days of the independent New York film companies were **(14)** ..... . When Alice died in 1968, hardly anybody **(15)** ..... her name.

11	A	bringing	B	including	C	containing	D supporting
12	A	moved	B	ran	C	entered	D transported
13	A	next	B	once	C	immediately	D recently
14	A	after	B	down	C	behind	D over
15	A	remembered	B	realised	C	reminded	D repeated

UFOs – do they exist?

UFO is short for 'unidentified flying object'. UFOs are popularly known as flying saucers, **(16)** ..... that is often the **(17)** ..... they are reported to be. The **(18)** ..... "flying saucers" were seen in 1947 by an American pilot, but experts who studied his claim decided it had been a trick of the light.

Even people experienced at watching the sky, **(19)** ..... as pilots, report seeing UFOs. In 1978 a pilot reported a collection of UFOs off the coast of New Zealand. A television **(20)** ..... went up with the pilot and filmed the UFOs. Scientists studying this phenomenon later discovered that in this case they were simply lights on boats out fishing.

16	**A**	because	**B**	therefore	**C**	although	**D** so
17	**A**	look	**B**	shape	**C**	size	**D** type
18	**A**	last	**B**	next	**C**	first	**D** oldest
19	**A**	like	**B**	that	**C**	so	**D** such
20	**A**	cameraman	**B**	director	**C**	actor	**D** announcer

Questions 21 – 40

- In this section you must choose the word or phrase which best completes each sentence.
- For questions **21** to **40**, mark **one** letter **A**, **B**, **C** or **D** on your Answer Sheet.

21 The teacher encouraged her students ..... to an English pen-friend.

A should write **B** write **C** wrote **D** to write

22 They spent a lot of time ..... at the pictures in the museum.

A looking **B** for looking **C** to look **D** to looking

23 Shirley enjoys science lessons, but all her experiments seem to ..... wrong.

A turn **B** come **C** end **D** go

24 ..... from Michael, all the group arrived on time.

A Except **B** Other **C** Besides **D** Apart

25 She ..... her neighbour's children for the broken window.

A accused **B** complained **C** blamed **D** denied

26 As I had missed the history lesson, my friend went ..... the homework with me.

A by **B** after **C** over **D** on

27 Whether she's a good actress or not is a ..... of opinion.

A matter **B** subject **C** point **D** case

28 The decorated roof of the ancient palace was ..... up by four thin columns.

A built **B** carried **C** held **D** supported

29 Would it ..... you if we came on Thursday?

A agree **B** suit **C** like **D** fit

30 This form ..... be handed in until the end of the week.

A doesn't need **B** doesn't have **C** needn't **D** hasn't got

31 If you make a mistake when you are writing, just ..... it out with your pen.

A cross B clear C do D wipe

32 Although our opinions on many things ..... , we're good friends.

A differ B oppose C disagree D divide

33 This product must be eaten ..... two days of purchase.

A by B before C within D under

34 The newspaper report contained ..... important information.

A many B another C an D a lot of

35 Have you considered ..... to London?

A move B to move C to be moving D moving

36 It can be a good idea for people who lead an active life to increase their ..... of vitamins.

A upturn B input C upkeep D intake

37 I thought there was a ..... of jealousy in his reaction to my good fortune.

A piece B part C shadow D touch

38 Why didn't you ..... that you were feeling ill?

A advise B mention C remark D tell

39 James was not sure exactly where his best interests ..... .

A stood B rested C lay D centred

40 He's still getting ..... the shock of losing his job.

A across B by C over D through

Part 2

Do not start this part unless told to do so by your test supervisor.

Questions 41 – 50

- In this section you must choose the word or phrase which best fits each space in the texts.
- For questions **41** to **50**, mark **one** letter **A**, **B**, **C** or **D** on your Answer Sheet.

The tallest buildings - SKYSCRAPERS

Nowadays, skyscrapers can be found in most major cities of the world. A building which was many **(41)** ..... high was first called a skyscraper in the United States at the end of the 19th century, and New York has perhaps the **(42)** ..... skyscraper of them all, the Empire State Building. The **(43)** ..... beneath the streets of New York is rock, **(44)** ..... enough to take the heaviest load without sinking, and is therefore well-suited to bearing the **(45)** ..... of tall buildings.

41 A stages B steps C storeys D levels

42 A first-rate B top-class C well-built D best-known

43 A dirt B field C ground D soil

44 A hard B stiff C forceful D powerful

45 A weight B height C size D scale

SCRABBLE

Scrabble is the world's most popular word game. For its origins, we have to go back to the 1930s in the USA, when Alfred Butts, an architect, found himself out of **(46)** ..... . He decided that there was a **(47)** ..... for a board game based on words and **(48)** ..... to design one. Eventually he made a **(49)** ..... from it, in spite of the fact that his original **(50)** ..... was only three cents a game.

46	**A** earning	**B** work	**C** income	**D** job
47	**A** market	**B** purchase	**C** commerce	**D** sale
48	**A** took up	**B** set out	**C** made for	**D** got round
49	**A** wealth	**B** fund	**C** cash	**D** fortune
50	**A** receipt	**B** benefit	**C** profit	**D** allowance

Questions 51 – 60

- In this section you must choose the word or phrase which best completes each sentence.
- For questions **51** to **60**, mark **one** letter **A**, **B**, **C** or **D** on your Answer Sheet.

51 Roger's manager ..... to make him stay late if he hadn't finished the work.

A insisted **B** warned **C** threatened **D** announced

52 By the time he has finished his week's work, John has hardly ..... energy left for the weekend.

A any **B** much **C** no **D** same

53 As the game ..... to a close, disappointed spectators started to leave.

A led **B** neared **C** approached **D** drew

54 I don't remember ..... the front door when I left home this morning.

A to lock **B** locking **C** locked **D** to have locked

55 I ..... to other people borrowing my books: they always forget to return them.

A disagree **B** avoid **C** dislike **D** object

56 Andrew's attempts to get into the swimming team have not ..... with much success.

A associated **B** concluded **C** joined **D** met

57 Although Harry had obviously read the newspaper article carefully, he didn't seem to have ..... the main point.

A grasped **B** clutched **C** clasped **D** gripped

58 A lot of the views put forward in the documentary were open to ..... .

A enquiry **B** query **C** question **D** wonder

59 The new college ..... for the needs of students with a variety of learning backgrounds.

A deals **B** supplies **C** furnishes **D** caters

60 I find the times of English meals very strange – I'm not used ..... dinner at 6pm.

A to have **B** to having **C** having **D** have