The Curious Case of Lexical Ambiguity: Using Talker-Specific Characteristics and Facial Expressions to Decode the Puzzle.

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A dissertation submitted in partial fulfilment of the requirements for the Doctor of Philosophy in Cognitive Science at the Faculty for Media and Knowledge Sciences

(MaKS)

University of Malta 2020

Abstract

This thesis investigates how facial expressions and the talker-specific characteristics (TSCs) of age, gender and sociolinguistic background affect language processing in Maltese. The main hypothesis within this study is that facial expressions and TSCs (talker-specific characteristics) guide language processing by categorising information, thus enabling superior usage and control of the information stream encountered during language processing. To test this, three experiments were carried out. The first was a behavioural study inspired by the McGurk paradigm, where facial expressions were expected to aid with the disambiguation of phonetically similar yet lexically diverse words. Here the results show attention to the facial features, however no specific effect of facial expressions in a single word situation. The second was an eye-tracking experiment containing biased sentence interpretations, based on common gender and age biases. Results show that participants could use speaker identity to guide language processing, albeit with some constraints. The third was a trial EEG study inspired by the second experiment, using biased sentences based on common gender and sociolinguistic biases. The results show no clear effects of speaker identity. Based on these results a series of limitations are discussed and ideas for future work are suggested. Overall, this thesis shows that language processing is a complex matter and much work still needs to be done (especially within the Maltese setting) to learn the extent of involvement of speaker identity and facial expressions within this process.

Keywords: facial expressions, talker-specific characteristics, McGurk effect, eye-tracking, EEG, psycholinguistics, cognitive science

Dedication

This thesis is dedicated to anyone who ever feels like giving up.

Sometimes it feels like everything is for nothing, things just look hopeless and you just do not have the strength to deal with them. However, if you are doing something that you love, something that you really want to achieve or something that is important to you, take time to remember why you felt like this. Once you do, no matter how bleak things look or really are, you will probably remember why you do not want to give up.

"I have not failed. I've just found 10,000 ways that won't work."

-Thomas Edison

Acknowledgements

I am very grateful to everyone who in one way or another, big or small helped in the completion of this thesis.

I sincerely would like to thank all my wonderful friends (furry and not) and my amazing boyfriend. All of you were my rock in a journey that was not without its challenges. Thank you for always being there to hear me out, to keep me from quitting and to keep my anxiety in check. Words cannot express how lucky I am to have all of you inmy life.

I would also like to thank the Department of Cognitive Science at the MaKS Faculty, University of Malta for giving me with the opportunity to carry out my studies and providing all the facilities and tools needed. Special thanks go to Prof. Holger Mitterer for his supervision, Prof. Ian Thornton for his guidance on all practical matters and Prof. Noellie Brockdorff for her leadership and always patiently hearing me out.

Finally, I would like to thank all the participants who gave their time and participated in these studies. A large part of this project would not have been possible without your participation.

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Chapter I

The Curious Case of Lexical Ambiguity: Using Talker-Specific Characteristics and Facial Expressions to Decode the Puzzle.

This thesis is being written as an experimental study within the field of cognitive science, specifically focusing on psycholinguistics. Throughout this thesis I will look into how facial expressions and the talker-specific characteristics (TSCs) of age, gender and sociolinguistic background affect language processing in Maltese. This study will also explore how such cues might be used in linguistic prediction.

The main hypothesis within this study is that facial expressions and TSCs can aid and streamline language processing by categorising information, thus enabling superior usage and control of the information stream encountered during language processing. If the predictive activation of stereotypical information provided by the state and identity of the speaker is influenced by patterns of use across society, this can indicate that social information about speakers whether it is how they are feeling, where they come from, etc. can be directly linked to mental representations and therefore make processing quicker and more effective. For example, hearing a child speaking might activate more child appropriate tokens, such as toys, school etc., whereas hearing an adult voice might hinder the activation of such tokens in favor of more adult topics. Additionally, such effects of state and identity stereotypes expand our understanding of the speech perception mechanism, suggesting that the social tokens are enhanced by stereotypical associations between words and extralinguistic characteristics. Another important question is how much such non-linguistic cues and language processing interact and the timing of this interactivity. An ample amount of work in cognitive neuroscience and linguistics argues in favour of the hypothesis that our brains are invested in predicting future input, such as upcoming words in a speech or text in order to improve comprehension. However there is as yet no agreement as to the timing and to which degree this can happen. Proponents of a strong prediction theory argue that, non-linguistic cues are integrated into

processing at all levels, even prior to the target being encountered. However, supporters of a more moderate version of the theory argue have questioned whether this is always the case or if there have to be specific conditions or a particular timing allowed for this predictive element to occur.The overview of the diverse research debated in the following chapter will discuss these two points further. Firstly the importance of the state (facial expressions) and identity of the speaker (TSC's) in language processing and secondly the range and timing of their predictive usage.

In order to test this, three experiments were carried out. The first is a behavioral study inspired by the McGurk paradigm, where facial expressions were expected to aid with the disambiguation of phonetically similar yet lexically diverse words.

The second is an eye-tracking experiment containing biased sentence interpretations, based on common gender and age biases. The third is a trial EEG study inspired by the second experiment, using biased sentences based on common gender and sociolinguistic biases.

All experiments contain a congruency / incongruency variable, therefore a result reflected as a difference in processing effort was expected, when the facial expression or speaker TSCs did not match with the word or utterance heard (for example a happy facial expression coupled with a sad word or a male voice describing an activity that is usually regarded as female like putting on makeup). Consequently, stimuli that are congruent with a particular facial expression or biased context (expressed via a talker specific characteristic) should be comprehended more easily, and therefore manifest as values promoting less cognitive effort in the results than incongruent ones. Therefore, in all the experiments the decoding cues, i.e. the congruent facial expression or biased talker-specific characteristic were expected to prime participants towards the correct interpretation whereas the incongruent options were expected to hinder processing.

In the first experiment, a word should have been easier to decode when accompanied by a matching facial expression versus a non-matching one. As for the second experiment, the target of the sentence should be easier to recognise when primed with voice-matching the age or gender of said biased target. In experiment three it was expected that the appropriate ERP component would

be observed when the stimuli were incongruent, indicating a hinderance in processing. By using three different paradigms, this thesis tried to make sure that results are not paradigm specific. The first experiment was based on a meta-linguistic decision. While meta-linguistic tasks always come with the issue that the results may be related to the decision component, an effect is relatively straightforward to interpret. This method was complemented with two methods that do not require a meta-linguistic judgement, one in which participants needed to listen "actively" and choose a visual referent matching the sentence, and one in which they listened completely passively while brain activity was monitored through electrophysiological recordings. Whilst the studies described in this thesis do vary greatly across their methods, they are all similar in their core principles. They all aim to investigate and address the core hypothesis, i.e., whether and how facial expressions and the talker-specific characteristics (TSCs) of age, gender and sociolinguistic background affect language processing in Maltese, albeit from varying perspectives.

While there are studies investigating the effects of, for instance, speaker identity, to my knowledge this is the first study of its kind to be carried out in this manner. It was also the aim of this study to apply an experimental approach to these current questions using the Maltese language as a medium.

The following section will give a short description of what can be expected in each chapter contained within this thesis.

Thesis Chapters

This Introductory chapter is being set as a precursor to the second chapter of this thesis, i.e. the literature review. The literature review contains four main parts, divided into further subsections. The first section gives an overview of some of the different levels at which contextual cues can affect language processing citing relevant literature that discusses various outlooks on this topic.

Following this, the next part concerns the state of the speaker (i.e. the emotional state). This part will review literature that discusses the effect of the perception of the emotional state of the

speaker on language processing, and how the cues derived from observing this emotional state can aid in processing language. As the relevant experiment carried out in this thesis focuses on facial expressions, this section will look at the state of the speaker and the multimodality aspect when integrating of visual and auditory stimuli.

The third part will discuss the identity of the speaker and how TSCs can be used as contextual cues by the listener to aid in language processing. This section will start off with an overview of studies which have looked into this topic. Subsequently, this section will discuss three popular biases that all fall under the main umbrella of the Stereotype bias: Ageism, Gender bias, and Linguicism. Following a brief introduction of each bias, this section will refer to relevant studies to discuss how TSCs can be used as contextual cues due to such biases.

The final section of this chapter will complete this literature review by looking at the issue of the timing of these cues, referring to studies that postulate both immediate and delayed use and models that refer to both unification and two-step processes. The topic of linguistic prediction will also be discussed within this section.

Concluding remarks will lead to the experimental part of this thesis. This will be made up of three chapters - one for each experiment - and will include three sections: the methodology, results, and a short concluding discussion. The Methodology section of each chapter will describe in detail the three experiments carried out, their variations and the hypotheses considered. The Results section will present the outcomes of the experiments carried out. Each chapter will end with a short summary, discussing what these results may mean.

This will lead to chapter six, the Discussion, where the results and short discussion in each experimental chapter will be deliberated in additional detail, using relevant literature to further the point where needed. The aim of this chapter will also be to apply such results to the main theoretical areas and frameworks discussed in the Literature Review regarding the timing of such cues. This chapter will set off with a short general discussion. Subsequently, to enable clarity, the discussion will be divided into two main parts (similar to the literature review); the state of the speaker and the

identity of the speaker. A limitations and future work section will be included in each part.

The last and final chapter of this journey concludes by summarising the essential parts of this thesis.

Conclusion

It is my hope and wish that by carrying out this study I can provide an experimental look into the world of situated language processing, specifically into the importance of the identity and the state of the speaker when it comes to language processing; and to highlight how these interact whilst also contributing towards this truly intriguing field of study.

Chapter II

The state and identity of the speaker: Can non-linguistic clues be useful to understanding and processing language?

Communicating and especially understanding each other is not simply about what is said. It is not even the beginning of the puzzle. There is much more that goes on in understanding each other during a conversation than listening to and assimilating an utterance. Multiple inputs need to be processed, some of which are not necessarily of a linguistic or even auditory nature.

This introductory statement which sets the tone for the inspiration behind this thesis clearly goes against the Chomskyian way, which has had a huge and deep impact on the science of language. From this perspective, the sentence is seen as the fulcrum of language interpretation; it is the prevailing unit of syntactic analysis, containing the most important properties of language coded within the syntax. Therefore, as per Fregean compositionality, the meaning of an utterance essentially becomes made up of the semantic meaning of its parts combined with the syntactic rules for that sentence (Culicover & Jackendoff, 2006).

However, despite the influence of the Chomskyan school of thought, various scientists have supported a different perspective, one that holds that context in all its various forms, holds a key position in our intricate mechanism for understanding language. Grice (1967a) said that an utterance can be divided into what the speaker says and what the speaker implicates. Jackendoff (2003) mentions the context provided by world knowledge in order to extrapolate meaning. Clark (1996) indicates the importance of talker-specific characteristics (TSCs), such as the gender and age of a voice, which provide essential insight into who is uttering the sentence and therefore aid in the recovery of its meaning.

Non-linguistic information in fact is not a fluke. Such cues are routinely used in language processing throughout its various levels as will be debated in the following section.

Context and Language Processing – A puzzle with varying levels

In psycholinguistics and cognitive science, online interactive language processing theories are prevalent (such as Marslen-Wilson & Tyler, 1980; McDonald et al., 1994; Levy, 2011; Girbau, 2018; Ryskin et al., 2019). Such theories consider the various levels of language; such as lexical, syntactic,semantic, and pragmatic; and how such inputs interconnect to optimize language processing at varying levels. This section will delve into how context can affect some of these levels.

The Word Level

At the word-level, the "Ganong effect" (1980) shows that there is an inclination to perceive an ambiguous phoneme as a phoneme that would complete a known word. Ganong (1980) posited that voice-onset, time-categorical boundaries shift at the world level, as a function of word knowledge and that these boundaries shift to favor real words over non-words. He created stimuli made of word pairs that varied in seven voice onset time levels, from 15 to 55 ms, with one end of the continuum resulting in a real word and the other ending in a nonword (e.g. ball-*pall vs. *boll-pool). Ganong observed that his participants produced larger categories for the real words than the non-words. For example, in English a speech sound that could be heard as either /b/ or /p/ was perceived as /b/ when followed by "all" but perceived as /p/ when followed by "oll", as these are possible lexical items, whereas the opposing options are not. Moreover, Ganong noticed that this effect was most evident along his continuum where the ambiguity was highest. Therefore, the context provided by the native speaker's knowledge of the rules of their own language was used to fill in any missing information in a way that makes sense.

Another example comes from the phonemic restoration effect (Warren, 1970). During his experiments, Warren deleted small speech segments from words in a sentence and replaced them with extraneous sounds, such as a cough (for example, replacing the 'n' from 'night' in the following sentence; 'Avid franchise fans gathered enthusiastically to the opening night viewing of the latest Star Wars movie', with a superfluous noise). An overwhelming portion of his participants did not notice the missing phoneme, and when asked to write what they had heard, they in fact reproduced

the words and sentences in their entirety. This indicates that, in the absence of a phoneme, listeners will use other disambiguating information that might be available at the time via top-down effects. Similarly, Samuel (1981) further showed that such effects are enhanced via lexical information, for example phonemic restoration is more prevalent in words instead of nonwords, and in longer words which can be more lexically predictable versus shorter words. In his experiment he added a second type of stimulus to the original paradigm; stimuli where the superfluous sound was simply superimposed on the target phoneme. During the trials, participants were asked to decide whether they thought an utterance was complete (i.e. the noise was superimposed) or not (i.e. the noise was replaced). The restoration of stimuli varied greatly depending on the class of phoneme which made part of the replaced segment and the acoustic similarity of said phoneme to its substitute sound. Increasing the participants' anticipation of a phoneme increased restoration, with missing segments in real words having a superior rate of restoration than equivalent pieces in phonologically similar nonwords.

Currently, models of word recognition can be divided into two groups. In Highly Interactive Models the direct interaction between diverse cues such as acoustic, lexical, contextual cues (which in this case cover a broad base such as visual stimuli, information about the speaker etc.) works in a manner that top-down information affects the perceptual system (Grossberg & Myers, 2000). Studies concerning the neural bases of lexical effects on phonetic perception, provide favourable support for such models. Myers & Blumstein (2008) used fMRI to monitor brain activity in participants taking part in a phonetic categorization task which contained real word and nonword stimuli pairs containing one syllable and sharing the same vowel (e.g. gift–*kift* and *giss*–kiss). Participants were asked to identify whether stimuli started with either a/g/ or a/k/. The results showed that participants provided behavioural evidence of a Ganong effect (i.e. preferring the lexically consistent alternative in the word pair stimuli). In addition, the activation pattern they observed in the superior temporal gyrus (where perceptual processing occurs) posits that this type of lexical effect includes a perceptual element, along with a decision component, which supports a model of language processing where the perception of flowing speech is influenced by higher-level

lexical information.

However, there is commentary regarding such types of studies and their support of interactive processes. Norris, McQueen and Cutler (2016) say that such an argument centres around the function of the superior temporal gyrus, especially the assumption that this structure is involved in pre-lexical speech processing but not in lexical processing itself. They argue that whilst there is indication that the superior temporal gyrus does aid in the mapping of the speech signal onto the mental lexicon, it is not clear that it is only involved in pre-lexical processing. Such discrepancies can shift the argument to be in favor of feedforward models of speech perception, thus creating an inconsistency with models where online processes and phonological content are expected to directly interact. In fact, in stark difference, post-perceptual models comprise a separate phoneme decision layer where listeners merge high-level lexical information with low-level phonetic cues, such as in Norris, McQueen & Cutler's (2000) Merge model. In Merge, phonemic decisions are centred around the concept of combining prelexical and lexical information, which arguably allows it to correctly predict the lexical component in phonemic decisions in both real words and nonwords.

The Sentence Level

Similarly looking towards the sentence level, contextual effects were also shown by a diverse body of studies. For example, Marslen-Wilson & Tyler (1980) showed that if the initial part of a word is heard, multiple words that match that initial sound can become activated. Whilst the word keeps being heard and these multiple options are being considered, all the information available is encompassed to aid in the final recognition of the utterance. In their two experiments, they looked into the word by word process of spoken language understanding, one focusing on word recognition and the other on structural and interpretative processes. In both experiments, a word-monitoring task was used, which allowed for the target to be observed using three different levels: phonetic, semantic, or both. Such a paradigm also provided three different conditions: normal, semantically inconsistent, and scrambled, together with the ability to distribute critical stimuli in nine diverse places in the test sentences. Experiment 1 also contained a context sentence whereas experiment wo

did not, so as to permit an evaluation of between-sentence effects to be calculated. The results showed an online interactive language processing approach where lexical, syntactic, and contextual knowledge inputs connect and interact during processing in an effective and precise manner that provides the final interpretation for the utterance.

Similarly, Tuinman et al. (2014) also paid attention to the sentence level part of the equation. In their study, they presented Dutch participants with a phonetic ambiguity they had previously experienced in their language, in this case different levels (clear to absent) of word-final /t/-reduction, which in Dutch helps distinguish third person from first person in singular present tense verbs. In the first experiment, the disambiguating syntactic information was placed before the target verb, whereas in the second experiment, it immediately followed the verb. The participants were asked to listen to these utterances and decided whether the verb in a sentence ended in /t/. In the two experiments conducted, participants reported more /t/ occurrences in sentences in which /t/ would be syntactically correct. Therefore, similarly to the word level effects described in the first part of this section, when participants were met with a stretch of speech where an ending /t/ was unclear, they resorted to their knowledge of the syntactic information and its context to make a decision.

In comparison to the previously mentioned word recognition models, there are diverse models that are currently attempting to explain how results obtained in such studies concerning the sentence level could be explained. Two of the currently most well-known ones are the syntax-first model, where syntax is processed separately and before other information; and the constraint-satisfaction model, where all types of information connect at every phase of the language comprehension process.

The syntax-first model assumes two separate stages. Firstly, one builds the simplest syntactic structure based using the available word-category information, independently of the lexical, semantic, pragmatic etc. data available. Secondly, this latter information is processed, and a thematic structure is built. If the syntactic structure built in the first phase isn't compatible with the

thematic structure built in the second phase, reanalysis occurs (Frazier & Rayner, 1982; Frazier and Clifton 1997). For example, in an eye-tracking experiment conducted by Frazier & Rayner (1982) containing stimuli made of garden path sentences such as; *The wife will claim the inheritance belongs to her*, they observed that participants fixated longer than expected on the word 'belongs', which in this case disambiguates the sentence. This led them to interpret that their participants, on first glance, interpreted 'the inheritance' as a direct object, as this is structurally simpler. However, they were confused when they realized it was actually the subordinate subject, and therefore had to revise their interpretation.

However, others (such as MacDonald et. al, 1994) argued that at least for ambiguous structures, the initial structure built cannot be completely independent of the information processed in the second phase. This led to the start of constraint-satisfaction models being developed, where it is assumed that several syntactic options are produced and assessed according to nonstructural factors. For the proponents of the constraint-satisfaction models (such as Marslen-Wilson & Tyler, 1980, see above), syntactic, semantic and pragmatic components interact from an initial phase during spoken language comprehension. This seems to be also applicable for syntactic and prosodic processes. Warren, Grabe & Nolan (1995) investigated the relationship between syntactic, prosodic and phonological components using stress shift items (where stress on neighbouring syllables is avoided usually by shifting the primary and secondary stress or losing the primary stress completely). Specifically, their interest was on the effect of intonation and stress on such stimuli in early and late closure utterances. Their participants were asked to mention the visual target words as rapidly and precisely as possible, and to specify if they thought the word mentioned was a good/bad complement for the sentence portion encountered. Results showed that prosodic contrast was used to aid the interpretation of structural ambiguities in the online processing of utterances. Listeners used stress placement in stress-shift items as structural cues, but not in cases where shifted stress could be interpreted by non-structural factors.

Similarly, Steinhauer et. al (1999) used event-related brain potentials (ERP) to show that

intonational phrasing aides preliminary sentence structure analysis. Their stimuli were made of German sentence pairs made out of similar sentences syntax-wise, but which contained different meanings due to the initial intonation applied (similar to: *'Since Jay always jogs a mile and a half, this seems like a short distance to him.'* vs. *'Since Jay always jogs, a mile and a half seems like a very short distance to him'*). Participants listened to these sentences in a prosody judgment and comprehension task whilst their responses were measured via an electroencephalogram (EEG). When participants were faced with a prosody–syntax mismatch (i.e., the initial prosodic features of the first sentence in the pair, applied to the second and vice versa) this elicited an N400–P600 signal, thus reflecting a prosody induced garden-path effect. The researchers advised that such results suggest that prosodic features decided the first parsing interpretations and that a positive signal in ERP at the intonational phrase boundaries suggests a specific online response to prosodic processing.

While in both types of models syntactic, semantic, pragmatic etc. cues are combined during language perception to attain comprehension, the important difference between these models is that the merging of such information takes place during different phases of the language interpretation process. In constraint-based models, early interaction is vital, as opposed to in syntax-first models interaction occurs at a later phase.

The Pragmatic Level

Finally, on the pragmatic level, similar studies are also being conducted. One such example comes from Rohde & Ettlinger (2012) where through a set of experiments they investigated whether participants could assimilate information from two very different linguistic domains: pragmatic inference and phonetic perception. Their hypothesis was that in utterances where the verb biased forthcoming references to be implicated as female, participants would hear more female (she) pronouns. More male (he) pronouns were expected to be heard in the opposite scenario, i.e. where the verb biased contexts towards a male referent. In order to test this, they used implicit causality verbs, such as; *hate, impress, annoy, admire* etc. This class of verbs can guide expectations about who will be referenced, due to cueing into world knowledge about events and linking to causality inferences. Their stimuli consisted of two clauses linked by the word *because,* the first containing the

verb. The first clause was used to introduce two individuals of opposite genders. The second clause had an auditorily ambiguous pronoun and a sentence conclusion that could be assigned to either character previously introduced (for example, *Mark deceived Betty because □ couldn't handle a conversation about infidelity*.).

Participants were asked to listen to the items to decide whether the sentence contained a *he* or a *she*. Their results indicated that pragmatic contextual biases have a role both in anticipating upcoming words as well as helping to integrate acoustically ambiguous stimuli into the context of the conversation. As mentioned in the sections above, this is consistent with the vast array of studies that highlight that listeners use real-world cues, for instance information about the speaker (in this case who's more likely to carry out a certain action depending on societal biases) to aid in processing.

Conclusion

Although much of the above-mentioned research favours the perspective that contextual cues interact with and guide language processing on different levels, the full range of information sources that listeners integrate is still unknown. It should also be noted that such research does not delve into the level, different modalities can be involved in, when supplying this vast range of very diverse information. However, these studies do serve to highlight the importance that contextual knowledge has on the whole process.sources that listeners integrate is still unknown. It should also be noted that such research does not delve into the level, different modalities can be involved in, when supplying this vast range of very diverse information. However, these studies do serve to highlight the importance that contextual knowledge has on the whole process.

The next section of this chapter will focus specifically on the type of context relevant to this thesis i.e. the state (facial expressions) and the identity (age, gender, and sociolinguistic background) of the speaker and the usefulness of such cues. For example, van Berkum et al. (2007) have posited such cues as key components in language processing. In their studies, they carried out an ERP experiment where participants listened to two types of sentences. One set of sentences contained a precise word which was either consistent or inconsistent in relation to the speaker's voice and the extra-linguistic

information it conveyed. For example, a child saying that they would drink some wine before going to sleep vs. an adult saying the same thing. The other set contained words with a standard semantic inconsistency based on linguistic information only (such as, T*he Earth revolves around the trouble in a year*) known to trigger an N400 effect. They found that both types of inconsistencies elicited an N400 effect.

Results such as van Berkum's form part of a large body of work indicating that language processing involves various sources of contextual representations that guide online processing This is in line with the main hypothesis of this thesis; that contextual cues grasped from the state (emotions) and identity (TSCs) of the speaker aid linguistic prediction and therefore positively affect language comprehension. As the state and identity of the speaker encompass broad variables, this thesis will specifically focus on facial expressions when referring to the state of the speaker, and age, gender and linguistic background when referring to the identity of the speaker. Throughout the rest of this chapter, I will look at further examples from this body of literature exploring instances that highlight both the pros and cons of such a hypothesis.

In order to provide a balanced debate, I will start by looking at the state of the speaker and identity separately. Firstly, I will investigate how the emotional state can be identified through facial expressions, and the importance of this multimodal integration with speech. Subsequently, I will look into literature regarding the identity of the speaker and how this interacts with speech, focusing specifically on the TSCs of age, gender, and linguistic background as these are also part of the aforementioned hypothesis. Finally, I will discuss the temporal usage of such contextual cues, whether they can be utilized immediately or whether other information needs to be processed first.

To further debate this, I will specifically discuss the usage of such cues in terms of Linguistic Prediction, since this topic also forms an important part of the aforementioned hypothesis. The final section of this literature review will present the plan for the following chapters, where I shall present the experiments carried out, based on the arguments presented in this review and the results obtained through them.

The state of the speaker – a multimodal story

Emotion and language processing have not always been hailed as the best of partnerships. However, as humans are social and emotional beings, there is a case to be made for the importance of such cues. For example, Nygaard and Lunders (2002) have hailed the usefulness that emotional tone of voice contributes towards processing lexical ambiguities. In the two experiments they carried out, listeners heard homophones containing an emotional connotation (happy or sad, such as *flower*) and others with a neutral meaning (such as *flour*). Participants were asked to type the word they thought they heard. In the first experiment, trials were controlled by tone of voice, i.e. each listener heard all the words in only one tone of voice (happy, sad or neutral). In the second experiment, listeners were exposed to stimuli with different tones, as the tone changed from trial to trial. Overall, the findings revealed that the participants provided more emotional than neutral answers when the tone of voice corresponded with the emotional implication of the stimulus (i.e. their participants provided more happy answers of the happy/neutral stimuli when the words were produced in a happy tone of voice and produced more sad answers of the sad/neutral stimuli produced in a sad tone of voice). The researchers argued that their results suggest that in the case lexically ambiguous words, emotional tone of voice affects processing by biasing meaning selection.

In an eye-tracking study carried out by Reinisch, Jesse and Nygaard (2013), listeners were observed using tone of voice to establish a relationship between tokens and referents and using this as a meaning guide in word learning. During a training phase, participants heard new adjectives (e.g., *blicket - Can you find the blicket one?*) spoken in a tone of voice indicating an emotional implication of strong and weak, hot or cold, and big or small. This was achieved by asking the speaker to say the new adjectives as if she was speaking to a child that did not know the word's meaning. Two pictures were shown simultaneously per sentence. The pictures used represented the two opposing meanings (e.g., *ice for cold, fire for hot*) and the participants' eye movements were monitored. In the following test phase, participants heard the sentences spoken in a neutral tone of voice, whilst observing old or new picture pairs having the same opposing dimensions (e.g., *a giraffe and an ant for big and small*). This time participants were asked to click on the adjective's intended target.

What the researchers observed from the participants' eye movements was that the intended meaning was not inferred during first exposure, but rather learned with the help of tone of voice during training. During the test phase participants were then able to apply this knowledge to old and new pairings even in the absence of an informative tone.

Thus, whilst emotional tone of voice is a useful cue, it is not the only method via which we are able to discern the state of another human being. Indeed, a lot of day-to-day interactions we take part in involve combining information from both the face and the voice of a person (whilst nothing some particular exceptions such as phone calls, texts and certain types of online communication). Therefore, visual cues such as facial expressions are also very useful, in fact one extremely important feature of our perceptual mechanism is this remarkable ability it has to assimilate information from different modalities.

Facial Expressions as Contextual Cues

People feel like they can read more into a person or situation through facial expressions. (Juckel et al., 2018; Frith, 2009). As Juckel et al. (2018) aptly describe:

It is important to distinguish two ways in which we can understand others' emotions. One can either develop a *cognitive understanding*; if one knows which emotion concept is appropriate to explain and predict the expression and behavior one observes; or one can know what it feels like to be in the others' affective state, or, in other words, develop an empathic understanding. Ideally, we can rely on both types of understanding, but they are independent of each other. (Juckel et al., 2018, n.p.)

This is the point of Emotion Recognition, i.e. the idea that we can obtain and decode emotional information from others' visible behaviors, such as facial expressions and movements. This ability to interpret context from facial cues is thought to be automatic and more or less innate (Izard, 1994; Buck, 1999), instinctive (Ekman, 1993), and to line up with how we instinctively classify emotion (Ekman, 1997). But how exactly are we able to do this?

More than a century ago, Charles Darwin (1872/1998) suggested that emotional facial expressions were similar in all people, and this idea has fueled a vast area of study regarding the

structure, the basis of emotional expression and the perception of these expressions. For example, Aronoff (2006) argues that at least for the main emotions of anger and happiness, meaning is passed through the geometric shapes produced by different parts of our faces. Firstly, he asked participants to imagine and draw what kind of mask they would wear in a threatening situation (such as, if they were headhunters in New Guinea about to go off on an expedition) and in a pleasant situation (such as, if they were about to go off to an engagement dance). From these drawings, common features were selected for a Threat Characteristics Scale, i.e. those that characterized anger according to previous studies on facial expressions (such as Ekman & Friesen, 1978). Aronoff then obtained from a museum masks of known (through their usage culturally in social functions) threatening or nonthreatening expressions. These were photographed and their features catalogued according to the aforementioned list. He observed that some of these features were a precise expression of the natural geometric changes seen on a human face when angry (for example, *eyebrows drawn together in a downward direction*) and that therefore it is conceivable that a few geometric patterns created by the face, specifically those containing angularity and diagonality as opposed to curved lines, carried the subjective meaning of threat to an observer. This is also consistent with an experiment by Bassili (1978) where he flashed luminescent dots on participants' faces in a darkened room, and then asked them to turn their faces a happy or an angry facial expression. In the happy case, the luminous dots form an outward rounded shape. In the angry case, the light dots formed a downward V-shape.

On the same train of thought, Ekman, Davidson, and Friesen (1990) discussed "genuine" and "false" smiles, based on the idea that our internal emotional states provide a certain authenticity to our facial behavior and its shape. In their experiment they observed facial expressions and analysed EEG recordings, whilst participants watched pleasant and unpleasant films. The Duchenne smile (in which the muscles that orbit the eye and control the corners of the lips pull these parts upward) is known to be related to enjoyment, i.e., it occurs more in pleasant moments than unpleasant ones (unlike nervous laughter for example). As they predicted, the Duchenne smile occurred much more

during the pleasant films rather than the unpleasant ones. Results from their EEG measures of cerebral asymmetry also supported this, as the Duchenne smile activated more the left-sided anterior temporal and parietal activation which is thought to highlight that an individual is experiencing a positive state.

Language research has also noticed the applicability of such cues to language comprehension. For example, Carminati & Knoeferle (2013) used a multimodal paradigm with emotional sentences and a visual context to study language comprehension. Specifically, they focused on how emotional facial expressions are quickly integrated into sentence processing. Using eye-tracking experiments they investigated how and at what speed the emotional expressions of a speaker's face could affect listeners. Participants were asked to view the emotional face of a speaker (happy or sad). Then they were shown concurrently two pictures depicting opposing emotional events (positive or negative), while they listened to a sentence regarding one of these events. The participants' fixations towards the relevant picture in the visual display increased when the sentence was emotionally congruent (vs. incongruent) with the previous primer facial expression. This effect happened from the initial phase of disambiguation and was varied by age of the participants, which is conducive with the socio-emotional selectivity theory (Santrock, 2008). For the older participants (average age - 64) it was more evident with happy faces, and for the younger participants (average age - 23) with negative faces. De Gelder and Vroomen (2000) also ran a similar experiment. They presented participants with a still photograph of a face (taken from a morphed continuum containing stimuli going from tokens expressing sadness to happiness), while a voice was heard pronouncing a sentence in one of two tones (happy or sad). Participants were asked to choose whether the person in the photograph was happy or sad. Their results showed that subjects combined both sources of information to arrive to an answer, with congruent stimuli being answered correctly and quickly whereas mismatching stimuli increased the rate of inaccuracy and reaction time. Dolan et. al. (2001) also looked into the intersection of emotional facial expressions (in this case fear) on language comprehension. Their experiment combined event-related functional MRI (efMRI) with a bimodal

presentation of faces and audio. During the task, still photographs appeared portraying either a fearful or happy facial expression while simultaneously, participants heard a voice uttering a short sentence in either a fearful or happy tone. The faces differed in the intensity of the expression which ranged from a neutral to a strong display of fear or happiness, which enabled the creation of congruent and incongruent stimuli. The principal finding was that they observed a modulation of the amygdala and fusiform in response to fearful faces when there was emotional congruency between the stimuli.

These findings show that emotional facial expressions -much like other speaker cues such as tone, eye gaze and gestures – are quickly used when processing language. Such data suggests that facial expressions provide an essential means of contextual knowledge about the emotive state of a person or situation, which when integrated with speech is essential to decode the message supplied by the speaker.

The state of the speaker as a multimodal display

Multimodality is essential to our brain; as a matter of fact, it is the way we interact and experience most of the world around us. Our brains constantly integrate information from our different senses to produce a coherent narrative, so that we can understand the world around us. One way in which this has been shown is through the ventriloquist effect, where visual cues affect how auditory information is perceived or understood. For example, Alais and Burr (2004) asked participants to find the location of fleeting light blobs or sound clicks, which were presented to them either unimodally (separately) or bimodally (together). On some trials, the visual and auditory stimuli were incongruent. Stimuli were presented into sets of two successively, separated by a short pause. Participants were instructed to envisage the stimuli as a single event, like a ball hitting the screen, and report which of the two instances was more leftward, which resulted in them being much less accurate with the incongruent stimuli. Overall, their results support a process were visual and auditory information is combined, leading to an improvement in processing.

The sentiment is similar in McGurk and MacDonald's work or as it is commonly known – the

McGurk effect (McGurk & MacDonald, 1976) which has become one of the most well-known effects in the field. It is an example of how speech perception is not only affected by auditory cues but also by visual ones. In the original paradigm, when a video showing someone uttering the syllable/ga/ is combined with an audio recording of the syllable /ba/, the syllable /da/ is frequently heard. Such studies highlight that we do not only process sounds, we also process the visual inputs that accompany the sound (if they are present), i.e. in the case of natural speech, characteristics such as the speaker's facial movements.

Due to this multimodal ability, visual cues can be a very useful aide to use when understanding speech. This has been suggested for many years. Even back in the 50s for example, when Sumby and Pollack (1954) argued that seeing the speaker could provide the listener with an improvement in the comprehension of speech. In their experiment they used bisyllabic words with a spondaic stress pattern (such as *cupcake* or *baseball*). Participants heard the stimuli and were asked to repeat the word they had just heard (guessing if necessary). For some participants the words were presented bimodally, i.e. participants could see the speaker's face whilst the words were uttered, whereas for others the speaker's face was concealed to create unimodal stimuli. Their results showed that participants found it much easier to understand the words uttered, when these were presented bimodally. It is clearly useful for the brain to be able to integrate these two types of information.

But how important is this multimodal approach? In a review chapter, Summerfield (1987) said that as listeners we recreate the patterns of articulation used by the speaker, no matter the modality of speech we receive. Similarly, Fowler & Dekle (1991) said that visual processes can have an input on our perception of what is heard. In their experiments they investigated the McGurk effect by contrasting visual and haptic processes with auditory processes. Specifically, they tested whether their participants' auditory perception could be influenced by visual and haptic cues using the Tadoma method, i.e. gained by feeling the speaker's face and neck with their hands. For example, they found that *ba/ga* auditory stimuli were identified more as *ba* when paired with a haptically-perceived lip

closure. Perhaps even more interestingly, they found that these cross-modal effects worked in both directions, i.e. the 'felt' syllables affected the judgements of the syllables heard and vice versa.

However, some cases show perplexing results. Fagel (2006) also used multimodal stimuli, in this case audiovisual, albeit with some surprising results. In his study he presented participants with stimuli made with an emotionally neutral sentence (meaning wise) uttered in four different emotions (content, happy, sad, and angry). He asked participants to state what emotion they were perceiving the sentence being uttered in. In his results, he recorded that evaluative meaning (happy or sad) seems to be perceived from the facial expression, whilst arousal (angry or content) seems to be perceived in the tone of voice. Similarly, Massaro (1998a) also looked into this effect of multimodality, using an integration of audio and visual stimuli, again with varying results. He used audiovisual cross-combined stimuli, in this case the word *please* in four different emotions, with natural audio and synthetic video stimuli to study whether when a face and voice are simultaneously presented, the visual and auditory information both contribute to perception proportionally.

Although most participants answered correctly when shown mismatching stimuli, by identifying the emotion either in the video or audio, when happy audio was played along with a fearful video, 41% of the subjects perceived surprise. When surprised audio was played in conjunction with a fearful video, the perception was that of fear. Only in the former of these two cases did the answer mismatch the emotional content from *both* the audio and video and only such *fusion* responses show true integration of the senses (similar to McGurk V: /ga/ + A: /ba/ = Percept /da/). Accordingly, integration of the audio and visual inputs hardly occurred. Massaro (1998a), however, did state a number of reasons that could explain this perplexing result. Firstly, he showed the same audio and video parts multiple times in the trials to the same subjects. Secondly, he created a discrepancy in his stimuli due to the natural audio and synthetic video composition.

Which is why it is important that support for an integration of stimuli comes from a varied range of studies using diverse tools and paradigms. In the electro-physiological arena, Sams et al. (1991) used Magnetoencephalography (MEG) to show that the reaction of the auditory cortex to

speech could be changed by adding visual speech information. In a McGurk inspired paradigm they presented via audio the syllable /pa/ accompanied by a video showing a speaker producing either the congruent version or the incongruent version /ka/ to their Finnish participants. Simultaneously, MEG was measured. Participants were asked to listen carefully to what the speaker was saying, and to silently count the number of auditory stimuli so that they could report this value at the end of the experiment. The responses obtained for the incongruent stimuli provoked a different waveform to the congruent ones. This difference could be credited to activity in the supratemporal auditory cortex, and therefore shows that visual cues obtained from articulatory movements influenced processing in the auditory cortex.

Calvert et al. (1997) used functional magnetic resonance imaging (fMRI) to examine the brain areas used in lipreading in normal hearing subjects. In the lipreading condition, participants were presented with a video of a speaker silently saying some numbers. They were asked to silently repeat the numbers they saw being produced. In the control condition they viewed a video of a static face and were asked to repeat to themselves the number ‘one’. As expected, lipreading activated the visual cortex and also the primary auditory cortex even in the absence of actual audio. This activation in the primary auditory cortex overlapped significantly with the region activated during normal speech. While this was taken by the authors to suggest that visual input strongly modifies the analysis of the content of the auditory stream, Stekelenburg and Vroomen (2007) suggested another possibility. In their experiment they also used audiovisual stimuli in a McGurk inspired paradigm, in this case the items /fu/ and /bi/. Their ERP readings showed a latency and amplitude reduction in the auditory evoked N1 component during audiovisual perception. This reduction was relatively independent of the content and match of the visual and auditory signal. Stekelenburg and Vroomen (2007) suggested that the interaction of visual and auditory streams may mostly be attentional, i.e. the visual signal changes the excitability of the auditory channel, rather than influencing the processing of the content of the auditory signal.

Various models have been proposed to account for the idea that audiovisual integration is

important for speech perception and comprehension. One well-known model is the Dual Stream model (Hickok and Poeppel, 2000, 2004 and 2007). Here speech is processed along two cortical pathways: a ventral auditory-conceptual stream and a dorsal auditory-motor stream. The model is based on the classical aphasia models of the 19th century, such as Wernicke's and Lichtheim's, both of which suggested an auditory-conceptual pathway and an auditory-motor pathway. In the Dual Stream model, the phonological network separates into two streams: a dorsal sensorimotor stream to process speech motor control (articulatory network) and a ventral sensory-conceptual stream to process comprehension (conceptual network). Distinct interface systems, the "sensorimotor interface" and the "lexical interface" link these networks. Another leading model is Massaro's (1983) fuzzy logical model of perception (FLMP). This model entails a three-step process. Firstly, Evaluation, the process by which auditory and visual features are encoded as preliminary perceptual representations. Secondly, Integration, where the preliminary feature representations are mapped onto stored category prototypes. Thirdly Pattern classification, where the input is assigned its best matching prototypical category.

Overall, such studies and models suggest that speech perception, to some extent, often includes a multimodal approach; such as an auditory and visual component; and reflects that a mismatch of such an integration can potentially slow down or even hinder comprehension.

Conclusion

This section has highlighted the importance of the state of the speaker as an added contextual cue, specifically our ability to process and utilise cues from facial expressions due to our remarkable ability to assimilate information from different modalities. Considering today's varied technology, many day-to-day interactions still involve face-to-face interaction, we cannot disregard the added value that combining information from both the face and the voice of a person brings to the equation of language comprehension.

Much in the same way, as has been mentioned in the first section of this chapter, we cannot disregard the importance of the identity of the speaker, as this is another piece of the puzzle. The

next section will focus on this other set of contextual cues bringing together views on three types of identity: age, gender, and social language background.

The Identity of the speaker – what is it saying about us?

The identity of the speaker, much like facial expressions can provide a formidable amount of context. Traditionally, such extralinguistic context was not conceded much importance unlike its linguistic and paralinguistic counterparts. This is because linguistic and paralinguistic signals are considered to be communicative in nature. They utilise a coded system and are therefore seen as an essential component to the communicative aspect of the speech signal. Linguistic signals are made explicitly and verbally to inform the receiver about the intentions of the sender whereas paralinguistic signals can advise the listener about the speaker's feelings, attitude, emotional state, etc. Extralinguistic signals (such as the age and gender of the speaker, the speaker's provenance, typical characteristics of the speaker's voice quality, etc.) on the other hand, much as the name implies were considered as extra and therefore thought to be discarded without much thought. Traditional views presumed that speaker normalization cancelled out extralinguistic signals (Goldinger et al., 1996; Ladefoged & Broadbent, 1957).

However, studies such as Brown-Schmidt's (2009) suggest differently. She used eye-tracking to investigate how listeners can create temporary conceptual references for words, based on a speaker-specific identity. In her experiment, she used an interactive conversation methodology, where an experimenter and participant decided words for various target images together through a task (see example below). Participants were asked to follow the experimenter's instructions to rearrange abstract images on a computer screen whilst being monitored by an eye-tracker. During practice trials, the participants created descriptions for these images with this experimenter. For example, they might have decided to call a target image with various blocks; *the multicoloured blocks*. On critical trials two variables were manipulated. One was speaker-specific identity, i.e. the same experimenter or a new one would give the instructions. The other was knowledge of the term, i.e. an entrained term (same as per practice trials, for example - *the multicoloured blocks*), or a new

term (different from practice trials, for example - *the stacked cubes*). When interpreting an expression, participants favoured using the established conceptual term (for example, *multicoloured blocks vs. stacked blocks*) to interpret the target only when the participant knew that the experimenter was aware of this term (i.e. previous experimenter). Her results suggested that participants used speaker-specific information about previously discussed terms to aid them in interpreting utterances online. When the participant did not know if the experimenter knew about the previously agreed term (new experimenter), they did not assume the speaker was talking about the previously agreed referent of that term even when they used the entrained term (*multicoloured blocks*) and instead considered multiple potential referents. A time course analysis further strengthened this hypothesis, as she observed a clear preference for the original vs. the new partner for sustained expressions.

On the same line of thought, Porter, Rheinschmidt-Same, & Richeson (2015) showed that when we describe others, we constantly and unknowingly 'expose' cues about our identity, feelings, social status that can be used to improve a listener's understanding. For example, according to the Linguistic Category Model (LCM), a way we communicate implicit messages is through the level of concreteness vs abstractness that one uses (Semin & Fiedler, 1988). Descriptive and concrete language (for example, 'Mark pushed his friend') tends to be seen as indicating that someone's mentioned behaviour is not usually characteristic. On the other hand, more abstract language (for example, 'Mark is violent') suggests characteristic behaviour. Based on this, in their studies they tested the effect of linguistic intergroup bias (LIB) on social category inferences, i.e. if abstract language was used to describe a target positively it would be assumed that that target was of a similar social group to the communicator and vice versa. Participants were sampled based on their political ideologies (Republican, Democrat, Independent or other). They were asked to read passages in which a communicator described the manners of a target, which could be easily recognized through social identity. This was done using either a positive or a negative LIB. Firstly, they were given an introductory part which was the same for all participants, for example; *Mark is American, has a keen interest in politics, and voted for Barack Obama* (to imply that he is a democrat). In the

second part the LIB conditions were applied by describing Mark's helpful and rude manners. In the positive LIB condition, Mark's positive manners was described abstractly (for example, *Mark stands up for others*), whilst his negative manners were described concretely (for example, *Mark said something rude and hurtful to another person recently*). In the negative LIB condition, Mark's positive manners was described concretely (for example, *Mark helped another person, even though he put himself in danger to do so*), and his negative manners was described abstractly (for example, *Mark is cold and unfriendly*). Based on this, participants were asked to decide about the communicator's social identity. Their results showed that individuals inferred that a communicator and target came from the same social group membership when the communicator defined the target using the Positive LIB, rather than negative LIB, showing that people used a speaker's social identity (in this case political party affiliation) and how they used abstract or concrete terms to describe someone else's behaviour as guiding factors throughout comprehension.

Other studies have focused on instances when speaker identity can become a hinderance to processing, such as, if there is a lot of speaker variation. Ryllas and Pisoni (1997) were ones to look into such effects of the variability of the speaker on word recognition in both children and adults. They created monosyllabic word lists using the Word Intelligibility by Picture Identification (WIPI; Ross & Lerman, 1970) and recorded these in the voices of fourteen different speakers (seven males and seven females). During the experiments, participants were exposed to these lists, one spoken all by the same speaker and one spoke by multiple speakers. Participants of diverse ages (12 four-year-olds, 12 five-year-olds, and 12 adult university students) were asked to listen carefully to the words, and repeat them back as fast as possible. All age groups were slower to repeat words from multiple-talker lists rather than single-talker lists.

Such studies coupled with the rise in research in exemplar models, in which certain extralinguistic signals are seen as useful contextual cues that aid in the recovery of linguistic content (Johnson 1997; Walker & Hay, 2011), are now giving sustainable support to TSCs as having a mostly positive impact on language processing. The next section will discuss this further, firstly by looking at how TSCs can stereotypically influence our perception.

Stereotypes – How can they be useful?

Cognitive bias is a collective term for processes in which an individual's judgment and decision-making can be affected by the context and framing of information or a situation. Biases usually carry negative connotations and are viewed as prejudicial or unfair, such as believing someone is skilled at something because of their gender or skin colour. An example of a cognitive bias is stereotyping, whereby specific traits and attributes are assumed about an individual due to their characteristics, as they are seen as befitting a certain category. For example, a study by Koch et al. (2015) shows the bias gender has in the area of employment and hiring. In this study, the researchers carried out a random effects meta-analyses on experimental studies concerning hiring and gender, in order to observe whether a particular gender was preferred in different types of job environments (including male and female-dominated jobs, gender-balanced and integrated jobs).

Included in the analysis were variables, such as the effect of the decision-maker's gender and information available to the decision-maker. Their results showed a preference for men in jobs that were considered male-dominated (i.e. gender-role congruity bias), whereas there did not seem to be a preference for the other job environments. They also saw that male evaluators displayed greater gender-role congruity bias than females, and that this type of bias only consistently decreased when these decision-makers were given information that undoubtedly indicated high competence in those being evaluated.

These kinds of results make sense when we consider that stereotypes are static, hard to change, over-generalized convictions about particular groups or types of people (Cardwell, 1996). For example, assuming that all librarians wear glasses and look relatively bookish is a case of stereotyping. Stereotypes are mostly seen as harmful because due to them we can ignore differences across individuals, which leads to thinking things about people that might not be correct (i.e. making sweeping generalizations). Stereotypes fall into two categories: explicit and implicit.

Explicit stereotypes infer some level of awareness, i.e. they are the stereotypes that we know we have, and that we are aware that we judge people with. People can try to control explicit

stereotypes, even though their attempt might not completely work. Implicit stereotypes on the other hand are trickier; they are part of our subconscious and we tend to be unaware of them or lack control over them. For example, many people believe that mostly males play video games (Gough, 2019). However, if we take into account mobile phone games, almost half of gamers are female (Zenn, 2018).

However, biases and in this particular case stereotypes are not necessarily negative.` They can be useful because in situations that require a quick reaction. Allport (1954) suggests that we use stereotypes to help us understand the world. They serve as a system of categorization that helps us to simplify and organise all the various types of information we are constantly bombarded with. Categorized information is more specific, as it highlights distinct characteristics that are common to members of a group. Through stereotyping, information is more effortlessly recognised, remembered, predicted, and reacted to (Tajfel, 1981).McGarty et al. (2002) proposed a complementary reasoning, saying that stereotypes are used to lessen the time and cognitive effort needed for processing, therefore making it more efficient and less cognitively demanding.

Language processing is one such case where such a system of categorization could be helpful to streamline the process. When processing language, we are constantly encountering multiple types of inputs at the same time, so when trying to understand a speaker during a conversation, we take into account inputs such as the previous utterances, the tone of voice, and also our knowledge of the speaker. Due to this, there is now a vast amount of research looking into how we use TSCs based on biases that we have about speaker identity to aid linguistic comprehension and processing. The first such example this thesis will provide comes from the bias of ageism.

Age

Ageism, as it may be implied, is a type of stereotype based on age. It may be explicit or implicit. Butler (1969) coined the term to describe discrimination against older individuals (50+) and based it on biases which operate on similar mechanisms, such as sexism and racism. Butler saw this bias as being made up of three combined elements. Firstly, prejudice against older people, old age,

and the aging process, which can be seen from phrases such as ‘senior moment’ implying that older people are forgetful or slower at making decisions. Secondly, discrimination against older people (for example hiring younger workers over older ones based on prejudices such as the aforementioned one). Finally, institutional practices and policies (such as discrimination in the law regarding employment, housing etc. strictly based on age) that perpetuate stereotypes about elderly people (Wilkinson & Ferraro, 2002).

Whilst the term is predominantly used in relation to older individuals, once it was noticed that this bias has a wider range than initially thought, the term was also adopted with regard to prejudice and discrimination against younger individuals, such as teenagers and children. Such adverse effects happen when their ideas or rights are ignored because they are considered too young (for example in custody cases), or when assuming a certain way of behaviour (such as carelessness) due to a younger age (Lauter & Howe, 1971). Ageism therefore leads to marginalization and a general feeling of being inexistent / unimportant to a certain demography of people (Senior Planning Services, 2016).

Ironically, even though ageism has the effect of making individuals feel like they are not being listened too, it is very helpful in the way we use and process language. For example, recent studies have shown that listeners understand words much quicker if said by someone who is stereotypically thought of as typically using that word. Walker and Hay (2011) hypothesised that a word would be more easily processed if it contained properties that resemble the listener's accrued stereotypical experience of a word. Participants took part in an auditory lexical decision task where they heard age-neutral words, older-biased words (words that are usually used more by older speakers) and younger-biased words (words that are usually used more by younger speakers). These words were produced both in congruent and incongruent voices. Accuracy increased, and reaction time decreased when voice age and word age were congruent. This provides support towards theories that expect TSCs to aid in the processing and accessing of language.

In a following experiment (Hay & Walker, 2019) studied how the age biases associated with

words affected lexical access for participants. They conducted an experiment consisting of an Implicit Association Task combined with a Lexical Decision Task. On a computer, participants had the task of first choosing whether a photograph was of an older or younger person, and then categorizing age- biased real words and nonwords. The bias in the real words was created by choosing words from a corpus that were high in usage in 1890–1930 (termed 'older' words, such as *idle* and *confectionary*) vs. words high in usage in 1930–1984 (termed 'younger' words, such as *depressing* and *intellectual*). They observed that listeners of all ages were quicker to distinguish correctly between words and nonwords if the real word was a 'younger' word and was congruent with the age of the person in the previous photo. However, no similar effect was seen in the 'older' words, i.e. access of old words was not aided when a congruent face was combined with them. This may be due to the fact that, the 'older' words might in general be more difficult to access compared to the 'younger' words due to the lessening usage over time.

Similarly, Kim (2016) measured the effect of age on word recognition in a lexical decision task, using Korean words that are stereotypically associated with younger or older people. In this case, however, the final choice of words was selected via an online survey where individuals of younger and older age groups (38 younger respondents aged from 18 and 25, and 42 older respondents aged from 50 to 71) voted on the 'older' and 'younger' words. A different set of participants listened to the words spoken either in a congruent or incongruent voice, and were asked to decide whether the word they heard was real or not. Kim noted that overall accuracy rates and response times improved significantly when a word was spoken in a voice age that matched the age stereotype it had been characterised under.

Such studies support a view where TSCs and stereotypical biases have a helpful effect on our language processing, in that they streamline its processing. To further look into this but using a different variable, the next section will review studies that deal with gender bias and its effect on language processing.

Gender

Gender bias or sexism is a type of prejudice based on one's gender or gender identity. It may be explicit or implicit, and can occur based on social or cultural customs and norms. Whilst it can affect any gender it tends to be primarily biased against women and girls (Cudd & Jones, 2005). It is a stereotype about gender roles and commonly held beliefs about the characteristics and behaviour of women and men. Usually, it includes some form of belief that one gender is inherently better than another (Witt, 2017). Studies have evidenced such commonly held cultural beliefs, for example that men are more socially respected and thought of as more skilled than women in a variety of activities (Wagner & Berger, 1997; Williams & Best, 1990; Thoman et. al, 2008).

For example, Thoman et al. (2008) studied if there really was a difference in mathematical ability between genders, based on the stereotype that men are better than women in mathematics. They hypothesized that the sociocultural beliefs surrounding the mathematical ability of females would be salient over other components of the gender-math stereotype and may therefore impact females from pursuing mathematics. In an experiment, female participants were given a standardized math exam. Participants were divided into Threat Ability or Threat Effort categories and depending on which category they were in, they were given an article to read before the test. Both articles were inspired by articles originally used by Smith and White (2002) when conducting research within the same topic. The articles were written in a scientific manner and described fabricated research that said that males are better than females at mathematics but varied in the reason why. In the Ability article, males were better than females because of biological and genetic differences whereas in the Effort article, the males were better than females because they tried harder than the females. When the test results were compared between the two categories, they saw that females made more effort, and did better on the exam when threatened with the effort-based stereotype vs. the ability-based stereotype. This suggests that the negative ability stereotype, which is influenced by sociocultural beliefs, affects female performance more than the second scenario, i.e. the effort component. Therefore, they concluded that people's academic

outcomes can be affected by stereotypes based on their genders.

However much like other biases, gender bias is not necessarily a negative occurrence but can also serve as a useful way of filtering information. For example, we know that it'd be unlikely to hear a man say, *Tonight I will paint my nails in a Barbie pink colour*. In order for such an example to be unusual (i.e. not something that a male would usually do), it is likely that to streamline the language comprehension process, we combine the information provided by the sentence with any learnt statistical dependencies that we have regarding characteristics of the speaker, such as in this case gender. This means that we learn that some words or utterances are more likely to be used by certain 'groups' and we use such knowledge to filter through the range of meaning possibilities available.

For example, Hay and Walker (2019) examined how gender bias affected lexical access. In their experiments they used male and female faces in an Implicit Association Task combined with a Lexical Decision Task. On a computer, participants had the task of first choosing whether a photograph was of a male or a female and then categorizing biased real words and non-words. The bias in the real words was created by choosing words from a corpus that were high in usage by females (which were more common in the female speaker vs. male speaker corpora, such as *pony* and *teacher*) vs. words high in usage in males (which were more common in the male speaker vs. female speaker corpora, such as *vehicle* and *guys*). The non-words were created using the selected real words as a basis so as to mimic the stress pattern, syllable structure, and orthographic length as much as possible. They observed that listeners of all genders were more accurate in categorizing the words when the word and gender of the previous photo were the same showing an association between lexical access and the cue provided by gender.

Along a similar vein, Boland and Clark (2014), used eye-tracking experiments to look into how listeners can use social cues expressed in the speaker's voice, to aid comprehension of the meanings of homophones. In their experiment, they measured the time it took for participants to fixate on a biased image following a biasing sentence spoken by a congruent or incongruent speaker.

For example, in the case of female bias a biasing sentence such as, *At the end of the month, I go makeup shopping*, accompanied with the picture of a lipstick, spoken in either a woman's voice (congruent) or man's voice (incongruent). Their results showed that the target (biased) image was looked at much more quickly when the speaker's voice was congruent with the social bias of that image. In their second and third experiments, using minimal linguistic context (such as, *Look at the..*, some of which were overlaid with crowd noise), no such speaker congruity effects were observed. Once again, their results promote the idea of language processing which takes into account social stereotypes associated with the speaker's voice, in this case especially when there is context for predictive processing.

Similar effects of congruity of speaker and message were also observed in electrophysiological studies. Hagoort & Van Berkum (2007) carried out an ERP experiment where participants listened to various sentences, some of which contained a speaker mismatch. This incompatibility was achieved by using a specific word, so that the content of the message mismatched with implications about the speaker's voice (which provided information about the speaker's gender, age or social status). For example, a male speaker uttering*: I'm pregnant'* or a child uttering: *I'll have a glass of wine*. Their findings indicated a clear N400 effect for both identity mismatches. These were compared to semantic anomalies as often used in such studies (see below for an example). The N400 caused by these sematic anomalies are clearly generated due to linguistic knowledge. This is important because usually such a component is elicited when an utterance doesn't make sense, such as in the case of semantic anomalies (for example, *the peanut won the dancing competition*, as opposed to *the ballroom dancer won the dancing competition*). The N400 observed by the experimenters was similar both in magnitude and timing to the N400 seen in 'normal' anomalies, which suggests that the context achieved from the stereotype of the speaker was taken into account. Along the same lines Lattner & Friederici (2003), in their experiments they presented participants with audio recordings of sentences that contained stereotypical male or female utterances. When congruent, the gender of the speaker matched the stereotypical semantic

content, when incongruent the gender and the content mismatched. The ERP results showed a late P600 effect in the incongruent condition.

Foucart et al. provided another example by investigating how speaker identity is integrated during L2 sentence comprehension. They theorized that differences which are often observed between L1 and L2 sentence processing may be due to differences arising from how various types of information are used to process a sentence, rather than differences between native and non-native linguistic systems. To test this idea, they looked into whether late bilinguals use the speaker's identity (inferred by the voice) when processing speech and whether this affects their online interpretation of the sentence. During the experiment they presented participants with sentences containing either semantic violations or pragmatic inconsistencies (inspired by Van Berkum et al, 2008). Both native and non-native participants exhibited a N400 response to semantic violations. However, their response to speakers' incongruencies differed albeit slightly. Late bilinguals showed a much earlier Late Positive Potential (LPP) than native speakers. Such results suggest that, both native speakers and late bilinguals process semantic and pragmatic information bit by bit; however, the time course of the process seems to differ between the two. Foucart et al. suggest that this difference may stem from the late bilinguals' being more sensitive to and able to utilize pragmatic information. This in turn may make them rely more on pragmatic cues, such as speaker identity, than native speakers when they face inconsistencies in processing.

Another example of the electrophysiological nature comes from Tesink et al. (2009) when they observed similar speaker mismatch effects via fMRI experiments. They examined the neural structures active in understanding utterance meaning with auditory-based inferences regarding the speaker's age, gender, or social status. Their results showed that there was enhanced activation in the inferior frontal gyrus bilaterally (BA 45/47 – speaker related information), when similarly, to the above mentioned experiment, participants were listening to sentences where the meaning was incongruent with the speaker characteristics perceived from the voice of the speaker. Their findings also showed an intersection between the brain areas involved in the combination of speaker-related

information and those of semantic and world knowledge.

Such findings provide positive results for a shared neural system that combines linguistic and extralinguistic sources of information. Coupled with the results mentioned from both the eye-tracking and behavioural paradigms cited previously in this section, such studies offer a solid background in favour of stereotypes and especially gender bias as a useful and important contextual cue for language processing. In the next section, this argument will be taken further by looking into this topic in relation to linguistic bias.

Language Background

Linguicism (also known as glottophobia and languagism) is a type of prejudice based on one's use of language. The term was invented by Tove Skutnabb-Kangas (1989, p. 455) who defined it as "ideologies and structures which are used to legitimate, effectuate, and reproduce unequal division of power and resources (both material and non-material) between groups which are defined on the basis of language". 'Use of language' may include things such as one's native language, one's accent, the extent of one's vocabulary (i.e. usage of a complex vocabulary vs. a more basic vocabulary), modality, syntax etc. In specific cases, based mainly on certain countries' sociolinguistic histories and context it can also impose on a person's choice to use one language rather than another. For example, an individual who speaks a certain dialect may be treated differently from another who speaks the country's standard version, as Linguicism is culturally and socially decided, based on a preference for one language / dialect / variation above another. Due to this difference in language use, an individual may make up judgments about another person's qualities such as financial status, education, social status, character, etc. Such supposed perceptions may then lead to biased thoughts or treatment towards said individual. For example, in the United States of America Southerners are sometimes perceived as having less intelligence than other groups.

Similarly, in Malta the sociolinguistic situation allows for a social and cultural bias to be created. In Malta, both Maltese and English are official languages. This has allowed for a particular variety of English to develop: 'Maltese English' (Broughton, 1976). Whilst it retains many features of

Received Pronunciation especially phonetically and prosodically, it also differs significantly. Thusat et. al. (2009, pp31.) in fact point out that, “one may claim that Maltese-English is part of the local linguistic repertoire, that there are a number of competent English L2 speakers and that it is going through ‘restructuring’.”

Depending on which language one chooses to use and also which language one was raised speaking, some form of this bias can be perceived, albeit some of it is also based on fact. For example, people who speak mostly English in Malta tend to be perceived as being on the higher end of the financial and social spectrum. Whilst this is not true for every individual, there is also a base of fact to this assumption. Bonniċi (2017) highlights the point that individuals who attend government schools tend to be Maltese speakers, whereas those who attend a church or private school tend to be English speakers. Similarly, Caruana (2011, pp.1) says that, “Most regular users of English in Malta are normally of high socio-economic status, thereby creating a situation in which social difference can be manifest through language choice.”

Caruana (2011, pp.1) continues to develop on this phenomenon by highlighting that, Language use also reveals a person’s underlying culture and background, and this is also highly relevant in Malta, despite the fact that the population constitutes one ethnic group. At times Maltese nationals who speak in English are called *tal-pepè* (snobs) or *qżież* (show- offs). On the other hand, in certain circumstances, these speakers of Maltese-English may also be prejudiced towards those who find difficulty in expressing themselves in English or are unable to do so, as they somewhat automatically consider them to be uneducated or pertaining to a low socioeconomic group.

However, like all other biases, linguicism is not necessarily all bad and it does serve an important function; that of aiding in processing via its classifying features. Human beings have a natural predisposition of wanting to belong to groups and identifying with others. One way in which this is achieved is by classifying individuals into determined social groups. Some groups are easily noticeable (such as those based on race, age, gender), whereas others are less prominent. Linguicism is one such less prominent manner. Fought (2009), wrote about how the language one

uses may lead to them being categorized in a way that otherwise would not be so apparent. Taking into account the above-mentioned examples, being from the South of Malta or having been raised speaking English in Malta, is less striking than being part of a group based on age or gender, however in such cases 'language' is enough to provide a base for categorization to streamline processing and allow for predictive mechanisms.

The effect of such stereotyping and speaker identity contextual cues on language processing can be observed from varied studies. Cai et al. (2017), conducted a series of web-based experiments to determine whether accent cues can have an effect on the word meaning accessed. In a word association task, they found that British participants chose the American dominant meaning of a word (for example, the meaning 'hat' for bonnet) more frequently if they heard the words in an American accent rather than a British one. In two additional experiments conducted to confirm that the perceived accent has an effect on on-line meaning recovery, one of which was a speeded semantic decision task and the other a sentence comprehension task, they found that processing and understanding ambiguous words is less effortful when the applicable word meaning is dominant in the speaker's dialect. Their overall findings indicated that listeners use such information to figure out the provenance of the speaker (in this case American or British) and then use this information and their world knowledge associated with that accent to guide meaning selection for the words uttered by that person.

Studies from the electrophysiological spectrum have also found interesting results. Martin et al. (2016) carried out an ERP experiment to observe whether listeners are mindful of the lexical choices made by a speaker according to the speaker's accent. If listeners do indeed take into account the speaker's identity (in this case dialectal accent) during the initial stages of utterance comprehension, then words that are not usually part of the speaker's dialect should produce larger N400 effects than consistent words (therefore a larger N400 amplitude for American words uttered by British speakers and vice versa). However, if listeners do not utilise the knowledge of the speaker's dialect, words that are uncommon in their own vocabulary, e.g., those not commonly used

in their variation, would elicit larger N400 effects overall regardless of the speaker producing them (therefore a larger N400 component for American than British words across both speaker types). They indeed found that a British expression (for example, *holiday* to mean going away for leisure) spoken in an American accent and vice versa an American expression (for example, '*vacation*') spoken in a British accent produced larger negative amplitudes than consistent words, mainly observed in the posterior region and between 700 and 900ms after the word onset, suggesting that listeners use cues that are part of the identity of the speaker, such as the speaker's accent during meaning selection.

Hanulikova et al. (2012), also ran an ERP experiment, however this time to look into whether speaker identity could affect the neural processes of syntactic processing. The ERPs obtained when a Dutch speaker made gender agreement errors were compared with the same errors made by a fluent, non-native speaker with a clear foreign accent (first generation Turkish speaker). The gender errors made by the Dutch native speaker caused a P600 effect, however the same errors made by the non-native Turkish speaker did not cause the same effect. Control sentences with semantic errors caused N400 effects for both speakers, therefore showing no general integration problem in the non-native accented speech. Such results show that TSCs, in this case the language background of the speaker, can have an effect on syntactic processing.

The art of listening and its two faces

We are able to recognize such patterns and use them because throughout development we have learnt the importance of co-variate learning. This is the basis of the theory of mind (Premack & Woodruff, 1978) whereby we are able to assign different mental states (such as, beliefs, desires, emotions, knowledge, perspective etc.) to others that might not match our own. Whilst we do experience life from an egocentric perspective (i.e. we automatically view experiences through our first-person viewpoint), research shows that anywhere from the age of 3 to 7 (Mossler, Marvin, & Greenberg, 1976, Piaget & Inhelder, 1956), we learn how to recognize and appreciate that our experiences are separate and different from those of others. Being able to use such biases during

language processing is dependent on being able to differentiate between ourselves and others. It is also dependent on the type of attention that is being given to the stimuli provided.

Listening and speaking are both important parts of a communication. Whilst speaking allows us to send the message and express ourselves, listening is what allows us to make sense of the messages of others. Through the process of listening, the listener must take the verbal and nonverbal stimuli into account and make sense of them. Listening is not just an auditory process, i.e. it does not only involve linguistic stimuli (such as syntax and semantics) and contextual cues that are only obtained auditorily (such as tone or accent that can inform one about the state and identity of the speaker). Frequently such information is also taken in via visual stimuli, (such as the speaker's facial expressions, age, gender etc.) creating an audio-visual process (Wolvin 2010). Auditorily, in the physiological hearing mechanism, sound moves into the middle ear, making the tympanic membrane vibrate. This vibration then continues through to the inner ear and into the brain (Newby & Popelka, 1992). This extends the physical process of listening to the neurological and cognitive component (Goss, 1995). Auditory and/or visual receptors receive the stimuli that make up the message. Then in the cerebral cortex, the occipital lobe (visual) and the temporal lobe (auditory) organize, associate and storage and necessary information. Wernicke's and Broca's areas also form part of the regions activated to take part in comprehension (Just, Carpenter, & Keller, 1996), along with the prefrontal cortex (Kane & Engle, 2000). The working memory system also steps in. Although there is no complete agreement as to how the working memory system (Baddeley & Hitch, 1974) receives and manages the information, most agree that the attention to these stimuli is quite limited, with the shortest possibilities being around a few hundred milliseconds going up to 30 seconds (Cowan, 1995). In fact, researchers such as Janusik (2005) have stressed that research involving listening needs to take into account working memory (due to its function to process and stored information simultaneously) to account for the listeners' attention limits.

Attention to communicative stimuli is also affected by the listeners' perceptual filter. This perceptual filter applies the stimulus to an individual's previous knowledge and beliefs, so

information such as the individual's biases can also be used to guide the analysis and also build schemas on when to use such information. Research has delved into what makes this perceptual filter, arguing that the individual's background, experience, sociological environment, and also mental and physical states constitute this filter and therefore influence the individual's predictions of the message encountered (Driver, 1992).

The two faces: Active and Passive listening. Listening is clearly a very complicated process. More than that, there are also different types of listening, the main two being: Active listening and Passive listening. Active listening involves the listener fully concentrating to understand the message and immediately act on it. Active listening also involves being attentive to cues that are not necessarily linguistic, such as facial expressions, body language and other speaker characteristics (Wolvin, 2010). This type of listening usually includes some form of response. For example, in a conversation setting an active listener would nod if agreeing with or understanding the subject manner. In other words, active listening requires a two-way process and some sort of engagement between the speaker and the listener. This type of listening is more effortful; however, this directs the listener's attention actively towards the stimuli being received. Such an attentive form of listening may be difficult to recreate in a laboratory experimental scenario where natural dialogue is lacking (although some researchers have found ways to incorporate dialogue into paradigms such as Brown-Schmidt, 2009 (see section 2.3)). However, this shortcoming may be mitigated by having participants respond to stimuli in a task, such as clicking on a picture, as in the eye-tracking task which will be described in chapter 4 (other examples mentioned above include Kim, 2016; Hay & Walker, 2019; etc.).

Passive listening on the other hand, does not require as much effort as active listening, since it is just the act of hearing what is being said. A passive listener usually does not interrupt or engage with the speaker or perform any other action whatsoever, concurrently whilst utterances are ongoing. For example, as opposed to the active listening example, a passive listener would not nod in agreement to a conversational stimulus. Passive listening is easily recreated in a laboratory

experiment scenario by having participants just listen to stimuli whilst not performing any actions in response, such as the ERP experiment detailed in chapter 5 (other examples mentioned above include, Tesink et al., 2009; Hanulikova et al., 2012).

Immediate or delayed use

So far, this thesis has discussed whether extralinguistic characteristics are of any use and aid language processing. Whilst varied points have been taken into consideration, it is the hypothesis of this thesis that such characteristics are important. Therefore, another important question concerning these extralinguistic features is, 'how early on in our processing system do they become available and are used'?

Originally a two-step model of interpretation was proposed (Grice, 1975; Fodor, 1983) which disagrees with the immediate usage of such cues. For example, in their overview chapter, Cutler & Clifton (1999) discussed syntactic and thematic processes and argued that the utterance is interpreted first, followed by discourse model integration. Such interpretations are along the same line of the previously mentioned syntax-first model of sentence comprehension, where two separate stages are also assumed to take place; firstly, building the simplest syntactic structure possible based on the available word-category information and secondly, lexical-semantic-pragmatic etc. information is processed, and a thematic structure is built. However, critics of the syntax-first model argue that syntactic, semantic and pragmatic processes interact from an initial stage during spoken language comprehension, leading to constraint-satisfaction models for sentence comprehension. Much in the same sentiment as the constraint-satisfaction approach, critics of the two-step model of interpretation advocate for the immediate approach or a one-step model as the fulcrum of their theories, as can be seen from the discussion that follows.

One-step versus two-steps

Proponents of a two-step model argue that there is a lag in the timing and effectiveness of such extralinguistic cues that supports the two-step idea. For example, McLennan and Luce (2005) carried out a series of experiments to investigate whether indexical specificity effects associated with

speaker identity need time to affect processing. In both experiments an auditory lexical decision task was used, where participants had to decide whether what they were hearing was a word or not. Participants were to listen to a stimulus that served as a prime, followed by a target stimulus that could either match or mismatch with the speaker identity of the prime (male or female).

In this first version, the nonwords were created specifically to look different from regular words (using sequences made of low phonotactic probabilities). This made the choice between words and nonwords reasonably easy, and therefore make the processing of all stimuli in the experiment relatively fast. This influence of nonwords on real word responses is supported in work by Stone and Van Orden (1993). Their participants took part in a lexical decision task where they were exposed to one-hundred experimental words (half of which were high-frequency words and the other half being low-frequency words) and three sets of one hundred nonwords, one for each nonword lexicality condition. The nonword conditions consisted of pseudo homophones of words not used in the experimental list, legal nonwords created from these pseudo homophones by changing the first or last letter so as to maintain as much as possible the equivalent bigram frequencies and pronounceability, and illegal nonwords created by using anagrams of the pseudo homophones so that the nonword created ignored English orthography making it unpronounceable. Their results showed that the lexicality of nonwords to real words had a key effect on correct response times to the real word stimuli.

Based on this selection of stimuli, McLennan and Luce's (2005) prediction was that indexical specificity effects would be reduced. Their results were consistent with their hypothesis, in that they found no effects for talker-specific identity due to processing being fast (in this case because of the easy choice between words and nonwords). In their second version, they instead chose nonwords that were similar to the regular target words (same target words used in the first experiment) to test the hypothesis that if processing is slower, talker specific effects should be present. This time around, when they asked participants to distinguish between real words and nonwords, they found an increment of around 30-40ms in response time when the talker identity in the primes did not match the one of the targets. McLennan and Luce (2005) then carried out a

speeded response shadowing task to check if the results could be replicated and therefore were not just task related. The procedure was the same as per the previous experiments, except that this time, rather than choosing whether a word was real or not they had to repeat it. In comparison to their previous results, when they asked participants to repeat a word they heard, uttered as quickly as possible, they found no talker-specific effects. However, when they asked participants to do the same thing replying to a prompt given 150ms after word offset, they observed talker-specific effects. Due to this, they suggested that at least in the context of spoken language, talker-specific effects are slow to emerge, especially when compared with linguistic effects.

Lattner & Friederici (2003) also said that mismatches between the utterance and the speaker saying it, affect the processing of that utterance only relatively late. In their experiments they presented participants with audio recordings of sentences that contained stereotypical male or female utterances. When congruent, the gender of the speaker matched the stereotypical semantic content, when incongruent the gender and the content mismatched. The ERP results showed a late P600 effect in the incongruent condition. Due to not observing any ERP effects earlier on, they argued that the semantic information is accessed first and independently from the speaker's voice, and eventually the speaker characteristics and corresponding stereotypical knowledge and semantic meaning are integrated in a later processing stage. However, Van Berkum et. al (2008) offer a different explanation for this observation stating that they suspected such results were observed due to the design of the task given to the participants. As the task consisted of many similarly built stimuli with incongruencies always occurring at the sentence-final word (140 congruent and incongruent sentences respectively), whilst not having any fillers, Van Berkum et al. argue that such a structure might have helped participants to learn what the critical target of the experiment was.This may have led the participants to regard the critical stimuli in a different way than they would have, had they experienced them in natural language comprehension. Moreover, Van Berkum et al. noted that each of the male or female speakers used for the recordings produced a distinct number of unusual utterances (17 to 18 times per experimental session). They argued that such occurrences

may have allowed the participants to become familiarized with the speakers as individuals who do not fit the predetermined gender stereotype, which could then lead to a reduction or elimination of the inconsistency effects that heavily depended on such stereotypical expectations.

In fact, in their review paper, Hagoort and Van Berkum (2007) discuss a wide range of findings that they argue support a one-step immediacy model, including an experiment similar to Lattner and Friederici where they did observe an early N400 effect to gender-dependent speaker inconsistencies. In their ERP experiment, participants listened to various sentences, some of which contained a speaker mismatch (for example, a male speaker uttering, *I'm pregnant*). The N400 observed by the experimenters for such mismatches was similar both in magnitude and timing to the N400 seen in normal anomalies which suggests that the context achieved from the stereotype of the speaker was taken into account as quickly as normal semantic context. Comparably, in an fMRI version of this ERP experiment, they observed that when the speaker information was combined with semantic content in a mismatched manner (i.e. a speaker mismatch leading to an increase inthe unification load), the increased cognitive load created led to an increased activation of the left inferior frontal gyrus (LIFG), the area that has been shown to be important for combining and unification processes in various neuroimaging studies (Hagoort, 2005), supporting that all information available is processed simultaneously.

Therefore, supporters of the one-step model of language processing advocate for the immediate approach as the fulcrum of their theories. The idea here is that every source of information available that can aid in the interpretation of an utterance, whether this is linguistic (e.g. syntax, semantics, etc.) or not (e.g. previous discourse, world knowledge, TSCs, facial expressions, etc.) can and will be used initially and immediately taken into account (e.g. Clark, 1996; Van Berkum et al., 1999; Jackendoff, 2003; Zwaan, 2004).

Another such example of a one-step approach comes from Boland and Clark (2014). As previously mentioned, Boland and Clark (2014) observed a result in their eye-tracking experiment, when they used short narratives and a biasing sentence context giving the task more ecological

validity. They measured the time it took for participants to fixate on a biased image following a biasing sentence spoken by a congruent or incongruent speaker (for example, *At the end of the month, I go makeup shopping*, accompanied with the picture of a lipstick, spoken in either a woman's voice (congruent) or man's voice (incongruent)). As mentioned above, the results showed that the target (biased) image was looked at much more quickly when the speaker's voice was congruent with the social bias of that image. They sustained that their findings fit in with theories advocating that non-linguistic knowledge can and will guide anticipatory processing, such as the selective access models of lexical ambiguity resolution and the constraint-based lexicalist models of sentence processing, and that their results positively assist the idea that characteristics inferred from the speaker's voice are a potential source of predictive cues.

As can been seen from the literature review here, there is still no consensus over whether such information is immediately taken into account to limit the probabilities for processing, or whether there is a delayed adaptation only once other characteristics have been taken into account.In an attempt to further look into this issue, the next section will discuss the topic of Linguistic Prediction which states that information about a word or utterance is activated before that item is actually encountered, in order to streamline understanding options and make processing less effortful. Such a theory adds another level to this debate on timing.

Linguistic Prediction

An ample amount of work in cognitive neuroscience and linguistics argues in favour of the hypothesis that our brains are invested in predicting future input, such as upcoming words in a speech or text (Van Patten & Luca, 2011; Kuperberg, 2007; Dikker et. al, 2010 & 2011) in order to improve comprehension. In this sense, linguistic prediction is described as a process where relevant information about concept, word or other linguistic unit is activated prior to this item being received. However, others (such as Huettig & Guerra, 2019) have questioned whether this is always the case or if there have to be specific conditions or a particular timing allowed for prediction to occur.

Various studies have focused on Linguistic Prediction as a theory that proposes that information about a word or other linguistic item can be activated before that item happens. In this sense, linguistic prediction works as a sort of priming effect. For example, Neely (1991) argues that a form of prediction specifically occurs in some types of lexical priming, when a word becomes easier to process because a related word is present before it. There is evidence sustained via various experimental techniques which indicates that when using language, we do not only assimilate consequent words into the context created by words encountered before, but that we may also under certain conditions, be able to try to predict forthcoming words. Using eye-tracking, Altman and Kamide (1999) showed that when listening to specific verbs in a sentence, listeners anticipated the outcome and moved their eyes to the picture showing the possible direct object of the verb in question (for example, *soda* instead of *cookie* when hearing, *The little girl drank...*). Further work by Kamide, Altmann and Haywood (2003) using a similar setup showed that the subject of the verb can also determine what item the listener will predict (for example, listeners look at a motorcycle rather than a horse when hearing, *The biker rode...*). Considering this, it is no wonder that prediction seems to happen especially when contextual cues substantially limit the likelihood of words to follow. For example, if a speaker were to utter something along the lines of, *In the morning it is light, whereas in the night it is….*, a listener would very likely predict the sentence to continue with the word *dark* before hearing it.

However, the case for linguistic prediction has not as yet, been settled. For example, Kochari and Flecken (2018) carried out a replication of a study initially carried out by Otten and van Berkum's (2009) who described observing ERP changes in relation to the prediction of nouns in sentences using gender-marked Dutch articles. In the original study, Otten and van Berkum (2009) were looking at prediction on pre-nominal stimuli using an ERP setup. Participants were asked to read highly confining target stories that favoured the prediction of a certain noun. Control stories contained the same content words as the predictive stories however were unpredictive. To test whether readers were anticipating upcoming words, a gendered determiner which either matched or mismatched

with the sometimes-predictable target nouns was used. In predictive stories, all participants demonstrated an early negative deflection (300-600 ms) to unexpected determiners. This effect was not seen in control stories. Kochari and Flecken (2018) did not manage to replicate the significant ERP pattern, even though they used almost identical stimuli, paradigms, and data analysis. They also failed to obtain irrefutable evidence as to the presence of an expectedness effect using a Replication Bayes Factor test. However, they do state that the results they observed are promising in terms of polarity and scalp distribution, and that the obtained effect size is consistent with the results of the original experiment. They also expressed that this positively supports further investigation of how grammatical gender manipulations effect meaning prediction.

Whilst most research seems to agree that listeners predict forthcoming language, there is no widespread agreement on how it happens either. Some argue (such as; Bonhage, et al., 2015; Scott, McGettigan, & Eisner 2009; Silbert, et al., 2014) that the most efficient manner for prediction is via using the production system i.e. prediction-by-production. In this theory, listeners subtly mimic the linguistic form of the speaker's utterance and then build a mental representation of the original communicative meaning. Listeners can subsequently use this representation in their production system to prepare a predicted utterance.

Whilst such a theory remains hypothetical, recent studies (such as Martin, Branzi & Bar, 2018) have looked for indication that the production system is used during language comprehension. They tested this by comparing prediction during sentence comprehension (their primary task) with participants using or not using their production system, i.e. being verbal vs. non-verbal (their secondary task). They presented their participants with sentences containing likely or unlikely target noun-phrase whilst using EEG for data collection. They found that prediction was only hindered when the production system was over-exerted during reading. These results highlight that the speech production system is important for meaning prediction during sentence comprehension and provide an explanation for how its usage might function.

However not everyone is on board with the motor theory of speech perception. In their

review paper, McGettigan and Eisner (2009) say that the motor-cortex is not essential for perceiving spoken language for a variety of reasons including that; motor-cortex activation to speech should show up in fMRI studies, anterior brain lesions should make it easier to differentiate unambiguous speech perception problems, and that we should be able to observe a clearer relationship between production and perception in language development. Instead, they suggest that motor activation can be linked to spoken language in several other different ways, such as; an imperative link that processes both linguistic and non-linguistic syntactic information, and to address motor information found in speech and other sounds. Their specific hypothesis is one of a very refined sound-to-action pathway, which allows us to converse effortlessly and efficiently.

Pickering & Gambi (2018) also disagreed with the production system being involved in comprehension, arguing that the prediction by production hypothesis takes too much time and effort and that listeners may vary in their extent of preparation due to characteristics such as educational level and social background. Based on this argument, many groups of people; for example, non-native speakers, illiterate individuals, children, and maybe even older individuals; would use prediction less than native adults of a young / median age. Therefore, in their review paper quoting a variety of studies (behavioural studies, eye-tracking, and electrophysiological) they argue that prediction-by-production is an elective mechanism that is enhanced when it encounters associative mechanisms.

Comparably Huettig and Guerra (2019) have also wondered whether prediction really is important for achieving comprehension or whether it is a case of occurrence only in the right circumstances. Using a series of eye-tracking experiments, they attempted to find some answers to this question. Their participants listened to some simple sentences (such as, *Look at the exhibited art*) whilst viewing four pictures (a target, e.g. a painting, and three unrelated distractors). In all experiments, the visual stimuli and target utterances were the same, however according to the experiment speech rates of such utterances, preview time, and participant instructions were varied. In order to allow for prediction of the target items these were preceded by definite gender marker

determiners, (as only the targets agreed in gender with the determiner, whereas the distractors did not). In the first experiment, participants were given a four-second preview, and the sentences were presented either in a slow or a normal speech rate. In this case, the participants predicted the targets as soon as they heard the determiner in both speed conditions. In the second experiment the participants were given only a one-second preview. Due to this, participants predicted the targets only in the slow speech rate condition. In the final experiment, participants were explicitly asked to try to predict which led only to a small prediction effect in the normal speech condition. Overall, it was only in the case of a normal speech rate with ample time for preview that prediction was observed with even the clear command to predict the target resulting in only a small anticipation effect under a normal speech rate with a short preview. Such a result raises further questions for hypothesis or models that presume that prediction encompasses cognition.

Similarly, Gambi, Gorrie, Pickering, and Rabagliati (2018), argue that prediction is a learned skill and not a subtle and instinctive ability. In this scenario, language processing in adults is seen as aided by an ability to create predictions about upcoming words and utterances, but in children it is non-existent up until a certain age and therefore needs to be learned. In their experiment, they tested if children could create predictions about the meanings of forthcoming words and also their sounds. They used a looking-while-listening paradigm in which participants saw a couple of pictures on a screen while hearing a sentence. A target object could be predictable by either number (e.g., *Can you see two ….?*) with just one picture depicted multiple objects) or through phonological alteration (i.e., an ice cream vs. a ball). They observed that whilst children aged 2 could create predictions about meaning if a determiner was present (*Can you see one…ball/two…ice creams?*), children up till the age of 5 could not predict the phonology of forthcoming words based on a determiner (*Can you see a…ball/an…ice cream?*) in the way adults can. Such results suggest that the skill to generate detailed predictions is a skill acquired later vs. an instinctive one.

Others argue that a large amount of behavioural and neural studies suggest that we create predictions probabilistically, and at several levels and types of representation. For example, in their review paper, Kuperberg and Jaeger (2016) claim that listeners use high-level interpretations to

predict and pre-activate information at several lower representative levels, and that the grade and level of prediction available may be a function of the listeners expected usefulness of the predictive process. This effectiveness can be altered by the listeners' understanding needs (i.e. the level of importance to them of understanding what is being uttered) and their approximations of the reliability of any prior knowledge they possess. Therefore, the properties of language comprehension should be part of a multi-representational framework whose goal is to deduce the meaning expressed by the speaker with predictive processing playing a defining role in explaining the bottom-up stimuli encountered.

As can be seen the literature and arguments regarding prediction is quite vast and still far away from resolution. In order to further delve into the debate, frameworks were built inspired by the body of studies currently available.

Prediction Frameworks Two of the most popular frameworks in prediction theory are the PARLO (Production Affects Reception in Left Only) framework and the Surprisal Theory. The Surprisal Theory is a theory of sentence processing built on information theory. Levy (2008), suggests that the effort of processing a word is determined by its self-information; i.e. the amount of information that makes a word predictable, given the right context. A very likely word carries only a low amount of self-information and because of this would be easily processed. This ease of processing is measured by a lower reaction time, a lower N400 response and/or lower fixation times.

The PARLO framework advocates that both prediction and integration occur during language processing and that they depend on the distinct contributions of the two hemispheres of the brain. Federmeier's (2007) inspiration stems from a varied body of data that endorses the idea that the left hemisphere (LH) processing is more anticipatory driven, involving the pre-activation of probable upcoming items at numerous levels, whereas right hemisphere (RH) processing seems to assimilate new information in a more bottom-up way. Therefore, in this framework, LH comprehension is driven by top-down, context-based information at each level which leads to strong feedback in the LH and a concurrent increase in interactivity across levels. Federmeier (2007)

argues that these properties make the framework efficient and robust because the accessibility of top-down information allows the framework to quickly generalize away from the input stimulus. If stimulus specific information is lost when context and expectations form and outweigh input features, this is compensated for by the RH processing which is more feed-forward. The specificity of the stimulus is important as it allows different levels at which the input is represented and maintained throughout the framework. Such a component allows flexibility, as information can be reestablished and then reanalysed when needed.

Whilst these frameworks are based on different trains of thought, much like the studies presented, they aim to provide further perspective on the Prediction debate.

Conclusion In conclusion, the studies and frameworks mentioned highlight that we need to consider several key aspects of prediction in language comprehension to further understand if, when, and how prediction works. Further research is needed in topics such as to; the representative levels at which we can form predictions, whether high-level and low-level representations intersect (such as using higher level tokens to predictively pre-activate lower-level ones) and whether we stick to our predictions beyond the pre-activation level.

Conclusion

This overview of diverse research shows the importance of the state and identity of the speaker in processing, specifically focusing on language processing. It also creates a case for some form of Exemplar model where the mental lexical tokens of meaning are related to specific knowledge or past experiences with that word. The predictive activation of stereotypical information provided by the state and identity of the speaker is influenced by patterns of lexical use across society. This can indicate that social information about speakers whether it is how they are feeling, where they come from, etc. can be directly linked to lexical representations through social tokens. Additionally, such effects of state and identity stereotypes expand our understanding of the speech perception mechanism, suggesting that the social tokens are enhanced by stereotypical associations between words and extralinguistic characteristics.

Based on the ideas debated in this literature review, a series of experiments were carried

out. The following three chapters will detail this experimental portion. Chapter 3 will discuss a McGurk inspired paradigm used to test hypotheses about the state of the speaker, while Chapter 4 will describe two different variations of an eye-tracking paradigm used to test hypothesis regarding the identity of the speaker. Chapter 5 will discuss two variations of an exploratory EEG study based on reflections from the previously mentioned eye-tracking study.

Chapter III

The state of the speaker – a McGurk inspired Paradigm.

As stated in the previous chapter, in order to test the general ideas mentioned in the literature review, three types of experiments were carried out. This chapter will describe the methodology and results used for the first experiment; a McGurk inspired paradigm testing the effect of facial expressions on word processing. The chapter will end with a short summarising discussion regarding these results, which will then be reprised in the General Discussion chapter (Chapter 6).

Hypotheses and Research Questions

As discussed in Chapter 2, this thesis takes on the idea that when listeners attempt to process an utterance or conversation, they use both auditory and visual cues. This is because speaking is a physical process that is displayed both in the optic and in the acoustic domain, and hence is visible and audible. Due to this, emotions are expressed both in the meaning uttered as well as on the face. Therefore, these two modalities influence each other in perception. Usually, the speech information in both conduits is complementary, coherent, and cohesive. For example, in a study carried out by Reinisch, Jesse and Nygaard (2013) listeners were observed using tone of voice as an indication of meaning to guide word learning. Tone of voice establishes relations between tokens and referents for listeners to take advantage of in word learning. During an eye-tracking study, the participants heard new adjectives spoken in their relevant tone of voice, such as strong and weak, whilst viewing target pictures. The participants learned these new adjectives' meanings, and even when there was no tone to guide them, were able to attribute them to new targets.

But what happens if this information is contradictory, with both modalities still integrated? If integration is present, it is possible to think that one modality could influence or affect the other. In this respect, Massaro and Egan (1996) and Hietanen et al. (2004) showed that when subjects were exposed to an angry utterance in one modality, hearing a happy utterance in the other modality

shifted their answer to happy and vice versa. Similar results were found by De Gelder and Vroomen (2000), this time with the groupings happiness-sadness, anger-sadness, and happiness-fear

In free speech, a variety of facial expressions are displayed along with the auditory stream, and in light of such research, it seems that a degree of agreement of different modalities is essential for the correct understanding of speech. The experiment described in this section was set to test this out. Due to its focus on multiple modalities, the McGurk task was selected as the inspiration for this paradigm as it is an excellent task to look into the usefulness of facial expressions in speech processing and perception.

The main hypothesis of this research concerns the notion that the facial expressions of a speaker play a predictive role in processing and understanding language, and therefore help us to narrow down possibilities to find the right meaning; that is, in cases where the face of the speaker is visually available, due to the contextual information the face provides, it makes linguistic prediction possible. Consequently, the findings expected were that (especially in the recordings where the auditory stimuli were not very clear) for the minimal pairs' participants would choose the word corresponding to the facial expression they were exposed too. For example, for the minimal pair *Miet – Mitt* (Engl. 'he died' – 'one hundred'), it was expected that a negative facial expression would lead to participants choosing *Miet* (Engl. 'he died') and a neutral facial expression would lead to participants choosing *Mitt* (Engl. 'one hundred').

The stimuli pairs were also chosen so that there could be a differentiation in visemes in some of the continua. A viseme is a visual representation of a speech sound, created through the position of the face and mouth when uttering such a sound. Therefore, visemes are the basic facial visual building blocks of speech. Different languages exhibit different sets of visemes, where in many cases several phonemes can correspond to one viseme. For example, in English, the words *pot* and *bot* are acoustically different, however, if observed only visually (i.e. without sound) they are very similar, which is why they can be very hard to distinguish when the acoustic signal isn't available, such as in cases of lipreading. In the case of the stimuli pairs *Mard – Bard* (Engl. 'sickness' – 'cold')

and *Ħabbet*– *Ħabbat* (Engl. 'she loved' – 'he knocked'), there is no difference in the visemes. In the case of the stimuli pair *Miet -Mitt* (Engl. 'he died' – 'one hundred'), there is also no difference in the viseme presented but there is a durational difference in the vowel expressed. In the case of the remaining two stimuli pairs, *Mard* – *Ward* (Engl. 'sickness' – 'roses') and *Biża* - *Wiża* (Engl. 'fear' – 'gecko') there is a difference in the visemes presented. Both cases contain an example of a labial closure versus an approximation. Utilising varied pairings such as these in the experimental design, enabled the possibility of seeing whether participants were sensitive to this type of visual information, and whether perceiving emotional cues plays a role, when potentially less ambiguous phonetic cues are present visually.

Design

The experiment used a variation of the McGurk Paradigm (McGurk and MacDonald, 1976) that was modified to permit the study of the intersection between facial expressions and auditory speech. All participants were exposed to all the words contained within the minimal pairs shown in Table 1 (in section Materials). The experiment was designed using a within subjects' setup, that is, all participants were exposed to all levels of the independent variables. Counterbalancing was achieved through the randomization of the stimuli presented.

Participants

Twenty-eight participants from the University of Malta participant pool - all native speakers of Maltese - were paid to take part in this experimental task. This sample size was determined based on sample sizes used in similar studies (such as the studies mentioned as inspiring literature in the 'Hypotheses and Research Questions' section above). All participants were native speakers of Maltese. In order to confirm this, a questionnaire designed to assess language dominance and background was completed by the participants before they could participate in the task.

Eleven participants were male, and seventeen participants were female. Participants were aged 18–30 years (mean age: 21 years). None of the participants reported any hearing or visual impairments, and all had normal or corrected-to- normal vision.

Written informed consent was obtained from all participants prior to the study. All methods and procedures conformed to the Research Ethics and Data Protection Guidelines of the University of Malta.

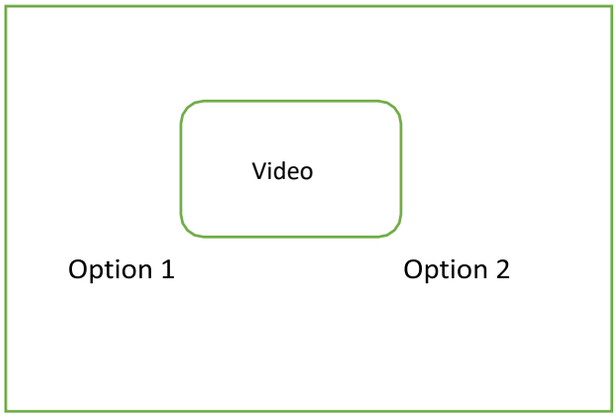
Paradigm

The experiment used cross- combinations of audio and one of three emotions (sad, happy, neutral) in a two-alternative forced choice (2AFC) task, applied in a bimodal perception scenario modelled after the McGurk paradigm. The participants were asked to look at videos of an actor uttering emotive words, and to choose the word they thought they were hearing. In a number of the videos, the emotion of the word matched with the facial expression of the actor, whereas in others the emotion and facial expression were mismatched. A continuum of these mismatches was created, and the level of the mismatch was varied across videos. This paradigm was chosen so that listeners could always easily focus on both modalities, and participants were always advised to keep their eyes on the screen.

Importantly, by using multiple stimulus pairs that either differ in their visemes or not, it was possible to additionally test whether the use of facial expression is limited to cases in which the articulatory movements are not informative regarding the choice. In the example above *(miet – mitt,* Engl. 'he died' – 'one hundred'*)*, there are differences in terms of timing of the visual speech gestures, but the visemes are the same (labial closure for /m/, lip-spreading for long or short /i/, and alveolar closure for /t/). Given that timing information is not processed very accurately in visual processing compared to auditory processing, it is unlikely that the visual speech gestures exert a strong influence on the choice in this case. However, in the case of the minimal pair *mard – ward* (Engl. 'sickness' – 'roses'), there is viseme difference in that the /m/ requires a full lip-closure while /w/ requires lip rounding. It is conceivable that the evidence of a clear articulatory visual cue may override the use of a facial expression.

Figure 1

Example display of a test trial



Materials

Five sets of minimal pairs that contained words with diverse emotional associations were created. This particular number was chosen out of necessity and practicality. Firstly, it was difficult to find other minimal pairs that followed the parameters and that passed the pre-test described further below in this chapter. Secondly, the number of trials does grow significantly due to the manipulation of different continua, therefore this number was also chosen so that the experiment would not be too long or taxing. These minimal pairs and the corresponding emotions can be viewed in the following table.

Table 1

Stimuli and corresponding emotions.

Minimal Pair	Emotion – Word 1	Emotion – Word 2	Visemes
Miet – Mitt (‘he died’ – ‘one hundred’)	Sad	Neutral	Similar
ɦabbat – ɦabbet (‘he knocked’ – ‘she loved’)	Neutral	Happy	Similar
Mard – Ward (‘sickness’ – ‘roses’)	Sad	Happy	Different

Mard – Bard (‘sickness’ – ‘cold’)	Sad	Neutral	Similar
Biża - Wiża (‘fear’ – ‘gecko’)	Sad	Neutral	Different

These emotions were chosen as they encompass a wide extent of three of the most common and basic emotional dimensions, i.e. positivity, negativity, and neutrality. To create the stimuli, twenty videos were recorded, two per word; one with a congruent facial expression and the other with an incongruent expression. The actress chosen to record these stimuli is native speaker of Maltese. She was asked to utter the words at approximately the same speech rate, whilst also producing the necessary facial expression.

Stimulus Construction

The stimuli were constructed based on a combination of three factors: the emotion tied to the word, the viseme or visual speech gesture, and the audio. The levels making up the factors of visual speech gesture and emotion can be seen in the table below:

Table 2

Levels of the factors of Viseme and Emotion

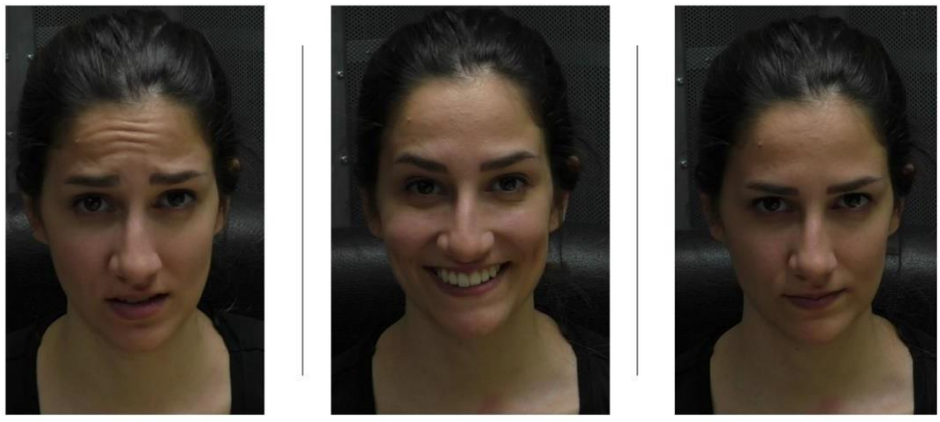
Minimal Pair	**Viseme Difference**	**Congruent Emotion**	**Incongruent Emotion**
Mard (Sickness) *Ward* (Roses)	labial closure approximation (2 levels)	sad - mard happy - ward (2 levels)	happy-mard sad - ward, (2 levels)
Mard (Sickness) *Bard* (Cold)	N/a	sad - mard neutral – bard (2 levels)	neutral - mard sad – bard (2 levels)
Miet (He died) *Mitt* (One hundred)	N/a (durational difference only)	sad - miet neutral – mitt (2 levels)	neutral - miet sad – mitt (2 levels)
Ħabbet (She loved) *Ħabbat* (He knocked)	N/a	happy - ħabbet neutral - ħabbat (2 levels)	neutral - ħabbet happy – ħabbat (2 levels)
Biża (Fear) *Wiża* (Gecko)	labial closure approximation (2 levels)	sad - biża neutral- wiża (2 levels)	neutral - wiża sad – biża (2 levels)

As can be seen from the table above, all stimuli pairs contained an emotional word and a neutral word, with the only exception being the stimulus pair of *Mard* – *Ward* (Engl. *'*sickness' – 'roses') which contained two words with contrasting emotions. This provided the same number of levels for the emotion factor across all pairs; four levels, with two levels being congruent and two incongruent. As for the Viseme factor, this differed across stimuli pairs (as explained in section 3.1.). As can be seen in Table 2, *Mard* – *Ward* (Engl. *'*sickness' – 'roses') and *Biża* – *Wiża* (Engl. *'*fear' – 'gecko') both contained two levels for this factor whereas it was absent from the other stimuli pairs. Since both factors form part of the visual information spectrum, videos were recorded to capture these stimuli.

The videos were recorded using a handheld Panasonic HC-W858 camera set up on a tripod in a sound-proof booth. Figure 2. shows frames of each of the three emotions.

Figure 2

Examples of emotions used in trials (happy, sad, neutral)



The videos were cut and edited using Movavi software, and the length of the videos was kept as similar as possible. They were dubbed with a corresponding audio track to add the audio factor to these stimuli. For each pair, an audio-morphed continuum containing nine different levels ranging from one word to the other were created. In order to create the continuum, the audio recordings were manipulated at specifically chosen time points corresponding to the contained phonemes. Morphing proportions were set in steps of 90 / 10, 80 / 20, 70 / 30, etc. (for example 90 =

Mitt (Engl. ’one hundred)’, 10 = *Miet* (Engl. ‘he died’) providing nine audio levels per continuum. Matlab was used to create the morphed audio using STRAIGHT (Kawahara, 1999). For the purposes of this experiment, Levels 2 and 8 were not used. This was done to allow for an increased repetition of ambiguous stimuli, for which stronger context effects were expected. The more unambiguous steps 1 and 9 were retained to provide participants with some clear phonetic variation (see, e.g. Mitterer, McQueen, & Reinisch 2018, for a rationalization of this). Per stimuli pair, the seven levels of the auditory continuum used (i.e. 1, 3, 4, 5, 6, 7, 9) were dubbed onto each of the four visual emotional recordings created (for example, the pair *Mard - Ward*, [Engl. ‘sickness’ – ‘roses’]) contained the four recordings of: *sad – mard, happy – mard, sad – ward, happy – ward*). This leads to 28 stimuli per continuum, in turn leading to a total of 140 stimuli for five continua.

Continua were presented fully mixed so that participants were provided with a randomized order and counterbalancing would be achieved. Experiment Builder was used to implement the task. The original video and audio tracks were stored separately.

Pre-test

In order to ensure the association between the words used and the emotion ascribed to them was as expected, a pre-test was carried out in the form of an online association test. Participants who volunteered were sent a Google form asking them to categorize the words used according to the three previously mentioned emotions. Thirty participants took the test; 20 of which were females and 10 of which were males. Table 3 shows the results of these tests.

Table 3

Pre-test results – Number of participants that chose each emotion as associative to the stimulus word.

Word (Translation)	Happy	Sad	Neutral
Miet (He died)	0	30	0
Mitt (one hundred)	2	0	28
Ħabbat (He knocked)	0	0	30
Ħabbet (She loved)	30	0	0
Mard (Sickness)	0	30	0
Ward (Roses)	27	1	2
Bard (Cold)	0	2	28
Biża (Fear)	0	30	0
Wiża (Gecko)	0	2	28

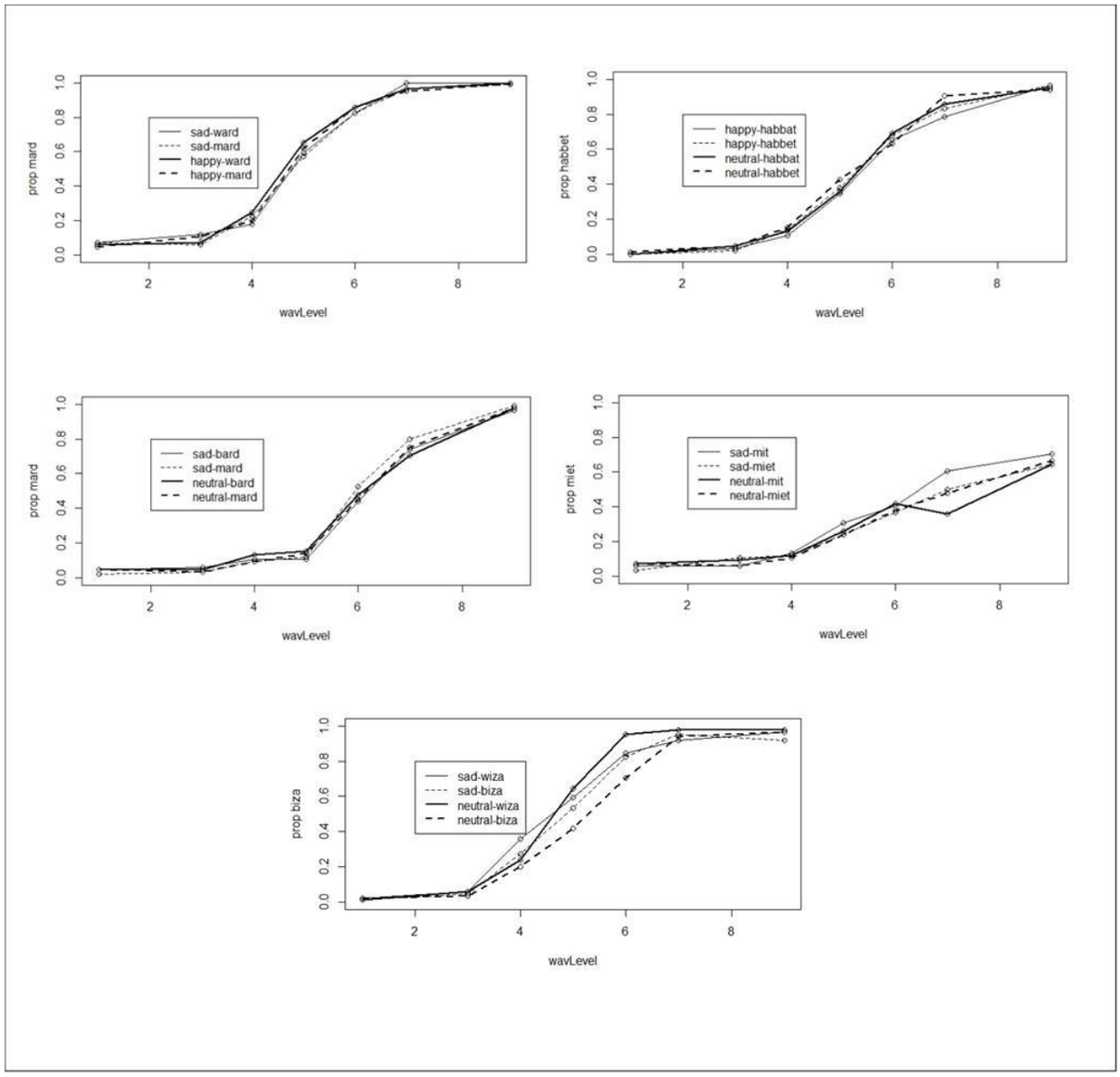
Procedure

Participants were seated in a sound-proof booth at a comfortable viewing distance from the computer screen. The auditory portion of the stimuli was presented to the participants using headphones, whilst the visual part was shown on a screen. Prior to the experiment, participants received written instructions regarding the task. The instructions advised them that they should look at the display and click on the word that they thought was being uttered. Participants were always strictly advised to look at the screen so as not to miss the visual stimulus. During the experiment, participants watched a video of an actor uttering a word. The answer options showed up on either side of the screen, and the participants selected their answer by pressing the left or right keys on a keyboard (as shown in Fig. 1 in the Design section). Participants were exposed to 420 trials in total, with breaks provided after every 100 trials. On average, this made each experimental session around 25 to 30 minutes long.

Results

Figure 3

Results from the 2AFC task for the five minimal pairs in five panels



Note. Panel A shows stimulus pair *Mard* – *Ward* (Engl. 'sickness' – 'roses'). Panel B shows stimulus pair *Ħabat* – *Ħabbet* (Engl. 'he knocked' – 'she loved'). Panel C shows stimulus pair *Bard* – *Mard* (Engl. 'cold' – 'sickness'). Panel D shows stimulus pair Miet – Mitt (Engl. 'he died' – 'one hundred'). Panel E shows stimulus pair *Biża* – *Wiża* (Engl. 'Fear' – 'Gecko').

Figure 3 shows the proportion of response (*Mard x 2, Miet, Ħabbet* and *Biża*) for all five

minimal pair continua (for details regarding the continua please refer back to table 2). R software was used for all of the analysis applying package lme4.

With regard to the minimal pairs *Mard – Ward* (Engl. 'sickness' – 'roses')*, Mard – Bard* (Engl. 'sickness' – 'cold')*, Miet – Mitt* (Engl. 'he died' – 'one hundred') *and Ħabbet - Ħabbat (Engl. 'she loved' – 'he knocked')* no clear distinction between the various conditions can be seen. As per the main hypothesis, it was expected that the emotion would prime the participant towards linguistic prediction. For example, in the case of *Mard – Ward* (Engl. 'sickness' – 'roses'), it was expected that the conditions *Sad - Mard* (Engl. 'sickness') and *Sad – Ward* (*Engl. 'roses')* would lead more participants to click on the option *Mard (Engl. 'sickness')* since the sad emotion corresponded with that word and vice versa for the conditions *Happy- Ward* (Engl. 'roses'), *Happy – Mard (Engl. 'sickness')*. However, via observing the above plots, this does not seem to be the case. This was confirmed by a statistical analysis with a linear mixed-effect model with a binomial linking function with three fixed effect predictors: the effect of the auditory continuum (nine-level continuum, coded numerically), the displayed emotion of the visual stimulus or visual emotional stimulus (i.e. facial expression) and the articulatory motion of the visual stimulus or the visual speech gesture. Participant was used as a random effect, with a maximal random effect structure.

For the analysis of the data from the *Mard – Ward* (Engl. 'sickness' – 'roses') continuum, the visual emotional stimulus was contrast coded with happy mapped on -0.5 and sad mapped on 0.5. The visual speech gesture stimulus was contrast coded with *Ward (Engl. 'roses')* on -0.5 and *Mard (Engl. 'sickness')* on 0.5. Therefore, a positive regression weight would indicate that a sad facial expression would provide more *Mard* ('sickness') responses since *Mard* ('sickness') responses were coded as "1". There was no significant effect of visual emotional stimulus observed, ($b = 0.118$, $SE(B) = 0.138$, $z = 0.854$, $p > 0.1$). Additionally, there was no significant effect observed of the visual speech gesture stimulus ($b = -0.138$, $SE(B) = 0.138$, $z = -0.996$, $p > 0.1$) and of an interaction between the visual emotional stimulus and visual speech gesture stimulus ($b = 0.001$, $SE(B) = 0.276$, $z = -0.003$, $p > 0.1$). However, there was a significant result observed, that of the effect of the auditory

continuum (b = 1.667, SE(B) = 0.123, z = 13.575, p < 0.001).

For the analysis of the data from the *Mard – Bard* (Engl. 'Sickness' – 'Cold') continuum, the visual emotional stimulus was contrast coded with neutral mapped on -0.5 and sad mapped on 0.5. The visual speech gesture stimulus was contrast coded with *Bard (Engl. 'cold')* on -0.5 and *Mard (Engl. 'sickness')* on 0.5. Therefore, a positive regression weight would indicate that a sad facial expression would provide more *Mard* responses, since *Mard* responses were coded as "1". There was no significant effect of visual emotional stimulus observed, (b = -0.011, SE(B) = 0.150, z = 0.073, p > 0.1). Additionally, there was no significant effect observed of the visual speech gesture stimulus (b = -0.078, SE(B) = 0. 150, z = -0.523, p > 0.1) and of an interaction between the visual emotional stimulus and visual speech gesture stimulus (b = -0.291, SE(B) = 0.299, z = -0.972, p > 0.1). However, there was a significant result observed, that of the effect of the auditory continuum (b = 1.836, SE(B)= 0.163, z = 11.257, p < 0.001).

For the analysis of the data from the *Ħabbet – Ħabbat* (Engl. 'she loved' – 'he knocked') continuum, the visual emotional stimulus was contrast coded with neutral mapped on -0.5 and happy mapped on 0.5. The visual speech gesture stimulus was contrast coded with *Ħabbat (*'he knocked'*)* on -0.5 and *Ħabbet* ('she loved') on 0.5. *Ħabbet* ('she loved') *responses* were coded as "1". Therefore, a positive regression weight would indicate that a happy facial expression would provide more *Ħabbet* (Engl. 'she loved') responses, which is the expected direction since *Ħabbet* (Engl., 'she loved') has a positive connotation. However, there was no significant effect of visual emotional stimulus observed, (b = -0.244, SE(B) = 0.156, z = -1.559, p > 0.1). Additionally, there was no significant effect observed of the visual speech gesture stimulus (b = -0.224, SE(B) = 0. 162, z = 1.389, p > 0.1) and of an interaction between the visual emotional stimulus and visual speech gesture stimulus (b = 0.100, SE(B) = 0.312, z = 0.321, p > 0.1). However, there was a significant result observed, that of the effect of the auditory continuum (b = 2.063, SE(B) = 0.177, z = 11.669, p < 0.001).

For the analysis of the data from the *Miet – Mitt* (Engl. 'he died' – 'one hundred')

continuum, the visual emotional stimulus was contrast coded with neutral mapped on -0.5 and sad mapped on 0.5. The visual speech gesture stimulus was contrast coded with *Mitt* (Engl. 'one hundred') on -0.5 and *Miet* ('he died') on 0.5. *Miet* ('he died') responses were coded as "1". Therefore, a positive regression weight would indicate that a sad facial expression would provide more *Miet* ('he died') responses, which is expected since *Miet* ('he died') has a negative connotation. There was no significant effect of visual emotional stimulus observed, ($b = -0.181$, $SE(B) = 0.115$, $z = -1.574$, $p > 0.1$). Additionally, there was no significant effect observed in the visual speech gesture stimulus ($b = -0.126$, $SE(B) = 0.115$, $z = 1.095$, $p > 0.1$) and in the interaction between the visual emotional stimulus and visual speech gesture stimulus ($b = 0.335$, $SE(B) = 0.231$, $z = -1.455$, $p > 0.1$). However, there was a significant result observed, that of the effect of the auditory continuum ($b = 0.643$, $SE(B) = 0.067$, $z = 9.572$, $p < 0.001$).

For the analysis of the data from the *Biża* – *Wiża* (Engl. 'Fear' – 'Gecko') continuum, the visual emotional stimulus was contrast coded with neutral mapped on -0.5 and sad mapped on 0.5. The visual speech gesture stimulus was contrast coded with *Wiża* (Engl. 'Gecko') on -0.5 and *Biża* ('Fear') on 0.5. *Biża* (Engl. 'fear') responses were coded as "1". Therefore, a positive regression weight would indicate that a sad facial expression would provide more *Biża* ('Fear') responses, which is expected since it has a negative connotation. There was no significant effect of visual emotional stimulus observed, ($b = -0.136$, $SE(B) = 0.135$, $z = -1.007$, $p > 0.1$). However, there was a significant effect observed of the visual speech gesture stimulus ($b = -0.587$, $SE(B) = 0.136$, $z = 4.312$, $p < 0.001$), of an interaction between the visual emotional stimulus visual speech gesture stimulus ($b = 0.560$, $SE(B) = 0.283$, $z = 1.981$, $p < 0.05$) and also of the effect of the auditory continuum ($b = 1.410$, $SE(B) = 0.062$, $z = 22.900$, $p < 0.001$).

Summary

As can be summarized from the results described, in all stimuli pairs with the exception of the *Biża* – *Wiża* (Engl. 'Fear' – 'Gecko') continuum, the expected results were not observed. Firstly, an effect of visual speech gesture was expected in two of the five continua (refer to table 2 for details

regarding the continua), *Mard* – *Ward* (Engl. ‘sickness’ – ‘roses’) and *Biża* – *Wiża* (Engl. ‘fear’ – ‘gecko’), due to the variation in viseme difference, but was only observed in the latter. Secondly, no direct effects for the emotion displayed, interacting with the meaning uttered were observed. The only constant effect observed throughout all stimuli pairs was that of the effect of the continuum.

Biża – *Wiża* (Engl. ‘fear’ – ‘gecko’) as previously mentioned provided exceptional results when compared to the other continua. A significant effect of the visual speech gesture stimulus was observed, as well as an interaction between the visual emotional stimulus and visual speech gesture stimulus.

This may indicate that - at least in the utterance of single words - a specific level of phonetic distinction is necessary as a starting baseline, and that facial expressions can guide linguistic prediction only once this baseline is present. It is also plausible that in certain cases of articulatory clarity, such cues may prove more useful than the facial expression expressed. Further discussion will continue in Chapter 6 of this thesis.

Chapter IV

The Identity of the speaker in active listening – an eye-tracking experiment

As stated in the literature review (Chapter 2), in order to test the general ideas and hypotheses mentioned throughout said chapter, three types of experiments were carried out. This chapter will describe the methodology and results used for the second experiment; an eye-tracking experiment testing the effect of gender and age on utterance processing. The chapter will end with a short summarising discussion regarding these results, which will then be elaborated further in the General Discussion chapter (Chapter 6).

Hypotheses and Research Questions

As discussed in Chapter 2, this thesis takes on the idea that when listeners attempt to process an utterance or conversation, they use the speaker's identity to help disambiguate meaning. This is because stereotypes and the categorization they offer, help us narrow down the amount of possibilities at a fast rate.

For example, Koops, Gentry, and Pantos (2008) studied native listeners' implicit knowledge of the social distribution of a phonological variable, specifically the 'unmerger' of pre-nasal */i/* and */e/* among English speakers in Houston. Southern American accents have typically merged these vowels before nasals, so that the words *pin* and *pen* became homophones. This feature is, however, losing popularity in more metropolitan areas of the South, potentially through formal education. Koops et al. ran a speech perception experiment to assess the level to which Houstonians expect English speakers of three different age groups to participate in the (un-)merger. In their eye tracking experiment, they observed the participants' eye movements whilst they heard sentences and selected the corresponding targets on a computer. Their results show that, participants were more likely to assume a merged system when listening to an "old" speaker, i.e. to assume that *pin* and *pen* would sound like homophones with older speakers, rather than when listening to a "middle-aged"

speaker, with no significant differences observed between the perception of the "middle-aged" and "young" speaker groups. Their results validate previous production studies they had carried out in Houston (Gentry 2006; Pantos 2006), which showed that the merger was positively correlated with age. However, they do point out that there was a slight divergence about the perception of the “middle-aged" group. Whilst participants expected the “middle age” group to be unmerged, in production terms, this group did actually participate in the merger. Koops et al. hinted that this mismatch could be due to recent demographic changes in Houston. In recent years large numbers of non-Southern Anglo speakers moved into more metropolitan areas, making native listeners who are exposed to this linguistically mixed population associate merged vowels specifically only with the oldest speakers, even though some younger speakers are also merged. They assert that their study provides evidence for the role of the perceived speaker identity, in this case through dialect, as a potentially disambiguating factor in speech perception.

Along the same line, Strand (1999) examined the effect of gender stereotypes on the perception of language. In her experiment she used CVC (consonant-vowel-consonant) stimuli both in an auditory only setting and in an audio-visual setting to show that the participants’ inherent expectations about gender altered their perception of the fricatives */s/* and */ʃ/* they heard. Strand used a 2 AFC task (two alternative forced choice paradigm). A nine-step fricative continuum going from */ʃ/* to */s/* was specifically created for these tasks. The nine fricative levels were linked to naturally occurring vowel-consonant (VC) coda chunks from the words *sod* and *shod*. These stimuli were recorded using four speakers: a typically female sounding speaker, a typically male sounding speaker, a non-typically female sounding speaker, and a non-typically male sounding. In the auditory only task, participants heard the stimuli and were asked to identify whether they thought they heard the word *sod* or *shod*. In the audio-visual task, participants watched videos of prototypical looking male and female faces with the previously mentioned non-prototypical speaker voices dubbed onto them, and then were asked to make a choice as to which word they heard. Half of the audio-visual tokens had face and voice genders that were matched, and half mismatched. In both cases she

observed that, the same fricative was perceived differently depending on whether it was seen as being produced by a male or a female. A female speaker produced the perceived boundary between */ʃ/* and */s/* to increase in frequency compared to a male speaker. Such an effect was also seen in a comparable study which however used the stimuli *hood [hʊd]* to *HUD [hʌd]* (Johnson & Strand, 1998). Participants assessed the boundary between vowel categories at a lower frequency for stimuli perceived from a male speaker compared to a female speaker. Such results indicate that Talker- specific characteristics (TSCs) might have an influence on basic processes of language processing such as phonological categorization of the speech signal and challenge accounts where such cues of identity are discounted for use in human speech perception and language processing.

Cai. et. al (2017) also ran a series of experiments testing the disambiguation of ambiguous words, in their case focusing on the TSC of accent, specifically British vs. American. In a word association task, participants provided written responses to audio-morphed spoken words. The stimuli were composed of neutral-accent speech items (50% British accented and 50% American accented tokens) embedded with strongly-accented speech tokens (90% British accented and 10% American accented or 90% American accented and 10% British accented). They realised that participants interpreted these neutral stimuli in a similar way to accented words when embedded in a context with these accented words. The neutral morphs in the American accent context led to more American-meaning responses than in the British accent context. This means that, the same set of stimuli was interpreted by participants in different ways depending on the accent characteristics of accompanying tokens within the same experimental list. This finding indicates that accent information is used to determine the dialectic background of the speaker and then based on knowledge of this background used to listeners activate meaning access for all words produced by said speaker. These results highlight a speaker-model account of spoken word recognition in which listeners determine key TSCs and use these to aid them towards the correct word meaning. In a sentence interpretation task, Cai et al. asked participants to listen to a sentence and decide if it made sense or not. The sentences were again spoken in either a British or American accent. During

the target trials, the final word of the sentence was an ambiguous word that could be disambiguated either via the British meaning (e.g., *The mechanic needed to repaint the whole bonnet*) or the American meaning (e.g., *The woman decided to iron her daughter's bonnet*). Therefore, if participants made rapid use of accent information at the level of sentence comprehension, quicker and more accurate responses should be obtained when the envisioned meaning of the ambiguous word was congruent with the accent in which the sentence was spoken, which is what they observed.

Similarly, the experiment described in this chapter aimed to test how our perception of gender and age influences language processing under varied conditions including congruent and incongruent contexts. The main hypothesis for this research was that TSCs such as the age and gender of a speaker play a predictive role in processing and understanding language and therefore can help us to narrow down possibilities to find the right meaning. This hypothesis is applicable in cases where the gender or age of the speaker are previously known or can be inferred via visual or auditory inputs (as in the case of the experiments presented in the following section). Due to the stereotyping information and categorization that gender and age can provide, they can assist with linguistic prediction.

Consequently, the findings expected were that, the voice of the speaker (male, female, young or adult) would initially influence the perception of the listener and guide them to focus on a biased (target) image. For example, in figure 4 below representing an actual trial; it was expected that upon hearing the sentence starting with *'Today I will paint…'* in a female voice, participants would focus on the nails image as painting one's nails tends to be an action stereotyped towards females. However, for male voices, it was expected that they would initially focus on the picture of the wall, as DIY is seen a more stereotypically male action. A native Maltese speaker would be aware of both meaning options being possible. The identity of the speaker would guide to one option versus the other based on stereotypical bias. The listeners cannot know if this 'guidance' is right or wrong, hence the ambiguity can only be resolved when the rest of the context is provided, in this case by the direct object.

However, this 'guidance' can be thought of as a predictive primer, making one meaning more salient over the other until said meaning is confirmed.

Figure 4

Example display of test trial for stimulus 'Paint'

Since the identity of the speaker is expected to assist in this meaning prediction, it was also expected that reaction times would be affected depending on whether the condition was congruent or incongruent. This is because, every stimuli sentence used contained two levels when it came to factor in the congruency, i.e. based on stereotypical biases it could either concur with the voice heard or not. Taking the above case again, if the sentence heard was *'Today I will paint my nails'*, uttered in a male voice, it was expected that it would take participants longer to press on the correct answer, as due to stereotypical context, participants would expect such an utterance to be produced by a female voice. Due to this, a lower reaction time (RT) was expected for congruent conditions and a higher RT for incongruent conditions, due to the mismatch between voice and meaning creating confusion for the participant. A similar result was also expected in the case of eye movements, i.e. if the sentence heard was *'Today I will paint my nails'*, uttered in a male voice, it was expected that it

would take participants longer to fixate on the nails image, as they would at first consider the wall image due to stereotypical context. However, if the same sentence had to be heard in the female voice, participants were expected to immediately focus on the correct target.

As mentioned in chapter 2, another question of interest was to see whether these types of cues could be integrated in utterance processing immediately, or whether they needed a certain timing before they could be incorporated. Note that the results of Cai et al. (2017) would suggest that listeners need to form a hypothesis about the speaker, and hence would need some time to use TSCs in comprehension. To achieve this, two versions of the experiment were created, the only thing varying between them being the word order of the sentences used. In the first version, the verb was placed in the middle of the sentence following a temporal marker, whereas in the second version the verb was placed at the start of the sentence. Utilising such a variation enabled the assessment of whether cues relating to age and gender needed a certain timing in order to be incorporated usefully in disambiguation. Alternatively, it could be that the listeners store different versions of these words uttered in different voices, and these representations are associated with different meanings. This would be the prediction of a strong episodic model of the mental lexicon (Goldinger, 1998).

The Visual World Paradigm

As can be seen in Figure 4 above, a Visual World paradigm (VWP) was chosen for this task. This decision was made for a number of reasons. A VWP paradigm allows participants to listen to a spoken utterance, and concurrently examine a visual scene containing multiple objects while allowing the experimenter to tract their eye movements. The spoken utterance and visual stimuli are related, to analyse if and when participants look at these objects. The other objects present are usually a competitor (an item that overlaps with the target to some degree) and the distractors (objects that are completely unrelated). Observing saccades (the change in eye-movement to another location) and fixations (the point between two saccades where eyes are relatively stationary), provides the points in time at which a listener's gaze is directed towards the target

object and allows for a very precise estimate of the time at which a target has been recognized (Allopenna et al. 1998). The percentage of fixations on a target, along with the corresponding auditory occurrence of the target word, is taken to be an indicator that (at least some form of partial) lexical access has been reached.

As listeners integrate a variety of linguistic and visual information to carry out disambiguation and to predict the forthcoming linguistic input, the VPW has also proven very useful to investigate predictive processing. For example, Kamide, Altmann, and Haywood (2003) studied whether verb only information vs. the combination of verb information with the preceding grammatical subject could be used to predict what will be referred to next. They noticed increased fixations to a motorbike when participants heard *The man will ride …* as opposed to increased fixations to a carousel when participants heard *The girl will ride …*. Consequently, they showed that information provided by the type of subject and the verb can jointly influence the direction of anticipatory eye movements and that these eye movements reflect an activation and updating in our mental representations based on information derived from both the linguistic and the visual input.

Research has also shown when an eye-movement can be considered anticipatory. That is, in the sentence - *The man will ride a bike..*, looks to the bike can be considered anticipatory until the onset of the /b/ in *bike*. Moreover, it requires some time until an auditory input can trigger an eye-movement, but the question is, how much time. Altmann (2011) reanalysed data from earlier studies (including the Kamide et al. study cited above) and found that auditory input can trigger an eye-movement within 100ms. However, this analysis overlooked the potential of coarticulation. In a sentence like *the man*, the nasality will carry over onto the schwa of the article *the*. Taking this into account, Salverda, Kleinschmidt, and Tannenhaus (2014) found that it takes 200ms if such effects are taken into account. Eye-movements up to 100ms after the onset of the target word hence will be considered anticipatory.

Therefore, visual world paradigms have proven very useful to investigate language processing as syntactic, predictive, representational information etc. can be inferred from the

direction of the participants' eye gaze (Huettig et al., 2011). Apart from that, this type of paradigm is also particularly useful for studying what happens during or immediately after the presentation of target words in speech, for example in this case, the target verb in the carrier utterances. In the case of the two versions of this experiment, using such a task also enabled a look into the importance of previewing the stimuli, since the target word appeared in two different positions in the carrier sentence according to the version of the experiment. In version 1, as the target word was towards the middle of the sentence, participants had a little bit more time to familiarize themselves with the objects they were interacting with prior to the onset of the target. In version 2 this was less so, as the verb was the starting point of the utterance. It has been shown that the amount of time to preview stimuli can be important. For instance, Huettig and McQueen (2007) studied the effect of time on the retrieval of phonological, visual-shape and semantic knowledge. Dutch participants listened to utterances and looked at visual displays containing four pictures, one of which was the target and the other four its competitors. For example, for the target item *beker*, (a beaker), the display contained a phonological (*bever*), a shape (*bobbin*), and a semantic (*fork*) competitor. In the first version the display was shown at sentence onset, whereas in the second version the display was shown 200ms before. In the first experiment fixations first were directed to the phonological competitors rather than shape and semantic competitors. However, in the second experiment fixations were directed to shape and then semantic competitors, showing that the likelihood of fixating on particular objects depended on the time participants had to recall appropriate interpretations about said objects.

In order to be able to create useful stimuli for such a paradigm, verbs were used as the focal point in these sentences, as in Maltese they can have the multiple meanings required for this task. To qualify as stimuli for these tasks, the verbs chosen had to fulfil two criteria. Firstly, they had to have two levels of meaning, a main meaning (i.e. the more generic meaning of the verb) and a more specified meaning. Apart from taking into consideration the general everyday usage of such verbs, the list of chosen verbs was also strongly based on their classification of main (primary) and

specific (secondary) meaning found in Maltese dictionaries and on a corpus study which is detailed in section 4.6. Having stimuli containing these two types of meaning enabled an analysis that could look into whether prediction is enabled in generic cases as well as more specified ambiguities.

Secondly, each of these meanings had to be applicable towards one of the biased voices (for example, the generic meaning of paint is more attributed towards a male stereotype as it brings up associations of building, DIY etc., whereas the specified meaning is more attributed to females since it involves make – up and such similar products). The biases chosen were inspired by and based on different stereotypical examples utilized in similar studies (studies which have been discussed throughout this thesis such as van Berkum's, etc.). This second criterion was assessed via a pre-test in the form of a survey, more details of which can be found in the following section. Utilising such criteria enabled the assessment of whether the specific cues of age and gender would be useful as predictors.

Incorporating such criteria allowed to test the hypothesis of this thesis, i.e. that the identity of the speaker could make one interpretation more probable than the other. Ultimately, the aim of this chapter was to look at the original hypothesis from three points of view. Firstly, if the TSCs of age and gender did have an impact on sentence level processing. Secondly, if they could be useful both in generic and specified ambiguities. Thirdly, if the issue of timing could be assessed as immediate or not. The following sections will discuss how these three criteria were undertaken in more detail.

Aim

Two experiments were conducted with the aim to analyse through eye movements whether the age (adult/young) and gender (male/female) of a speaker could aid in language prediction and processing. In these experiments verbs with biased meanings were used as primes. In experiment 1, the verbs were always placed in the middle of the sentences following a temporal marker. In experiment 2, the verbs were always placed at the beginning of the sentence. This alteration was carried out to check whether a certain amount of onset time was needed for prediction to occur. As

per section 2.4 the aim of this experiment was also to observe the effects of an active listening task, as opposed to a passive listening one which is described in the next chapter.

Participants

In both experiments, thirty-one participants from the University of Malta subject pool, all native speakers of Maltese, were paid to take part in this experimental task. This sample size was determined based on sample sizes used in similar studies (such as the studies mentioned as inspiring literature in the 'Hypotheses and Research Questions' section above). All participants were native speakers of Maltese. In order to confirm this, a questionnaire designed to assess language dominance and background was completed by the participants before they could participate in the task.

In experiment 1, seventeen participants were male, and fourteen participants were female. Participants were aged 18–30 years (mean age: 21 years). None of the participants reported any hearing or visual impairments and all had normal or corrected-to-normal vision.

In experiment 2, Twenty participants were male, and eleven participants were female. Participants were aged 18–30 years (mean age: 21 years). None of the participants reported any hearing or visual impairments and all had normal or corrected-to-normal vision.

Written informed consent was obtained from all participants prior to carrying out the task. All methods and procedures conformed to the Research Ethics and Data Protection Guidelines of the University of Malta.

Design and Paradigm

The eye-tracking experiment used a cross-combination of audio representing one of four different speakers making part of two conditions (age: adult/young and gender: male/female) and images (target, competitor and distractors) in a four-alternative forced choice (4AFC) task, applied in a visual world paradigm, as such a task provides participants with a visual context with respect to which the linguistic stimuli can be interpreted.

In this version of the visual world paradigm, the participants were asked to listen to

sentences through a set of headphones. At the same time, they were asked to look at the screen in front of them, where for every sentence they were shown four pictures, one of which was a target picture, another the competitor image and the remaining two were related distractors (as shown in Figure 5). In order to be able to analyse the data, four specific sets of co-ordinates were set for placing the pictures. On every trial the images were randomly assigned to one of these co-ordinates. The images were presented simultaneously with the onset of the spoken utterance and stayed in view until the utterance was finished and participants clicked on one of them.

Figure 5

Example display of a test trial.

Participants were asked to choose the image that corresponded to the sentence they heard by clicking on the desired picture using the mouse, making this an active listening task. 100 filler sentences were also included, 25 spoken by each different speaker used. These were created by using verbs that didn't have multiple or biased meanings and the sentences were structured to be as similar as possible to the target sentences. All participants were exposed to all the verbs contained within the sets shown in Appendix A. Participants were exposed to all types of conditions in a 2x2 factorial design (age: adult/young, gender: male/female & congruency, incongruency). However, the items were rotated through conditions and across participants. Therefore, if a participant listened to the verb *'paint'* in the Male Congruent condition, they would not be exposed to that specific example in the other conditions as well. Counterbalancing was achieved through the randomization

of the stimuli presented.

Materials

Fifty verbs were selected for this experiment, twenty-five for the gender (male / female) variable and twenty-five for the age (adult / young) variable. As was mentioned in the first section, the verbs were selected on the basis of two criteria, having two meanings (one generic, one specific) and the ability to bias these meanings towards the stereotypes chosen. For example, *jilgħab* (‘to play / gamble’) can have two meanings i.e. to play (general) or to gamble (specific). The former tends to be more easily associated with the ‘young’ factor of the age variable, whereas the latter is more easily associated with the ‘adult’ factor. The full list of verbs and associated biased interpretations can be found in Appendix A. Out of these fifty verbs, four sets of sentences were created per verb, two of which were congruent with the factors and two of which were incongruent, thus providing two-hundred sentences in total, with four different conditions per verb. For example, Table 4 shows sets of sentences for different conditions using the previous example of *jilgħab* (‘to play / gamble’):

Table 4

Example of set of sentences for a target word, in this case ‘Jilgħab’.

Condition	Sentence
Adult Congruent	Is-Sibt li ġej se nilgħab bil-karti. Saturday coming I play cards. (Next Saturday I’ll play cards)
Adult Incongruent	Is-Sibt li ġej se nilgħab bil-ballun. Saturday coming I play ball (Next Saturday I’ll play with the ball)
Young Congruent	Is-Sibt li ġej se nilgħab bil-ballun. Saturday coming I play ball (Next Saturday I’ll play with the ball)

Young Incongruent	Is-Sibt li ġej se nilgħab bil-karti. Saturday coming I play cards. (Next Saturday I'll play cards)

In experiment 1, the sentences were crafted so as to always contain the verbs in the middle of the sentences following a temporal marker. In experiment 2, the sentences were crafted so as to always contain the verbs at the beginning of the sentence, with the temporal marker shifted to the end of the sentence. Examples of both are shown in Table 5. below. Full lists of the sentences can be found in Appendix B (temporal marker initial) and C (non-temporal marker initial).

Table 5

Example of different placement of target word in experiment 1 and 2

Experiment	Sentence
Experiment 1	Is-Sibt li ġej se nilgħab bil-karti. Saturday coming I play cards. (Next Saturday I'll play cards)
Experiment 2	Se nilgħab bil-karti s-Sibt li ġej I play cards Saturday coming (Next Saturday I'll play cards)

Every verb was also assigned a set of images containing four different pictures, the target, the competitor and two related distractors. The target and competitor images were always reflective of the two meanings and biased interpretations the verb could have. The target picture was the one always mentioned in the sentences (whether its interpretation was congruent or not). The competitor picture was always a picture of the other possible interpretation. The distractors were always two pictures that were related between themselves, but completely unrelated to the target and distractor. Figure 6. shows the images used in the above mentioned *'jilgħab'* (to play / gamble) trial.

Figure 6

Example display of a test trial for 'Jilgħab'

Since it was crucial for both experiments that the verbs chosen held the meanings and biases expected, a corpus study and a pre-test were carried out before the final set of stimuli were constructed and implemented in the experimental task.

Corpus Study and Pre-Test

As previously mentioned, the verbs were chosen based on two main criteria. The first criterion was that they had to have two levels of meaning, a main meaning (i.e. the more generic meaning of the verb) and a specific meaning (i.e. the more specified meaning of the verb), so that the effect of generality vs. specificity could be taken into account. In order to ensure that the multiple meanings expected from each verb were current, and in use a dictionary analysis followed by a corpus study using MLRS (Maltese Language Resource Server, Gatt & Čéplö, 2013) corpus was carried out. Using the corpus, a random sample of 50 different occurrences was taken (where available) and the amount of their usage was tallied according to the generic and specific meanings found in the dictionaries. Overall, the main meaning accounted for 37% of the sentences, and the specific meaning for the remaining 11%.

Table 6

Sample taken from corpus divided into main and secondary meaning.

Verb	Main Meaning	Secondary Meaning	Overall Occurence	Sample Taken
Se ngemma (to collect / save up)	7	26	33	33
Se nirkeb (to ride / get a lift)	45	5	107	50
Se nibda (to start / get a new job)	45	5	10063	50
Se naqa' (to fall / lapse)	47	3	287	50
Se nidħaq (to laugh / mock)	40	10	73	50
Se nibni (to build / stack)	42	8	483	50
Se ngħaddi (to pass through / pass an exam)	40	10	6154	50
Se nħassar (to erase / cancel)	40	10	507	50
Se naqbeż	45	5	422	50

(jump / jump a qeueu)				
Se naqta' (to cut / quit)	35	15	56	50
Se mmexxi (to lead physically / take charge)	30	20	36578	50
Se nirbaħ (to win / defeat)	35	15	477	50
Se ndoqq (to play music / play professionally)	33	17	182	50
Se nġib (to get / achieve a good result)	34	16	1153	50
Se nkanta (to sing / sing professionally)	40	10	71	50
Se naħfer (to forgive / pardon)	42	8	73	50
Se nidħol (to enter / be part of)	40	2	57	42

Se niekol (to eat / go out to eat)	43	7	471	50
Se niftaħ (to open / inagurate)	45	5	969	50
Se niġbed (to pull / withdraw)	45	5	3751	50
Se nikteb (to write / write professionally)	27	23	4292	50
Se nilgħab (to play / gamble)	39	11	883	50
Se nilħaq (to reach / be promoted)	30	20	310	50
Se nitlaq (to leave / leave a job)	43	7	3751	50
Se niżboħ (to paint / apply make-up)	18	2	20	20
Se nagħmel	45	5	40,910	50

(to do / get a service done)				
Se nerfa' (to lift / store)	29	3	32	32
Se nħabbat (to knock / whisk)	38	12	65	50
Se nżomm (to hold / keep)	40	10	763	50
Se jkolli (to have / have a baby)	37	13	6388	50
Se ngħolli (to lift / raise)	39	11	104	50
Se nrabbi (to bring up / breed)	30	20	260	50
Se npitter (to paint / apply make-up)	41	9	92	50
Se niġri (to run / race)	41	9	485	50
Se naħdem (to work / work in theatre)	45	5	4651	50

Se nsewwi (to repair / mend)	38	12	125	50
Se nbiddel (to change something /change outfit)	38	12	252	50
Se nħallat (to mix / mix drinks)	28	22	59	50
Se nlegleg (gulp down / drink alcohol)	32	11	43	43
Se nsegwi (to follow / to stalk)	42	8	976	50
Se nagħti (to give / to beat up)	42	8	14487	50
Se naħtaf (to grab / kidnap)	28	14	42	42
Se niflaħ (to be in good health / be strong)	42	8	202	50
Se nifred	33	17	58	50

(to separate / break up)				
Se nikkoregi (to discipline / mark papers)	28	22	284	50
Se nilqa' (to catch / welcome)	36	14	413	50
Se nikser (to break item / break rules)	36	14	161	50
Se niżfen (to dance / dance professionally)	42	8	52	50

Note. For full translations and meaning assignment please refer to Appendix A.

The second criterion was that each of these meaning could be biased towards one of the identities chosen, so as to be able to check whether the TSCs chosen were having the expected impact. To assess this a pre-test was carried out to confirm the association between the verbs used and the biases ascribed to their meanings was as expected. The pre-test took the form of an online association test. Participants who volunteered were sent a google form asking them to categorize the verb meanings according to the speaker.

Every question contained an image that embodied the general stereotype of one of the four speakers (young, adult, male, female), followed by a multiple-choice answer containing two sentences with the different biased verb meanings. Before the questions began, participants were asked to look at the picture carefully and then to choose the sentence they thought would most likely be uttered by the person photographed.

Forty participants took the test, 30 of which were females and 10 of which were males. Two forms were created as participants were exposed to all verbs mentioned in Appendix A and all types of conditions, however, the items were rotated through conditions and across participants, for example if a participant was shown the sentences for the verb *'Jilgħab*' (to play / gamble) along with the picture of an adult, they wouldn't also be shown the same sentences with the picture of a younger person. Tables 7 and 8 show the results of the pre-tests.

Table 7

Results for age conditions from the Pre-Test in percentages.

Verb	Adult Photo		Child Photo	
	Adult response	Child response	Child response	Adult response
Se nġemma (to collect / save up)	90	10	90	10
Se nirkeb (to ride / get a lift)	80	20	70	30
Se nibda (to start / get a new job)	90	10	70	30
Se naqa' (to fall / lapse)	90	10	90	10
Se nidħaq (to laugh / mock)	70	30	80	20
Se nibni (to build / stack)	70	30	80	20

Se ngħaddi (to pass through / pass an exam)	70	30	90	10
Se nħassar (to erase / cancel)	70	30	70	30
Se naqbeż (jump / jump a qeueu)	80	20	80	20
Se naqta' (to cut / quit)	90	10	70	30
Se mmexxi (to lead physically / take charge)	80	20	70	30
Se nirbaħ (to win / defeat)	80	20	70	30
Se ndoqq (to play music / play professionally)	80	20	80	20
Se nġib (to get / achieve a good result)	90	10	90	10
Se nkanta	90	10	70	30

(to sing / sing professionally)				
Se naħfer (to forgive / pardon)	90	10	80	20
Se nidħol (to enter / be part of)	80	20	70	30
Se niekol (to eat / go out to eat)	70	30	70	30
Se niftaħ (to open / inagurate)	90	10	90	10
Se niġbed (to pull / withdraw)	90	10	90	10
Se nikteb (to write / write professionally)	70	30	80	20
Se nilgħab (to play / gamble)	80	20	90	10
Se nilħaq (to reach / be promoted)	90	10	90	10
Se nitlaq	90	10	90	10

(to leave / leave a job)				
Se noħroġ (to get out / go out)	70	30	70	30
Mean	81.6	18.4	79.6	20.4

Note. For full translations and meaning assignment please refer to Appendix A.

Table 8

Results for gender conditions from the Pre-Test in percentages.

Verb	Female Photo		Male Photo	
	Female response	Male response	Male response	Female response
Se niżboħ (to paint / apply make-up)	90	10	90	10
Se nagħmel (to do / get a service done)	90	10	90	10
Se nerfa' (to lift / store)	70	30	80	20
Se nħabbat (to knock / whisk)	80	20	70	30
Se nżomm (to hold / keep)	90	10	80	20
Se jkolli	90	10	90	10

(to have / have a baby)				
Se ngħolli (to lift / raise)	70	30	70	30
Se nrabbi (to bring up / breed)	90	10	80	20
Se npitter (to paint / apply make-up)	90	10	90	10
Se niġri (to run / race)	70	30	70	30
Se naħdem (to work / work in theatre)	90	10	70	30
Se nsewwi (to repair / mend)	90	10	90	10
Se nbiddel (to change something / change outfit)	90	10	70	30
Se nħallat (to mix / mix drinks)	90	10	90	10
Se nlegleg	90	10	90	10

(gulp down / drink alcohol)				
Se nsegwi (to follow / to stalk)	90	10	80	20
Se nagħti (to give / to beat up)	90	10	80	20
Se naħtaf (to grab / kidnap)	90	10	90	10
Se niflaħ (to be in good health / be strong)	70	30	90	10
Se nifred (to separate / break up)	90	10	70	30
Se nikkoregi (to discipline / mark papers)	90	10	70	30
Se nilqa' (to catch / welcome)	90	10	80	20
Se nikser (to break item / break rules)	80	20	80	20
Se niżfen	70	30	80	20

(to dance / dance professionally)				
Mean	85	15	80.8	19.2

Note. For full translations and meaning assignment please refer to Appendix A.

Stimulus Construction

The audio was recorded using Speech Recorder software (Draxler & Jänsch, 2004, version 3.4.21), running on a Windows 10 computer and using AudioVision amplifier hardware in a soundproof booth. The audio was then filtered and edited using Praat software to note the timing of the verb and target for data analysis purposes.

For each of the target - competitor and distractor images - a Google search was carried out and a high-quality image embodying the word was chosen. These images were edited using Gimp software and were cropped to a standard size of 400x300 pixels. Experiment Builder was used to implement the eye-tracking task. The stimuli were presented fully mixed so that participants were presented with a randomized order and counterbalancing would be achieved.

Procedure

Participants were seated in a sound-proof booth at a comfortable viewing distance from the computer screen and an Eyelink SR 1000 eye tracker in desktop set-up was calibrated. The auditory portion of the stimuli was presented to the participants using headphones, whilst the images were shown on a screen. Prior to the experiment, participants received written instructions regarding the task. The instructions advised them that they should listen carefully to the sentences, look at the display and click on the image that they heard in the sentence. Participants were always strictly advised to look at the screen.

Participants were exposed to 100 target trials and 100 fillers in total, with breaks provided after every 50 trials. On average including eye-tracking calibration, this made each experimental

session around 30 to 35 minutes long.

Results

As mentioned in the introduction of this chapter, besides investigating whether TSCs are useful in sentences level processing, another question of interest was whether these types of cues could be integrated in utterance processing immediately, or whether they needed a certain timing before they could be incorporated. Since Maltese allows for utterances to have a certain level of free word order, whilst retaining the same meaning, two versions of the experiment were created, the only thing varying between them being whether the utterances started with the verb or a temporal marker. In the Non-verb initial version, the verb was placed in the middle of the sentence, whereas in the Verb Initial version the verb was placed at the start of the sentence. Utilising such a variation achieved two different sets of results, which enabled the assessment of whether cues relating to age and gender needed a certain timing in order to be incorporated usefully in disambiguation. As it is more likely for results to be observed in the first version, due to having a temporal marker allowing further time for the intake and assimilation of the auditory identity cues, the results for this version will be presented first, followed by the results of the verb initial version.

Every section will first detail the statistical results for click accuracy and RT, followed by the eye-tracking data split into a Prediction phase and a recognition phase. To analyse the data produced, a measure of target preference was created, which was the difference in the fixation on the targets vs. the competitors transformed into logOdds. For the Prediction phase this was carried out in the time window 200ms before target onset to 100ms after target onset. The Recognition phase was set at 200ms after target onset till 800ms after target onset. These time windows were chosen for a number of reasons. It is estimated that it takes around 200ms for information gained from speech to influence eye movements (Salverda et al., 2014). Therefore, using the time window of 200ms before the verb onset to 100ms after allowed the analysis to consider any early or predictive effects due solely to the identity of the speaker. Following the same reasoning, the Recognition window was set to 200ms to 800ms after target onset as at this time early effects due to he target

should have been visible and the resulting 600ms would allow for aggregation to reflect the full extent of processing.

Non-Initial verb experiment

Table 9 and 10 show the means for all conditions, with table 9 displaying the means for click accuracy and table 10 focusing on reaction time.

Table 9

Means in % of click accuracy for each condition.

	Congruent	**Incongruent**
Main meaning	**91.3**	**86.5**
Subordinate meaning	**87.9**	**87.6**

Table 10

Means in ms of RT for each condition.

	Congruent	**Incongruent**
Main meaning	**3300**	**3153**
Subordinate meaning	**2704**	**2710**

The results indicate that participants clicked on the expected word around 88.5% of the time, with little variance between the experimental conditions (min: 86.5%, max: 91.3%).

For further analysis, a generalized linear mixed-effect model was used with the correct click response rate as the dependent variable, the contrast-coded fixed factor for meaning (±0.5) and congruency (−0.5: incongruency, +0.5: congruency), their interaction and random factors per participant and target. Table 11shows the results of this analysis, highlighting an effect observed for the variable of Congruency. The positive regression weight indicates that there were more correct responses in the congruent condition mapped onto +0.5. As the table suggests, the effect of congruency is larger for the main, less-specific meaning. However, this interaction is only

marginally significant.

Table 11

Results of the general linear mixed-effect mode for accuracy.

	B	SE(B)	z	p
Intercept	3.426	0.362	9.476	<0.001
Meaning	0.246	0.268	0.919	0.358
Congruency	0.429	0.215	1.998	<0.05
Meaning & Congruency	1.575	0.826	1.907	0.057

Note. The results show slightly significant effects of the independent variable of Congruency on correct click responses.

Further, there was not much of a difference in response times between congruent and incongruent conditions. However, there were differences according to the meaning, with faster responses to the subordinate, more specific meaning. To further analyse this data, a linear mixed-effect model was used with the reaction time as the dependent variable, the contrast-coded fixed factor for meaning (±0.5) and congruency (−0.5: incongruency, +0.5: congruency), their interaction and random factors per participant and item. As Table 12 shows, the main statistically significant effect observed was for the variable of Meaning.

Table 12

Results of the linear mixed-effect mode for reaction time.

	B	SE(B)	df	z	p
Intercept	3061.22	98.15	55.46	31.19	<0.001
Meaning	504.90	109.28	73.93	4.62	<0.001
Congruency	22.78	118.58	44.99	0.192	0.849
Meaning & Congruency	114.29	205.60	165.31	0.556	0.579

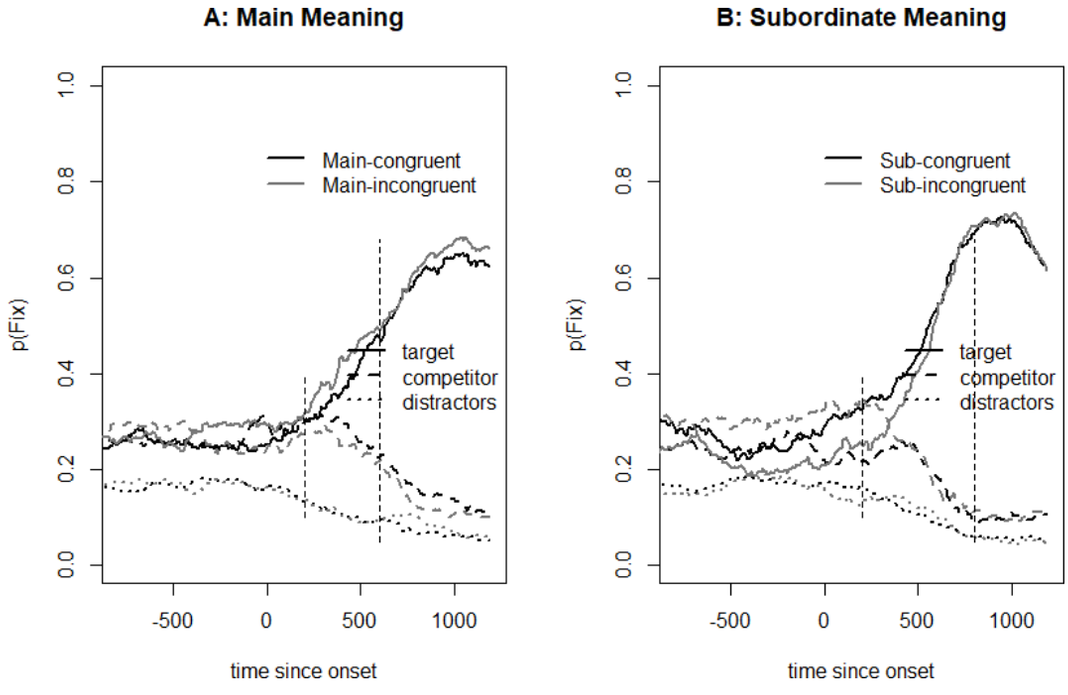
Note. The results show significant effects of the independent variable of Meaning on click reaction times.

Figure 7 shows a plot for the eye-tracking, which indicates a small preference for the specific

biased meanings.

Figure 7

Fixation proportions in Experiment 2 for the target, competitors, and distractors for main meaning (non-biased) vs. sub meaning (biased).



Note. The vertical dashed lines indicate the analysis time window.

Further analysis was split into a Prediction phase and Recognition phase by looking at different time windows. For reasons explained above, the prediction phase time window was set to 200ms before target onset to 100ms after, so as to focus on early prediction effects on processing, before the crucial target is heard and therefore recognition sets in. The target preference for the Prediction phase was calculated, by looking at the fixation on the targets vs. that on the competitors and transforming into logOdds. This target preference was used as a dependent variable in a linear mixed-effect model similar to the one used for reaction time above. Meaning and congruency were contrast coded as per the reaction time model and their interaction and random factors per participant were used. Table 13. shows the results of this analysis which indicates a slight effect of the interaction of congruency and meaning. Looking at Figure 7, this seems to be caused by a preference for the target in the congruent condition and the competitor in the incongruent

condition for the subordinate meaning, with no clear preference in the main-meaning condition.

Table 13

Results for the linear mixed effect model for eye-tracking target preference in the Prediction time window of - 200 to 100ms.

	B	SE(B)	df	z	p
Intercept	-0.152	0.27	298.17	-0.561	0.576
Meaning	0.412	0.377	1311.1	1.093	0.275
Congruency	0.56	0.379	1308.2	1.480	0.139
Meaning & Congruency	-1.656	0.537	1308	-3.085	<0.01

Note. Values show a slight significant effect of the interaction of Meaning & Congruency.

For the Recognition phase, the time window 200ms–800ms after target onset was considered. As mentioned above, these time values were chosen so as to focus on the phase after the target word is heard and recognised and allow for aggregation to reflect the full extent of processing. The target preference for the Recognition phase was calculated in the same way as for that in the Prediction phase. This target preference was again used as a dependent variable in a linear mixed-effect model similar to the one used for reaction time above. Meaning and congruency were contrast coded as per the previous models and their interaction and random factors per participant and target were used in this model. Table 14 shows the results of this analysis which indicates no significant effect of the variables.

Table 14

Results for the linear mixed effect model for eye-tracking target preference in the Recognition time window of 200-180 ms.

	B	SE(B)	df	z	p
Intercept	2.039	0.235	60.54	8.675	<0.001
Meaning	-0.307	0.249	1212.95	-1.233	0.218

Congruency	0.118	0.327	28.72	0.359	0.722
Meaning & Congruency	-0.968	0.771	112.94	-1.255	0.212

Note. Values show a significant effect of the interaction of Meaning & Congruency.

Initial verb experiment

Table 15 and 16 show the means for all conditions, with Table 15 displaying the means for click accuracy and Table 16 focusing on reaction time.

Table 15

Means in % of click accuracy for each condition

	Congruent	**Incongruent**
Main meaning	**88.9**	**89.6**
Subordinate meaning	**89.9**	**88**

Table 16

Means in ms of RT for each condition

	Congruent	**Incongruent**
Main meaning	**2944**	**2816**
Subordinate meaning	**2298**	**2349**

The results indicate that participants clicked on the expected word around 89.25% of the time, with little variance between the experimental conditions (min: 88%, max: 89.9%). For further analysis, a generalized linear mixed-effect model was used with the correct click response rate as the dependent variable, the contrast-coded fixed factor for meaning (±0.5) and congruency (−0.5: incongruency, +0.5: congruency), their interaction and random factors per participant and target. Table 17 shows the results of this analysis, highlighting no particular statistical significance.

Table 17

Results of the general linear mixed-effect model for accuracy.

	B	SE(B)	z	p
Intercept	5.57	1.055	5.28	<0.001
Meaning	0.105	0.252	0.415	0.678
Congruency	0.15	0.253	0.594	0.553
Meaning & Congruency	1.386	1.072	1.293	0.196

Note. The results show no significant effects of the variables.

Further, there was not much of a difference in response times between congruent and incongruent conditions. However, some numerical differences in response times were noticed in regard to main meaning vs. specific meaning. To further analyse this data, a linear mixed-effect model was used with the reaction time as the dependent variable, the contrast-coded fixed factor for meaning (±0.5) and congruency (−0.5: incongruency, +0.5: congruency), their interaction and random factors per participant and item. As Table 18 shows, the main statistically significant effect observed was for the variable of Meaning.

Table 18

Results of the linear mixed-effect model for reaction time.

	B	SE(B)	df	z	p
Intercept	2683.64	94.67	57.84	28.348	<0.001
Meaning	462.81	113.54	69.29	4.076	<0.001
Congruency	190.51	108.54	43.28	1.756	0.086
Meaning & Congruency	138.45	259.40	138.67	0.534	0.594

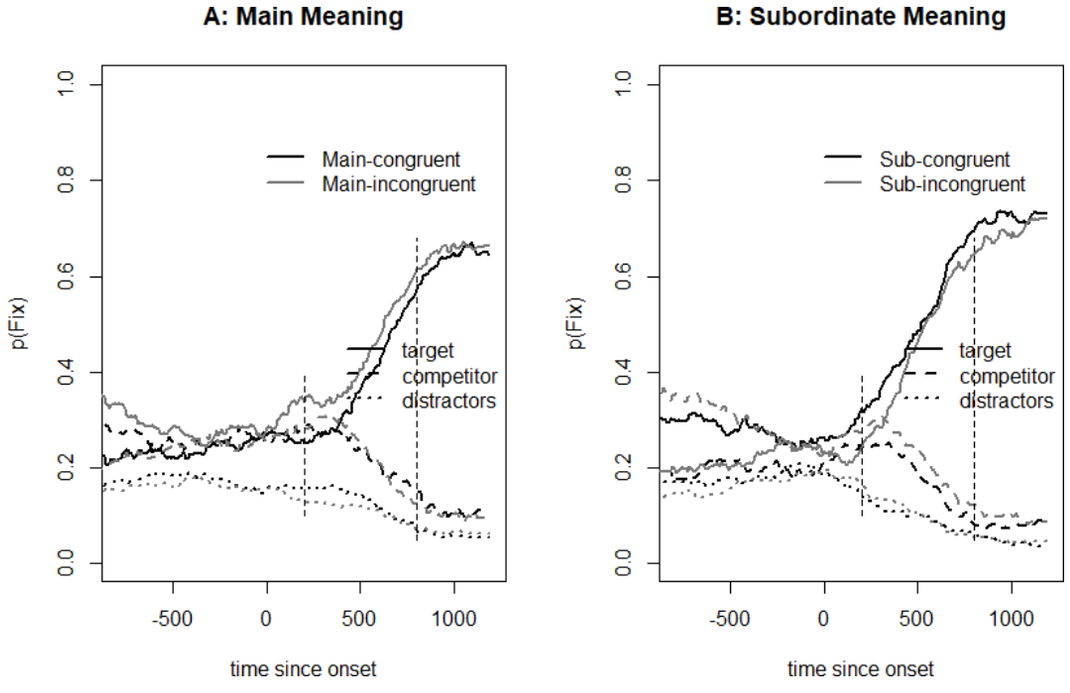
Note. The results show significant effects of the independent variable of Meaning on click reaction times

Figure 8. shows a plot for the eye-tracking, which indicates a small preference for the specific biased meanings. After target onset, fixation occurs more for the target than the competitor in the congruent condition and vice versa for the incongruent conditions, but the same is not

evidenced in the main meaning plot, suggesting that meaning might be important.

Figure 8

Fixation proportions in Experiment 2 for the target, competitors, and distractors, depending for main meaning (non-biased) vs. sub meaning (biased).



Note. The vertical dashed lines indicate the analysis time window.

Further statistical analysis was split into a Prediction phase and Recognition phase by looking at different time windows. For reasons explained above, the prediction phase time window was set to 200ms before target onset to 100ms after, so as to focus on early prediction effects on processing, before the crucial target is heard and therefore recognition sets in. The target preference for the Prediction phase was calculated, by looking at the fixation on the targets vs. that on the competitors. This target preference was used as a dependent variable in a linear mixed-effect model similar to the one used for reaction time above. Meaning and congruency were contrast coded as per the reaction time model and their interaction and random factors per participant were used. Table 19 shows the results of this analysis which indicates no significant effect of the variables or interactions.

Table 19

Results for the linear mixed effect model for eye-tracking target preference in the Prediction time window of - 200 to 100ms.

	B	SE(B)	df	z	p
Intercept	0.160	0.155	27.64	1.029	0.313
Meaning	-0.035	0.259	1197.6	-0.137	0.891
Congruency	0.066	0.259	1197.5	0.253	0.801
Meaning & Congruency	-0.778	0.577	82.269	-1.348	0.181

Note. Values show a significant effect of the interaction of Meaning & Congruency

For the Recognition phase, the time window 200ms–800ms after target onset was taken into account. As mentioned above, these time values were chosen so as to focus on the phase after the target word is heard and recognised and allow for aggregation to reflect the full extent of processing. The target preference for the Recognition phase was calculated in the same way as for that in the Prediction phase. This target preference was again used as a dependent variable in a linear mixed-effect model similar to the one used for reaction time above. Meaning and congruency were contrast coded as per the previous models and their interaction and random factors per participant and target were used in this model. Table 20. shows the results of this analysis which indicates a significant effect of meaning., This is reflected in Figure 8 where in the subordinate meaning, a slight preference for the target vs the competitor in the congruent condition and the competitor vs. the target in the incongruent condition can be seen after target onset, suggesting this specificity of meaning is important.

Table 20

Results for the linear mixed effect model for eye-tracking target preference in the Recognition time window of 200 to 800ms.

	B	SE(B)	df	z	p
Intercept	1.988	0.244	61.26	8.147	<0.001
Meaning	-0.742	0.245	1169.88	-3.007	<0.01
Congruency	0.129	0.257	27.98	0.501	0.621
Meaning & Congruency	-1.167	0.807	119.71	-1.446	0.151

Note. Values show a significant effect Meaning.

Summary

Both experiments indicate that participants were relatively accurate with their click responses and with little variance between the experimental conditions, which indicates that participants were paying the required attention towards the task. This can also be seen from Figures 7 and 8, where the focus is on the targets and competitors which were biased according to the voices of age and gender as opposed to as opposed to the distractors, which were completely unrelated. In the first experiment positive regression results indicated that there were more correct responses in the congruent condition which supports an effect of the speaker. There were no such results in the second experiment, once again allowing for speculation that some time is needed for such cues to be used in prediction.

Further, both experiments show that there was not much of a difference in response times between congruent and incongruent conditions. However, some numerical differences in response times were noticed in regard to main meaning vs. specific meaning, with slightly longer RTs for main meaning sentences possibly indicating that this meaning proved more effortful due to its more generic nature. This was also evidenced in the results of the linear mixed-effect models for reaction time for both experiment where the main statistically significant effect observed was for the variable of Meaning. This predilection for the subordinate meaning (which in both cases is the

more specific and easily biased meaning) is interesting, as it possibly suggests that specificity also plays a part, enabling the role of such cues even more.

The eye-tracking results on the prediction and recognition phases highlight further the effects of the time difference in the verb non-initial version, with the interaction of Meaning and Congruency having a slight significant effect on the eye data analyzed for the prediction time window whereas this was not observed in the verb initial version. This was also seen in Figure 7, reflected as a preference for the target in the congruent condition and the competitor in the incongruent condition in the subordinate meaning. This highlights that an interaction of identity cues and meaning might be more useful to target preference in a more specific situation which was also sustained by the results of the recognition analysis and plot for the non-initial verb experiment.

As can be seen, such results suggest that biases based on talker-specific characteristics have some form of an effect on language processing and prediction albeit within more specified conditions. This needs to be tested further, possibly with the usage of paradigms where a more conversational approach can be used to provide more ecological validity. A larger scale study on biases within Maltese society would also prove useful for the construction of more valid and current stimuli. These ideas will be discussed further in the discussion chapter along with limitations and further research proposed.

Chapter V

The Identity of the speaker in passive listening – an EEG experiment

This chapter will describe the methodology and results of the third experiment; an EEG task testing the effect of gender and sociolinguistic background on utterance processing. This experiment was inspired by the task and results carried out in the eye-tracking experiment (Chapter 4), as it was of interest to see what outcomes could be achieved using an electrophysiological task and by making the utterance confusing through grammatical incorrectness. While the task in the eye-tracking experiment used implied biases (such as, a male putting on make-up being unusual), the task in this experiment used language mistakes which are easily discernible by native Maltese speakers (for example, a male using the feminine version of an adjective). In the same manner as the previous two experimental chapters, this chapter will end with a short summarising discussion regarding these results, which will then be developed further in the General Discussion chapter (Chapter 6).

ERP components in sentence processing

As described in the literature review and the section above, communication necessitates that listeners can somehow keep track of agreement elements between words of various categories. Studies have used ERP recordings, as these have proven invaluable to indicate that the human brain shows different responses to expected continuations as opposed to unexpected ones, during sentence processing and across many languages (Bates et al., 1996; Mancini et al., 2011b, and many more). One particular advantage is that these responses can be observed during listening without an artificial task, as often necessary in behavioural research (such as trying to pinpoint when an extraneous click is superimposed on the sentences). Moreover, they occur relatively quickly after an unexpected word is heard or seen, and, as such, represent online processing of such unexpected words. For example, Mancini (2011b) investigated agreement between nouns and verbs in Spanish. They found that when participants listened to unexpected continuations between the noun and verb

(for example, *el cocinero ⁎cocinaste...* 'the cook-3RDPERSON−SG cooked-2NDPERSON−SG', a so-called agreement error) a LAN-P600 signal was elicited, compared to the correct control sentences (for example, *los cocineros cocinaron...*'thecook-3RDPERSON−PL cooked3RDPERSON−PL').

Gender agreement / disagreement is one such case which has benefitted from these methods. There have been numerous ERP studies examining how gender information is stored, and language production and comprehension is affected by this type of knowledge. Some have demonstrated that the proper use of gender has an effect on the listener (i.e. expected or congruent gender being easier to process than an incongruent form). Besides the examples presented in the last section, there are many others that have also focused on grammatical gender agreement (for example, Lattner & Friederici, 2003; Van Berkum et al., 2005; Martin et al., 2012). Martin et al. (2012) investigated the online processing of ellipsis in Spanish. Whilst participants read sentences containing noun-phrase ellipsis indicated by the determiner otro/otra ('another – M/F'), they recorded the elicited ERPs. These determiners were followed by a correct or incorrect gender with respect to the antecedent nouns occurring earlier in the sentence. Grammatically incorrect determiners evoked a broad negative (between 400 and 1000ms after word onset) reaction compared to correct ones suggesting gender agreement effected the comprehension of these ungrammatical sentences.

Various components are useful in the types of ERP studies mentioned. One such component is the anterior negativity that is often left-lateralized Left Anterior Negativity (LAN), and peaks between 300 and 500 ms after the mistake onset. For example, Batterink and Neville (2013) noticed this when they showed participants word category violations containing a preposition immediately followed a possessive noun (for example, *We drank Lisa's by brandy the fire in the lobby).* Control sentences for each violation were created by using syntactically congruent sentences, where a possessive noun and a non-possessive noun preceded the critical preposition (for example, *We drank Lisa's brandy by the fire in the lobby).* Sentences were presented visually, one word at a time whilst ERP recordings were taken. All violations elicited an early negative effect,

which the researchers argued is evidence for a neural marker of implicit syntactic processing. Similarly, when Mancini et. al (2011b) asked participants to listen to sentences with number violations (for example, *el cocinero ∗cocinaron...'the cook-3RDPERSON−SG cooked-3RDPERSON−PL'*), such anomalies elicited a LAN-P600 signal, which they say reflects the hinderance posed on the participants' interpretative process.

Another well-observed component is a late posterior positivity (P600). It can be elicited in both visual and auditory mediums, and is characterized as a positive-going deflection within the 500 ms after the stimulus onset, which peaks around 600 milliseconds. In contrast to the LAN, the P600 is correlated with a later part of processing and has been observed in response to various syntactic violations. It is linked to key processes of syntactic integration, reanalysis, and recovery (Hagoort et al., 1993). For example, Banon and Rothman (2019) used event-related potentials to examine subject–verb person agreement in Spanish, with a focus on marking the person's status. It is assumed that first and second persons are participants in the speech act, since they play the speaker and addressee roles, respectively, whereas third persons are unmarked (as they refer to whomever is neither the speaker nor the addressee). Participants heard sentences where person agreement was either congruent (for example, *'yo...lloro – 'I...cry'* - 1STPERSON−SG and *'la viuda...llora – 'the widow...cry'* - 3RDPERSON−SG) or incongruent (for example, *'yo... ∗llora – 'I...cry'* -3RDPERSON−SG and '*la viuda... ∗lloro'* – 'the widow...cry' - 1STPERSON−SG). Twenty-eight native speakers of Spanish participated and positive ERPs within the P600 range were elicited for person violations. No N400 or LAN like components were observed (although incongruencies did elicit an anterior negativity in the P600 time window), which Banon and Rothman argue reflects the memory costs associated with keeping the errors in working memory to provide a sentence-final judgment. Importantly, person violations with a marked subject (for example, 'yo...∗llora' – 'I...cry' -3RDPERSON−SG) produced a larger P600 effect. This highlights prediction theory as in, upon encountering a subject with marked features, the listener was able to generate a stronger prediction regarding the upcoming verb and therefore eventually had to reanalyse the information when a conflict arose due to the

incongruency.

In line with studies mentioned above a larger P600 was expected in cases of language mistakes, as syntactic features lead to structural integration as reflected in a P600 complex. For example, Hanulíková et al. (2012, previously described in the above section) participants' ERPs were obtained whilst they listened to gender agreement errors in sentences spoken by a native Dutch speaker and a fluent, non-native speaker with a clear foreign accent (first generation Turkish speaker). They observed a reaction of N400 signals for control sentences with semantic errors for both speakers. However, only the gender agreement errors made by the Dutch native speaker caused a P600 effect. The exact same errors made by the non-native Turkish speaker did not cause an effect. This indicates that listeners may modify their expectations for syntactic gender agreement, a feature notoriously difficult for second-language learners. That is, listener adjust their processing based on a speaker-characteristic, here the L2 status of the speech.

Based on such results, in the first version of this experiment concerning the impact of the male and female speakers, it was expected that any gender violations should result in a P600 when compared with correct sentences. This is since the participants would be sensitive to the grammatical incongruency produced between the content of the sentence and the identity of the speaker. Likewise, in the second version of the task, it was expected that gender violations spoken by the Maltese native speaker should result in a P600 compared with correct sentences. Potentially, with regard to the Maltese English speakers, this was not likely to be the case, as the listeners were expected to be more lenient with such mistakes due to the Maltese English accent implying that the speaker had not been raised with Maltese as their first language. However, some form of modulation of the P600 could be present if listeners are still sensitive to such errors due to a Maltese English accent not being considered as a completely foreign accent (such as Chinese or Spanish). Potentially a LAN could also have been expected since - as highlighted in research such as Batterink and Neville (2013, mentioned above) - this is also a marker of syntactic processing.

In contrast to the semantic control sentences, a N400 signal was expected. The N400 was

discovered by Kutas and Hillyard (1980). They conducted an experiment where they asked their participants to read sentences with nonsensical endings (for example, *I take tea with cream and turtle*) with the intention of looking at the response to the unexpected words. They expected a P300 component (as this had been shown to be elicited by unexpected stimuli in the visual and auditory domain) however they noticed a negativity around the 400 mark. Nowadays, the N400 is one of the most studied ERP components that is often seen during semantic processing. It shows up as a negative deflection that peaks around 400 milliseconds after stimulus onset, although it can extend from 250 to 500ms. The N400 does not always need to show up as negative value but it is more of a negative leaning deflection. A solid finding concerning N400 effect studies is that the amplitude is negatively correlated with the incongruency or abruptness of a word in the semantic context. The N400 has frequently been interpreted as indicating the semantic or conceptual integration (that comes at a cognitive cost) associated with word recognition, such as mentioned in the Gray and Van Hell (2016) study discussed above.

Therefore - as will be explained in detail in the following section - the findings expected were that the voice of the speaker (male, female, Maltese or Maltese-English) would initially influence the perception of the listener for what was to follow in the sentence. If this did not match the initial stereotype it was expected that a result would be observed as an alteration in the ERP values as described above.

Hypotheses and Research Questions

In chapter 2, this thesis discussed how due to our stereotypical bias, TSCs can influence our perception and comprehension. Chapter 3 and 4 focused on ambiguities created by the possibility of multiple meanings, with chapter 3 focusing on facial expressions creating and disambiguating these lexical ambiguities, and chapter 4 focusing on the TSCs of age and gender doing the same. This train of thought led to a new question: what about the cases where ambiguity is created by a misuse of speech rather than multiple meanings? Mistakes in language, especially in spoken language, are frequent, however we seem to have developed systems to not only detect them but

also help us circumvent them. With this in mind, do TSCs aid in dealing with the wide variety of 'mistakes' that occur frequently in everyday spoken language? Are some mistakes more unexpected than others, specifically due to the identity of the person making them? Considering this, how do we as listeners react when faced with unusual mistakes in our native language?

In an attempt to answer similar questions, Hanulíková et al. (2012) (as mentioned above), ran an ERP experiment to look into whether neural processes are affected by speaker identity. Their results (see below for detail) showed that listeners had more trouble processing the syntactic error when it was committed by the Dutch native speaker rather than by a foreign-accented speaker.

Hanulíková along with Carreiras (2015) also ran an ERP task testing the effect of the speaker's gender and the information it provides specifically related to subject-verb agreement. They chose Slovak to look into this issue as it is a morphologically rich language in which agreement is needed for number, case, gender etc. (much like Maltese). Due to this and similarly to the experiments carried out in this thesis, the pragmatic infelicity of a sentence can be assessed depending on the social and pragmatic information delivered by the speaker's gender as expressed by their voice. Throughout the task, ERP responses were collected whilst participants listened to utterances with verb agreement and disagreement (for example, *'the neighbors were upset because I* $^{*}stole_{MASC}$ *plums'* uttered by a male (agreement) or a female (disagreement)). Responses to verbs disagreement with the speaker's gender prompted a larger early posterior negativity compared to the correct versions. When the agreement was solely based on syntactic information and therefore did not depend on gender (such as, a disagreement between a formally marked subject and the verb inflection (e.g., the $woman_{FEM}$ $^{*}stole_{MASC}$ plums)), this elicited a larger anterior negativity followed by a larger P600. The researchers highlighted that this result is in line with similar findings where pragmatic and social information, such as the gender of the speaker, results in N400-like effects, whereas purely syntactic mismatches are reflected as a LAN/P600 complex.

Grey et al. (2019) looked at such questions focusing on a speaker's accent and therefore the information offered by their linguistic background. They looked for and observed differences in

their participants' brain reactions when hearing errors in native-accented speech vs. foreign-accented speech. During their EEG task, target sentences were presented in the form of a sentence listening task. Participants were told that they were going to listen to a conversation between two people concerning their friends and due to this were advised of the names of 10 friends (five females and five males). The target sentences were made up of declarative sentences that were grammatically and semantically correct, and sentences containing incorrect usage of the English subject pronouns (he/she) or were semantically anomalous. For example, a grammar target could consist of a sentence such as: 'Mark was planning to attend the concert but he/*she missed the bus to the venue', whereas a Semantic target could consist of a sentence such as: 'Camilla travelled across Europe in a train/*daffodil to attend the concerts'. All sentences were recorded using two female speakers: one with a standard native American English accent, and one with a foreign Chinese-English accent. ERP results showed that native-accented speech elicited a frontal negativity (Nref) for grammatical errors and a delayed N400 for semantic errors. Nevertheless, when it came to foreign-accented speech, only semantic errors produced an ERP effect; once again a late negativity.

Based on such studies and considering that the Maltese language makes abundant use of gender agreement, the third experiment in this series was designed to assess the impact of gender and social bias when native speakers listen to grammatical errors made by different speakers. In order to assess this, adjectives were used; Maltese adjectives always have to agree with the subject or object. For example, the English phrase *'I am beautiful'* would translate to either, *'Jien sabiħ'* or *'Jien sabiħa'* depending on whether one is male or female, respectively. This is relatively unusual; even language that uses grammatical gender, such as German, do not require agreement in the first person based on speaker identity. Due to this, the first part of the experiment focused on ERP measurements in the case of mistakes made by a native male and female speaker. The second part of the experiment was designed to assess errors made by a native Maltese speaker and a Maltese English speaker.

Much like the eye-tracking paradigm described in the previous chapter, the main hypothesis

for this research was that the gender and language background of a speaker have a categorization effect, and can therefore play a predictive role in the processing and understanding of language. This hypothesis is applicable in cases where the gender or language background of the speaker are previously known or can be inferred via visual or auditory inputs (as in the case of the experiments presented in this section). These observations were expected to show up as fluctuations in specific ERP components, as mentioned in the studies above.

Aim

Two versions of the same experiment were conducted with concurrent measurements of the EEG, with the aim to analyse the EEG as event-related potentials (ERP) to investigate whether the gender (male/female, first version) and language background (Maltese/Maltese English, second version) of a speaker could influence language prediction and processing. In these experiments, sentences containing target adjectives were used. In both experiments, the adjectives were always placed roughly in the middle of the sentences following a temporal marker. This was reflective of some results seen in the previous eye-tracking experiment which highlighted that a certain amount of time was necessary for such cues to set in.

There was one main difference between the two versions. In the first version, the sentences were set in the first person so as to directly agree or disagree with the gender of the speaker uttering the sentence (for example, *Jien nistudja ħafna, jien ambizzjuż u irrid nilħaq tabib* - ('I study a lot, I'm ambitious and want to become a doctor'). In the second version the sentences were set in the third person (i.e. the speakers were describing someone / something) as in this case the 'correct' language usage was to be decided due to the sociolinguistic background of the speaker. Maltese speakers were expected to make no grammatical mistakes and use the gender of the adjective appropriate to the item being described, where Maltese English speakers were supposed to make grammatical errors.

The aim of this experiment was also to observe the effects of a passive listening task, as opposed to an active listening one which is described in the previous chapter.

Participants

In both versions of the task, forty participants from the University of Malta subject pool were paid to take part in this experimental task. This sample size was determined based on sample sizes used in similar studies (such as the studies mentioned as inspiring literature in the 'Hypotheses and Research Questions' section above). All participants were native speakers of Maltese. In order to confirm this, a questionnaire designed to assess language dominance and background was completed by the participants before they could participate in the task. Participants only took part in this study and were not the same as the participants who took part in the eye-tracking study.

Eighteen participants were male, and twenty-two participants were female. Participants were aged 18–30 years (mean age: 24 years). None of the participants reported any hearing or visual impairments, and all had normal or corrected-to-normal vision. From each experiment, six participants had to be removed due to technical difficulties, and another six had to be dropped as they did not complete the task accordingly or exhibited too may artefacts in the raw data.

Written informed consent was obtained from all participants prior to carrying out the task. All methods and procedures conformed to the Research Ethics and Data Protection Guidelines of the University of Malta.

Design

Both experiments focused on using gender agreement and violations to observe Maltese listeners' ERP responses to an expected structure vs. an ambiguous structure created due to a gender violation mismatch. The first version used recorded utterances of two native Maltese speakers, a male and a female, using either the correct adjective configuration or one which disagreed with their gender. In the second version, recordings of a native Maltese speaker and a Maltese English speaker uttering third person sentences, and once again containing either gender agreement or violations were used. A different speaker was used to record the control set of sentences made of semantically congruent and semantic world knowledge violations to ensure any N400 signal achieved in the target stimuli was due to the ambiguity created by the gender

discrepancy. Similarly, to the target sentences, no effect was expected in the correct sentences, however an N400 response was also expected for semantic violations.

The auditory stimuli were recorded using four different speakers (male / female and native Maltese / Maltese English - the latter were both recorded using male speakers to ensure no other changes except for the speakers' linguistic background) to represent a range of TSCs, one for gender and one for linguistic background. The speakers were asked to read the sentences at a natural speech rate. The sentences were either congruent or incongruent with the speaker uttering them, thus resulting in four different conditions per experiment. The participants were asked to listen to the sentences through a set of headphones. They were instructed to look at the screen in front of them, as a simple yes or no question would show up on the screen after a target sentence. The questions were asked as a checking question, with the aim of helping participants maintain their attention throughout the task.

A set of two hundred filler sentences was also included in the task, so as to circumvent the participants from realizing the aim of the experiment. All participants were exposed to all the adjectives, a list of which can be seen in Appendix E. Both experiment versions followed a 2x2 factorial design. In version A this was achieved by combining gender (male or female) with congruency (congruent or incongruent). On the other hand, in experiment B, sociolinguistic background (Maltese speaker or Maltese English speaker, both male so as not to create further variables) and congruency (congruent or incongruent) were combined. The congruent sentences were always grammatically correct and therefore should have been easy to process, whereas the incongruent sentences were created to be ambiguous as they were grammatically incorrect, by Maltese language rules. In both versions the items were rotated through conditions and across participants. Therefore, if a participant listened to a version of the adjective *'ambizzjuż/a'* (ambitious) in the Male Congruent condition, they would not be exposed to that specific example in the other conditions as well (Male Incongruent / Female Congruent / Female Incongruent). Counterbalancing was achieved through the randomization of the stimuli presented.

Materials

Eighty adjectives were selected for the language background task, and another eighty for the gender task. In both cases, adjectives were chosen as in Maltese they naturally display gender, for example the Maltese word for *beautiful* could be used as the masculine version – 'sabiħ' or the feminine version 'sabiħa'. The adjectives had no stereotypical connotations. As previously mentioned, in both versions one set of sentences was created to be congruent while another was set as incongruent with the speaker. In the case of version one, this was achieved by creating gender agreement or disagreement between the adjective used in the sentence and the speaker by using first person sentences.

In the case of the language background version, congruency and incongruency were based on the correct grammatical usage when describing something or someone else, in a third person format. A native Maltese speaker is expected to be able to use gender agreement correctly. On the other hand, gender disagreement mistakes are quite common of Maltese English speakers, as they tend to be raised speaking mainly English which contains no gender agreement. The full list of adjectives can be found in Appendix D. Out of these adjectives, two sets of sentences were created per adjective, thus providing one-hundred and sixty sentences in total. The four different conditions mentioned per adjective were achieved by matching or mismatching the sentences to the speaker. Table 21 shows an example of these stimuli, with a full list available in Appendix E:

Table 21

Example of sets of stimuli sentences used in version 1 and 2.

Condition	Sentence
Version 1	
Male Congruent 1st person	Jien nistudja ħafna, jien ambizzjuż u irrid nilħaq tabib. I study a lot, I am ambitious-M and want become doctor (I study a lot, I'm ambitious and want to become a doctor)

Male Incongruent 1st person	Jien nistudja ħafna, jien (*)ambizzjuża u irrid nilħaq (*)tabiba. I study a lot I am ambitious-F and want become doctor (I study a lot, I'm ambitious and want to become a doctor)
Female Congruent 1st person	Jien nistudja ħafna, jien ambizzjuża u irrid nilħaq tabiba. I study a lot I am ambitious-F and want become doctor (I study a lot, I'm ambitious and want to become a doctor)
Female Incongruent 1st person	Jien nistudja ħafna, jien (*)ambizzjuż u irrid nilħaq (*) tabib. I study a lot I am ambitious-M and want become doctor (I study a lot, I'm ambitious and want to become a doctor)

Version 2	
Maltese Congruent Speaker independent	L - artiklu ħadd ma fehmu, huwa ambigwu wisq. The article noone no understand it is ambiguous-M too much (No one understood the article, it was too ambiguous.)
Maltese Incongruent Speaker independent	L - artiklu ħadd ma fehmu, huwa (*)ambigwa wisq. The article noone no understand it is ambiguous-F too much (No one understood the article, it was too ambiguous.)
Maltese English Congruent Speaker independent	L - artiklu ħadd ma fehmu, huwa ambigwu wisq. The article noone no understand it is ambiguous-M too much (No one understood the article, it was too ambiguous.)
Maltese English Incongruent Speaker independent	L - artiklu ħadd ma fehmu, huwa (*)ambigwa wisq. The article noone no understand it is ambiguous-F too much (No one understood the article, it was too ambiguous.)

For both experiments semantic anomaly sentences and fillers were created. Collectively, 120 semantic anomalies and 200 fillers were created. The sentences were crafted so as to be as similar as possible to the stimuli sentences in both length and structure. A set of one-hundred and sixty 'yes/no' checking questions (one per every stimuli sentence) were also created to ensure

participants were paying attention throughout the task. Table 22 shows an example of these sentences. A full list of these sentences and questions can be found in Appendix G, H, and I respectively.

Table 22

Example of different placement of target word in experiment 1 and 2

Item	Sentence
Semantically Correct	Martin mar jistad, qabad ħuta daqsiex. Martin went fishing, he caught fish huge (Martin went fishing, he caught a huge fish)
Semantic Anomaly	Martin mar jistad, qabad ajruplan daqsiex. Martin went fishing, he caught aeroplane huge (Martin went fishing, he caught a huge aeroplane)
Filler	Ħareġ temp mill-isbaħ, sejra mixja max-xatt. It is weather nice going walk shore (It's nice weather, I'll go for a walk by the shore)
Checking Question	L-artiklu fehmuh ħafna nies? The article understood many people (Did a lot of people understand the article?)

Stimulus Construction

The audio was recorded using Speech Recorder software (Draxler & Jänsch, 2004, version 3.4.21), running on a Windows 10 computer and using AudioVision amplifier hardware in a soundproof booth. The audio was then filtered and edited using Praat software to note the timing of the adjective for data analysis purposes. The experimental task was built using Matlab. The stimuli were given fully mixed so that participants were presented with a randomized order and counterbalancing would be achieved.

Procedure

Participants were seated in a sound-proof Faraday cage at a comfortable viewing distance

from the computer screen. The participant's head was measured, and then an ActiVision EEG cap and corresponding electrodes were correctly positioned on the participant's head. The 16-channel electrode system was placed at a standard 10–20 set-up (Fz, Cz, Pz, Oz, Fp1/2, F3/4, C3/4, T7/8, P3/4, O1/2) and was connected to a recording computer utilizing Activision software and a BrainAmp DC amplifier. The auditory portion of the stimuli was presented to the participants using speakers, whilst the questions were shown on a screen.

Prior to the experiment, participants received written instructions regarding the task. The instructions advised them to listen carefully to the sentences and avoid unnecessary blinking and movement as much as possible. They were also instructed to keep their eyes on the screen in case a checking question appeared, and to answer 'yes/no' using the keyboard in such an event.

Throughout the experiment participants were presented with 80 target trials, 60 semantic controls and 200 fillers in total, with breaks provided half-way through the trial. Stimuli were presented in randomized order. Each trial played automatically, a few seconds after the previous trial had finished. On average, including EEG calibration, this made each experimental session around 60 minutes long.

Signal Processing

The data was analysed using the EEGLAB and ERPLab toolkits on Matlab. The EEG signal was filtered off-line using a 1-40 Hz band-pass filter. An Individual Component Analysis (ICA) using *runica* was applied to all datasets. Based on the results of these ICAs, eye blink artifacts were removed manually by eliminating components that were correlated with blinks and saccades. EEG epochs ranged from -0.2ms to 1ms. Baseline correction was performed with reference to pre-stimulus activity (-200 to 0 ms). Extreme values were rejected automatically using a minimum threshold of - 70µV, and a maximum threshold of 70µV. Epochs rejected were always less than half of the overall trials. Segments were averaged for each participant, experimental condition, and electrode. ERPs were analysed over the entire scalp divided mainly into 3 regions of interest; Anterior which included electrodes "F3","Fz","F4", Central which included electrodes

"C3","Cz","C4", and Posterior which included electrodes "P3","Pz","P4".

Statistical Analysis

As mentioned in the introduction of this chapter, the main scope of this task was to investigate whether the TSCs of gender and sociolinguistic background are useful in sentences level processing; in this case when ambiguity is created by a mistake in language usage. Based on results seen in chapter 4, the adjectives were placed approximately in the middle of the sentence, to provide enough time for the identity cues to be acknowledged. As mentioned in the first section of this chapter, it might be the case that the native Maltese participants would be more lenient with the Maltese English speaker, and therefore the results obtained in the sociolinguistic version of the experiment might be less clear. Due to this and because the results in the gender version of the experiment were expected to be more prominent, the results for this version of the task will be presented first, followed by the results of the sociolinguistic version.

In the gender version, the conditions included were: Male congruent and incongruent, and Female congruent and incongruent. In the sociolinguistic experiment, the conditions included were: Maltese congruent and incongruent, and Maltese English congruent and incongruent. To assess any differences to the reactions for these conditions, two repeated measures analysis of variance (ANOVA) were performed on each set of the ERP mean amplitudes recorded. The first included aspects related to electrode position with factors: Position (anterior/posterior), Laterality (left/right) and Condition (Male/Female or Maltese/Maltese English). The second included aspects related to the interaction between the speaker and congruency with factors: Speaker, congruency, and condition. The time windows chosen for the analysis were, 300–500ms for the N400 and LAN signals and 500ms to 800ms for the P600 effect.

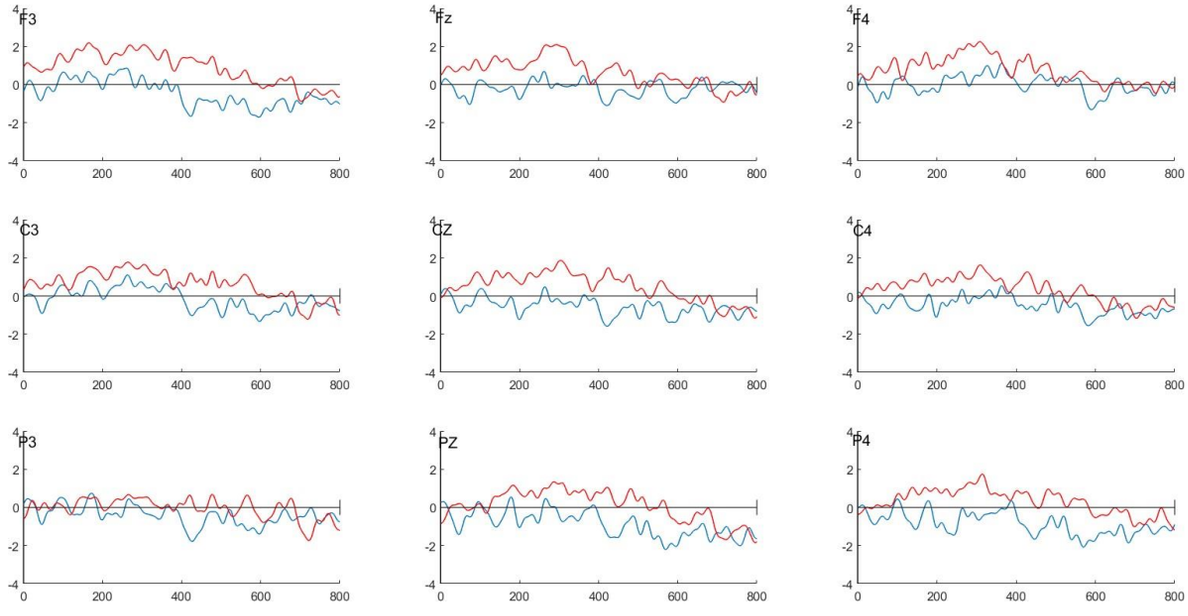
Results – Gender TSCs

N400 results

Sentences with semantic manipulation were analysed to dismiss the possibility of shallow processing or confounding results (if any were to be found). Figure 9 below presents the Grand averaged ERP results for the N400 conditions in this study. It contains plots across nine channels for the semantic congruent and semantic incongruent conditions (i.e. where the N400 was expected).

Figure 9

Grand Average ERP for channels C3, C4, Cz, F3, F4, Fz, P3, P4, Pz for the semantic congruent (blue) and incongruent (red) conditions.



Note. Y-axis = amplitude, X-axis = time. Note that negativity is plotted downwards.

However, as can be seen in Figure 9, the semantic violations do not seem to have elicited a larger N400 distribution than correct sentences in the 300–500ms window. Instead they lead to a broadly distributed positivity. In view of this unexpected result, to further the analysis, a repeated measures ANOVA was carried out. This revealed an effect of Position and Condition, but no effect for Laterality. In the case of the interactions the only significant result observed was for Position, Laterality and Condition, with no significant results were seen for Position and Laterality, Position and Condition and Laterality and Condition. Table 23 (below) shows all the values of this analysis.

Whilst the N400 effect does not seem to be replicated with clarity in the above plots, the ANOVA results do suggest that participants were attempting to listen carefully to the stimuli provided.

Table 23

Results for the ANOVA on ERP mean-amplitudes for experiment version 1.

	DFn	**DFd**	**F**	**P**
Position	2	54	3.679	0.032*
Laterality	2	54	0.279	0.757
Condition	1	27	14.335	0.001*
Position:Laterality	4	108	1.847	0.125
Position:Condition	2	54	0.220	0.803
Laterality:Condition	2	54	0.347	0.708
Position:Laterality:Condition	4	108	3.202	0.016*

Note. Values show a significant effect of Position (AntPost) and Condition and the interaction of AntPost:Laterality:Condition.

As this last interaction presented as significant, a paired t-test was run to evaluate further the impact of it. The aim of using the t-test was to see whether the condition's significance varied across the electrodes used. Condition was found to be significant across channels F3, Fz, C3, Cz, Pz, P4. The full results of this t-test per electrode can be found in Table 24:

Table 24

Results for a post hoc paired t-test due to the significant interaction of Position:Laterality:Condition, observed in the ANOVA (above).

	T	**DF**	**P**
F3	-2.063	53.965	0.044*
Fz	-2.588	53.477	0.012*
F4	-0.511	53.97	0.611

C3	-2.751	53.994	0.008*
Cz	-3.024	53.966	0.004*
C4	-1.427	53.949	0.159
P3	-0.703	52.125	0.485
Pz	-1.705	52.269	0.094*
P4	-3.955	53.99	0.000*

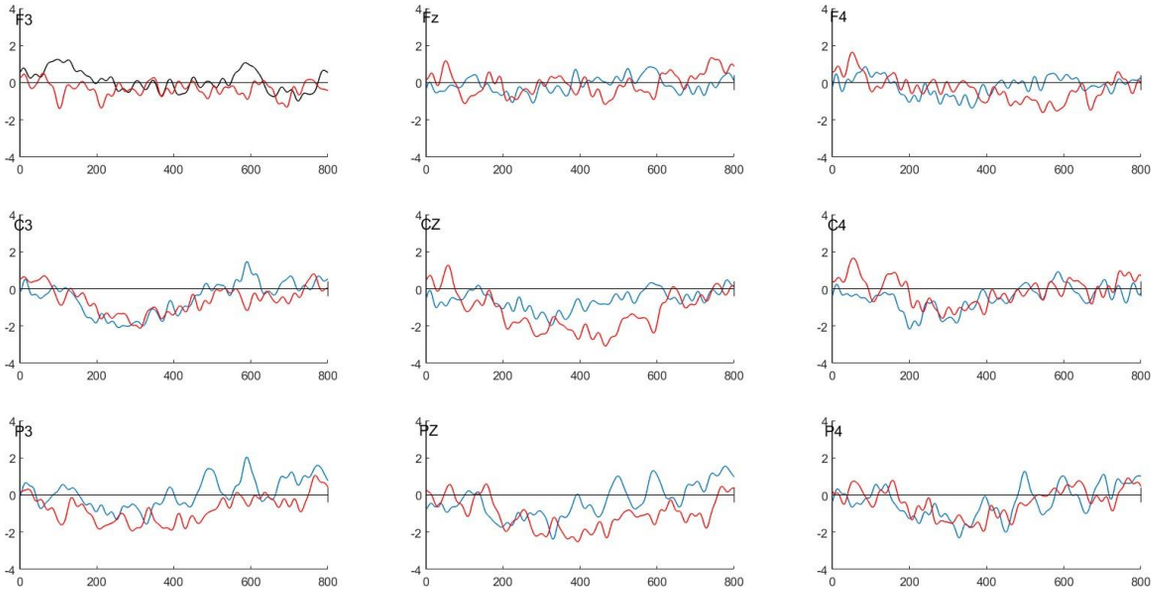
Note. Values show a significant effect of Position (AntPost) and Condition and the interaction of AntPost:Laterality:Condition.

Speaker results - Gender

This version of the experiment was focused on gender (male or female) and congruency (congruent or incongruent). It was expected that any gender violations should result in a Lan / P600 when compared with correct sentences. This is since the participants would be sensitive to the grammatical incongruency produced between the content of the sentence and the identity of the speaker. The Grand averaged ERP results for the speaker voice and congruency in this study can be seen in Figure 10 and 11 below. Figure 10 displays results for congruency and incongruency for the sentences with the Male speaker, whereas Figure 11 displays the same but for the Female speaker.

Figure 10

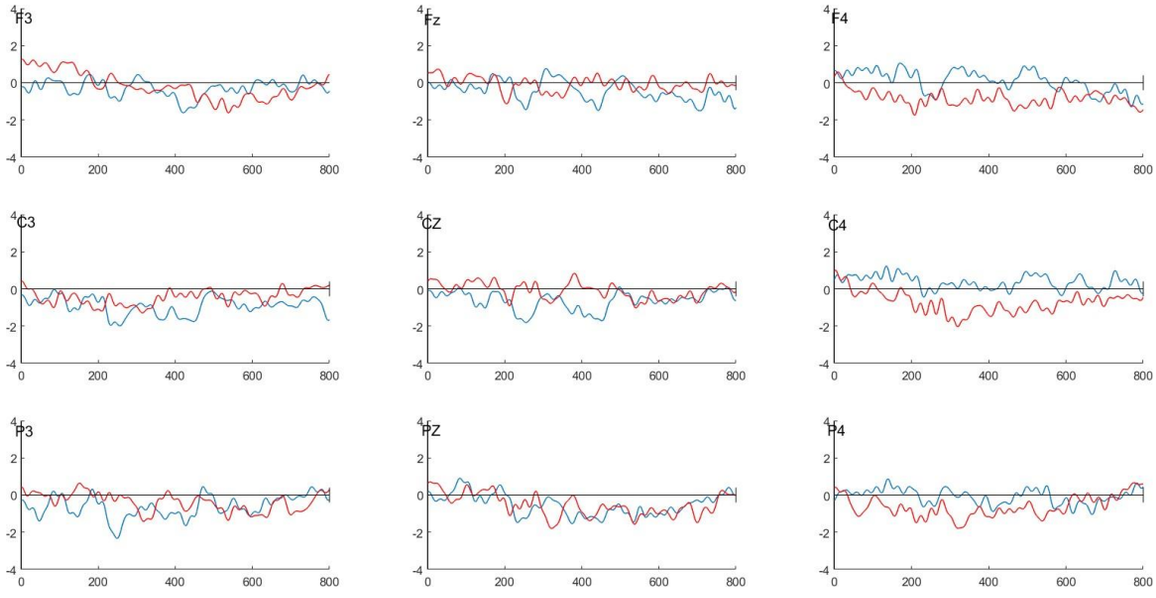
Mean amplitude ERP for channels C3, C4, Cz, F3, F4, Fz, P3, P4, Pz for the Male congruent (blue) and incongruent (red) conditions.



Note. Y-axis = amplitude, X-axis = time. Negativity is plotted downwards

Figure 11

Mean amplitude ERP for channels C3, C4, Cz, F3, F4, Fz, P3, P4, Pz for the Female congruent (blue) and incongruent (red) conditions.



Note. Y-axis = amplitude, X-axis = time. Negativity is plotted downwards.

Figures 10 and 11 show plots across nine channels for the gender (male and female respectively) congruent and incongruent conditions. As can be seen in these figures, no clear P600 is observed for the syntactic incongruities caused by gender violations (i.e. Male and Female Incongruent). This was also confirmed in a repeated measures ANOVA which also did not reveal significant effects overall. Table 25 (below) shows all the values of this analysis.

Table 25

Results for the ANOVA on ERP mean-amplitudes for experiment version 1 (Gender).

	DFn	**DFd**	**F**	**P**
Position	2	54	1.088	0.344
Laterality	2	54	0.163	0.850
Speaker	1	27	0.023	0.881
Congruency	1	27	1.697	0.204
Position:Laterality	4	108	0.96	0.433
Position:Speaker	2	54	0.254	0.777
Laterality:Speaker	2	54	1.57	0.217
Position:Congruency	2	54	1.879	0.163
Laterality:Congruency	2	54	0.372	0.691
Speaker:Congruency	1	27	0.033	0.857
Position:Laterality:Speaker	4	108	1.391	0.242
Position:Laterality:Congruency	4	108	0.246	0.911
Position:Speaker:Congruency	2	54	1.332	0.272
Laterality:Speaker:Congruency	2	54	1.83	0.170
Position:Laterality:Speaker:Congruency	4	108	1.033	0.393

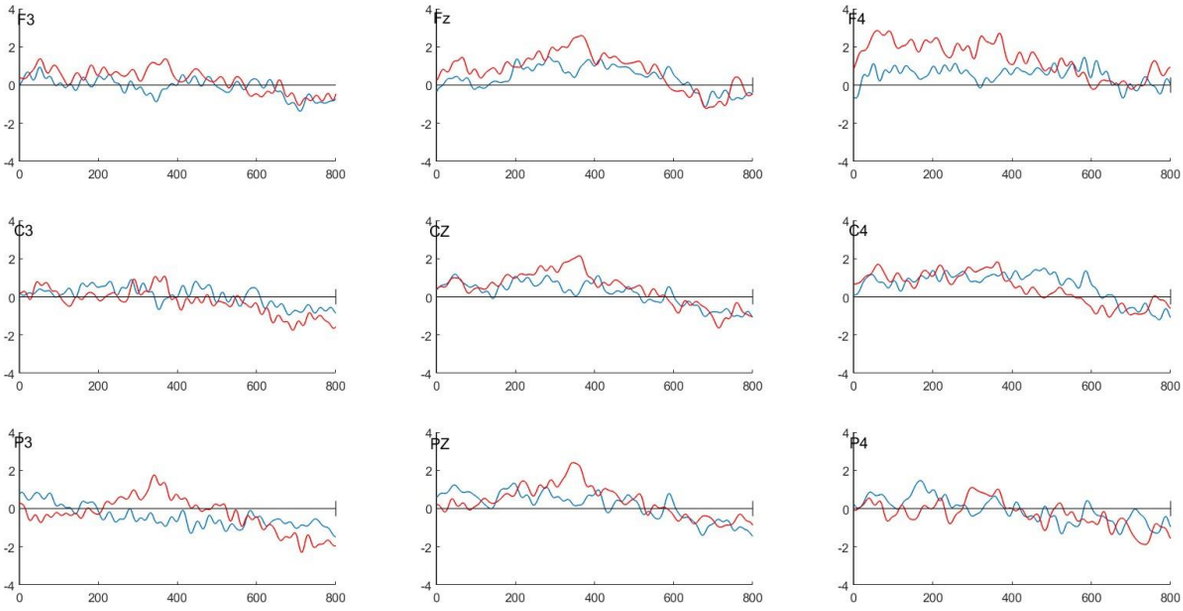
Note. Values show no significant effects.

Results – Linguistic TSCs

N400 results

Figure 12

Mean amplitude ERP for channels C3, C4, Cz, F3, F4, Fz, P3, P4, Pz for the semantic congruent (blue) and incongruent (red) conditions.



Note. Y-axis = amplitude, X-axis = time. Negativity is plotted downwards.

As mentioned in the previous section, sentences with semantic manipulation were analysed to dismiss the possibility of shallow processing or confounding results, if any were to be found.

Figure 12 (above) presents the Grand averaged ERP results for the N400 conditions in this study. It contains plots across nine channels for the semantic congruent and semantic incongruent conditions (i.e. where the N400 was expected).

However, as can be seen in Figure 12, the semantic violations do not seem to have elicited a larger N400 distribution than correct sentences in the 300–500ms window. In view of this unexpected result, to further the analysis, a repeated measures ANOVA was carried out. This corroborated the above visuals as a repeated measures ANOVA revealed no significant effect of Position, Laterality and Condition. There was also no significant result observed for the interactions of

Position and Laterality, Position and Condition, Laterality and Condition, and Position, Laterality and Condition. Table 26 (below) shows all the values of this analysis.

Table 26

Results for the ANOVA on ERP mean-amplitudes for experiment version 2.

	DFn	**DFd**	**F**	**P**
Position	2	54	2.183	0.122
Laterality	2	54	2.332	0.779
Condition	1	27	0.169	0.684
Position:Laterality	4	108	1.647	0.168
Position:Condition	2	54	1.334	0.272
Laterality:Condition	2	54	0.647	0.528
Position:Laterality:Condition	4	108	0.658	0.622

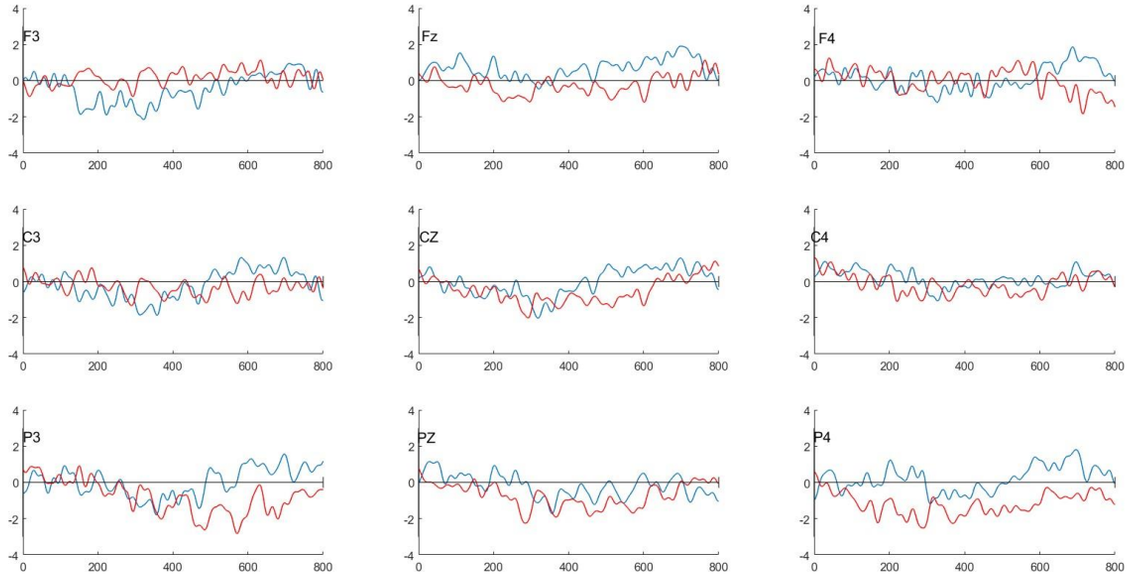
Note. Values show no significant effects.

Speaker results – Social Background

This version of the experiment was focused on social background (male or female) and congruency (congruent or incongruent). It was expected that gender violations spoken by the Maltese native speaker would result in a P600 compared with correct sentences. A clear P600 was not expected for the Maltese English speaker (as per previously mentioned studies), due to listeners being more lenient with such mistakes because the speaker's background implying less fluency. The Grand averaged ERP results for the speaker and relevant syntactic conditions in this study can be seen in Figure 13 and 14 below. Figure 13 displays results for congruency and incongruency for the sentences with the Maltese speaker, whereas Figure 14 displays the same but for the Maltese English speaker.

Figure 13

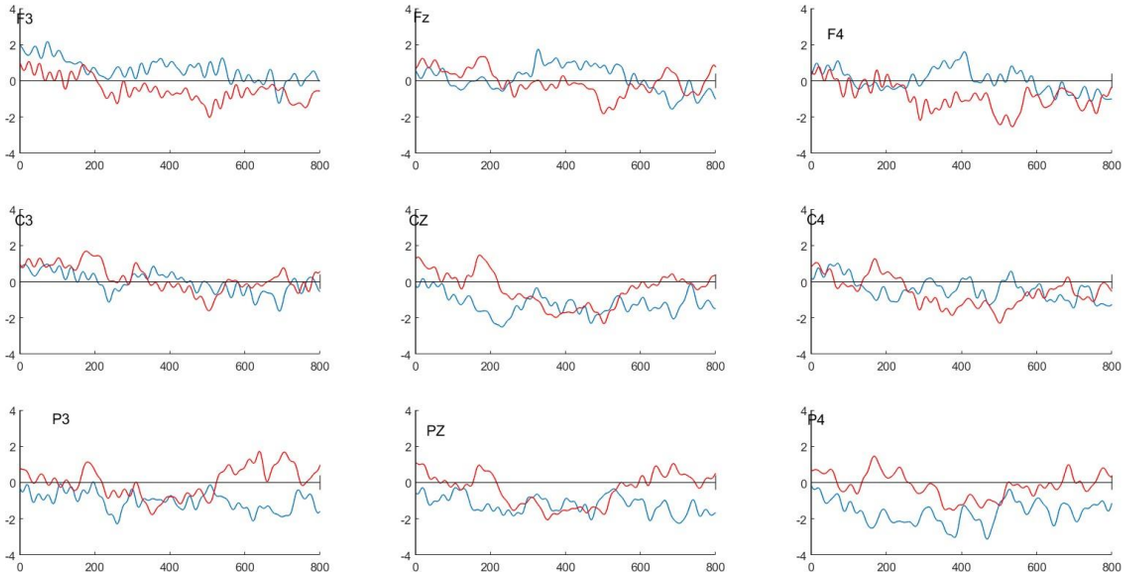
Mean amplitude ERP for channels C3, C4, Cz, F3, F4, Fz, P3, P4, Pz for the Maltese congruent (blue) and incongruent (red) conditions.



Note. Y-axis = amplitude, X-axis = time. Negativity is plotted downwards.

Figure 14

Mean amplitude ERP for channels C3, C4, Cz, F3, F4, Fz, P3, P4, Pz for the Maltese English congruent (blue) and incongruent (red) conditions.



Note. Y-axis = amplitude, X-axis = time. Negativity is plotted downwards.

Figures 13 and 14 show plots across nine channels for the gender (Maltese and Maltese English respectively) congruent and incongruent conditions. As can be seen in these figures, no clear P600 is observed for the syntactic incongruities caused by language background violations (i.e. Maltese and Maltese English Incongruent). This was also confirmed in a repeated measures ANOVA which did not reveal significant effects of Position, Speaker or Congruency. The only significant effect viewed was for Laterality. No significant results were observed for the interactions except for the interaction of Position:Laterality:Speaker:Congruency. For the interaction of Laterality:Speaker, Mauchly's test indicated that the Sphericity assumption had been violated ($p = 0.035$), therefore the Huynh-Feldt correction was applied (as epsilon is > 0.75). Table 27 (below) shows all the values of this analysis.

Table 27

Results for the ANOVA on ERP mean-amplitudes for experiment version 2.

	DFn	**DFd**	**F**	**P**
Position	2	52	1.866	0.165
Laterality	2	52	4.219	0.02*
Speaker	1	26	0.65	0.428
Congruency	1	26	0.442	0.512
Position:Laterality	4	104	0.299	0.878
Position:Speaker	2	52	0.158	0.854
Laterality:Speaker	2	52	1.303	0.279
Position:Congruency	2	52	0.51	0.604
Laterality:Congruency	2	52	2.801	0.07
Speaker:Congruency	1	26	0.053	0.820
Position:Laterality:Speaker	4	104	1.168	0.329
Position:Laterality:Congruency	4	104	0.604	0.661
Position:Speaker:Congruency	2	52	0.861	0.429
Laterality:Speaker:Congruency	2	52	1.611	0.209

Position:Laterality:Speaker:Congruency	4	104	2.595	0.041*

Note. Values show a significant effect for Laterality and the interaction Position:Laterality:Speaker:Congruency.

As this last interaction presented as significant, two paired t-test were run (one per variable) to evaluate further the impact of this result. The aim of using the t-test was to see whether the Speaker and Congruency significance varied across the electrodes used. Full results of these t-tests per electrode can be found in Table 28 and Table 29:

Table 28

Results for the paired t-test carried out as a follow up test due to the significant interaction of Position:Laterality:Speaker:Congruency observed in the ANOVA (above).

	T	**DF**	**P**
F3	-0.325	51.839	0.746
Fz	0.847	51.994	0.401
F4	-0.135	51.58	0.893
C3	-.1816	51.578	0.075
Cz	2.222	51.991	0.031*
C4	0.119	51.737	0.906
P3	0.186	50.941	0.853
Pz	0.052	51.782	0.959
P4	0.620	51.952	0.538

Table 29

Results for the paired t-test carried out as a follow up test due to the significant interaction of Position:Laterality:Condition, observed in the ANOVA (above).

	T	**DF**	**P**
F3	-0.103	49.68	0.916
Fz	0.948	51.995	0.348
F4	2.075	50.137	0.043*

C3	0.750	51.798	0.457
Cz	0.195	52	0.847
C4	0.758	51.3	0.452
P3	-0.362	51.24	0.719
Pz	-0.052	51.978	0.959
P4	-0.236	51.984	0.814

Summary

As per the hypothesis discussed in the earlier parts of this chapter, the effect of the state and identity of the speaker was expected to have a significant importance, however throughout both analyses this did not reflect as expected. This could be due to the type of paradigm chosen, which might have hindered the participants' attention to the stimuli as they were overall passive throughout the task.

The first version of this experiment focused on a contrast created by the gender of the speakers when this was incongruent with the adjective used. No results of the expected ERP signals were seen in the plots for both the control condition (the N400 section) and the experimental conditions. In the subsequent ANOVA for the control condition, the results in the effect of Position (AntPost), Condition, and the interaction between Position (AntPost), Laterality and Condition suggests that the participants were attempting to pay attention to the stimuli. However, in the Speaker and Congruency ANOVA, there were no significant results, which therefore does not highlight a particular effect of the speaker as per the original hypothesis. This was not in line with original expectation with regards to gender stereotyping. It was anticipated that Maltese participants would be sensitive to these types of mistakes, since correct usage of gender agreement is a crucial part of the everyday Maltese language. However, in the Speaker and Congruency ANOVA, there were no significant results, which therefore does not highlight a particular effect of the speaker as per the original hypothesis.

Similarly, in the second version of this experiment, which focused on a contrast created by

the language background of the speakers, no significant results were observed for the experimental conditions. However, in this case the N400 analysis was also not significant, possibly indicating that the participants were not paying the required attention to the task or where not being engaged actively enough by the stimuli or task used. In light of the literature quoted in the beginning of this chapter, it was expected that a noticeable difference in ERP results would be seen when the Maltese speaker made language mistakes, whereas there would be more leniency towards the Maltese English speaker.

In the next chapter these observations and results will be discussed further, along with potential limitations that led to such values and suggestions to be considered in future studies.

Chapter VI

Discussion

Introduction

The purpose of this thesis was to investigate how characteristics that are extralinguistic can influence language processing and understanding. Extralinguistic signals are what is left in speech once the communicative elements have been separated. They are not coded like linguistic and paralinguistic elements, yet they still contain useful information such as the identity or provenance of the speaker, habitual aspects of the speaker's voice quality etc. Extralinguistic information is thus informative but not communicative in the typical sense of its definition. The main argument of this thesis was that these types of characteristics can and do influence our perception of speech. In particular, the focus was on how extralinguistic characteristics intervene in situations when lexical ambiguities, in the sense of meaning mismatches, were encountered. Although there are many characteristics that can be taken into account, this thesis had to narrow down its scope and therefore focused precisely on the state of the speaker; represented through facial expressions and the identity of the speaker; expressed through the gender, age and language background of said speaker. Throughout the studies carried out, the main aim was to see if listeners would use such cues to enhance their understanding and to alert them of unusual utterances. Subsequently, the secondary aim was to try and ascertain a timeframe for the usage of these cues, to see if they were being used in a predictive manner and therefore if such cues could prime and activate information about a word. This chapter will reference the studies carried out and results obtained and discuss the implications of the work carried out in this project.

The state of the speaker

A varied body of studies (such as the ones mentioned in the literature review) have focused on ambiguous phonemes being disambiguated through available contextual information. For example, Warren (1970) demonstrated in his experiment, that in the absence of a phoneme,

listeners will use other disambiguating information that might be available at the time. Likewise, Ganong (1980) with his "Ganong effect" showed a proclivity to perceiving an ambiguous phoneme as a phoneme that would complete a known word according to one's language rules (e.g. /b/*all vs /p/*all in English). Moreover, Ganong noticed that this effect was most evident where the ambiguity was highest. Therefore, the context provided by the native speaker's knowledge of the rules of their own language was used to fill in any missing information in a way that makes sense.

Another example is McGurk and MacDonald's work or as it is commonly known – the McGurk effect (McGurk & MacDonald, 1976) which is possibly one of the most well-known examples in the field. It is an illustration of how speech perception is not only affected by auditory stimuli but also by visual ones. In the original task, upon showing a video with an individual uttering the syllable/ga/, combined with an audio of the syllable /ba/, the syllable /da/ is frequently heard. Such studies highlight that we do not only process sounds, we also process the visual inputs that accompany the sound (if they are present), i.e. in the case of natural speech, characteristics such as the speaker's facial movements.

Considering such studies, a question arose as to whether facial expressions and visemes would likewise influence disambiguation. This was the focus of the experiment outlined in chapter 3, as through such cues we can tell a lot about the state of the speaker (Juckel et al., 2018). In lexically ambiguous circumstances created when a stimulus is ambiguous between two members of a minimal pair (e.g., *sad* – *fad*), but both have drastically different emotional connotations, can facial expressions help us distinguish and even predict the correct meaning? Minimal pairs were identified as useful stimuli to investigate such issues. In an attempt to shed some light on this, the experiment chosen was a two-alternative forced choice task, applied in a bimodal perception scenario modelled after the McGurk paradigm, as this has proven as a valuable method to study audio-visual processing (McGurk & MacDonald, 1976). In the videos presented in the task, the emotion of the word matched or mismatched with the facial expression of the actor uttering the stimuli. A continuum of these mismatches was created, with ambiguous steps in between and the level of the mismatch was

varied across videos. Thus, two different types of cues were made available for disambiguation: the visible speech gestures and the emotional expression. For example, the words in the minimal pair '*miet – mitt' (*Engl. 'he died' – 'one hundred'*)*, could be accompanied with either a sad (congruent with *miet* / incongruent with *mitt*) or neutral facial expression (vice versa) and the words also differed in in terms of timing of the visual speech gestures (due to the long or short /i/). By using multiple stimulus pairs that either changed in their visemes or not, it was also possible to test whether the use of facial expression is limited to cases in which the articulatory movements are not informative regarding the choice. For example, going back to the minimal pair *'miet – mitt'(*Engl. 'he died' – 'one hundred'*),* the visemes are the same (labial closure for /m/, lip-spreading for long or short /i/, and alveolar closure for /t/).

Therefore, whilst all minimal pairs offered a contrast in the emotions that they represented; the issue is different for the visemes utilized. In the case of the stimuli pairs *Mard – Bard* (Engl. 'sickness' – 'cold') and *Ħabbet – Ħabbat* (Engl. 'she loved' – 'he knocked'), there was no difference in the visemes and therefore the articulatory movements are not particularly useful. With the stimuli pair *Miet -Mitt* (Engl. 'he died' – 'one hundred'), there was a durational difference in the vowel expressed. However, timing information is not processed very accurately in visual processing compared to auditory processing. Therefore, it was unlikely that the visual speech gestures would exert a strong enough influence on the choice. In the case of the remaining two stimuli pairs, *Mard – Ward* (Engl. 'sickness' – 'roses') and *Biża - Wiża* (Engl. 'fear' – 'gecko') there was a difference in the visemes presented as both cases contained an example of a labial closure versus an approximation.

Of the five continua used in the experiment none showed a significant result for emotional expression of the speaker towards influencing disambiguation. Out of the same five, only one, *Biża – Wiża* (Engl. 'fear' – 'gecko') showed a significant result in the interaction between auditory and visual stimulus. Here the data showed a significant interaction, that the visible speech gesture did aid in the correct prediction of the word uttered. Considering that *Biża – Wiża* (Engl. 'fear' – 'gecko') was one of the most diverse out of all five continua, this may indicate that in cases lacking auditory

clarity, which one can envisage many of in real life, some level of viseme distinction is necessary as a starting baseline.

Such a result is interesting, as it suggests that a certain level of contrast is required to be present not only in the auditory stimulus but also in the viseme observed. This is because, it is conceivable that the evidence of a clear articulatory visual cue may override the use of a facial expression. Such an idea makes sense when considering that generally speaking, mouth gestures have less variation than sounds. For example, F2 (the 2nd formant) may change across speakers as it is dependent on the individual's shape of the oral cavity, but all individuals make use of lip rounding to lower this formant. As such, several phonemes may share the same gesture so a class of visemes may contain many different phonemes (Thangthai, Bear & Harvery, 2018) and are variable between speakers(Lazalde & Maddock, 2010). Therefore, these two points highlight that in both factors, the bigger the contrast the better.

Moreover, the influence of the visual speech gesture on the participants decision making should also be looked at in terms of more general information integration. As mentioned in Chapter 2, currently, models of word recognition can be divided into two groups. In Highly Interactive Models the direct and immediate interaction between diverse cues such as acoustic, lexical, contextual cues (which in this case cover a broad base such as visual cues, speaker information etc.) works such that top-down information effects the perceptual system (Grossberg & Myers, 2000). In Post Perceptual models a separate phoneme decision layer where listeners combine high-level lexical information with low-level phonetic cues (such as in Norris, McQueen & Cutler's Merge model, 2000) is essential. For example, in Merge, phonemic decisions are based on the merging of prelexical and lexical information, which arguably allows it to correctly predict lexical involvement in phonemic decisions in both words and nonwords. If there is a direct interaction of all different cues available, as stipulated by the Highly interactive model, such as in the experiment by Myers & Blumstein (2008), where participants showed a Ganong effect (i.e. preferring the lexically consistent alternative in the word pair stimuli) in the context of real word and non-word stimuli pairs (e.g. gift–*kift* and *giss*–kiss), the question arises as to why this interaction (of auditory input and visual gesture) was only

observed clearly in one stimuli pair, with no interaction of the facial expression evident at all? If on the other hand we take the Post Perceptual models (Norris, McQueen & Cutler's, 2000) idea of merging prelexical and lexical information in a separate step, i.e. in this case the facial expression and viseme along with what was uttered, we might be able to explain this lack of overall results owing to the lack of enough contrast (due to the reasons mentioned above) in this step.

In summary, the results achieved were not as expected, i.e. perceiving the emotional expression of the speaker seems to not have influenced the listeners choice when disambiguation between ambiguous stimuli. Also, a clear effect of the visual speech gesture was only observed in one of the two cases where it could be expected. Whilst, as previously mentioned both *'Biża – Wiża'*(Engl. 'fear' – 'gecko') and *mard – ward* (Engl. *'*sickness' – 'roses'), contained an example of a labial closure versus an approximation, *'Biża – Wiża'*(Engl. 'fear' – 'gecko') was the only one which produced significant results. This indicates that participants were attending to the visual stimuli presented, however it does not provide evidence to back the original hypothesis, i.e. that facial expressions would be a main guiding cue for disambiguation. In light of these conclusions, some limitations also need to be discussed as they too might have affected such results.

Limitations and Future Work

Potentially, the failure of the emotional expression of the speaker to influence the speech categorization could also stem from the limitations of this experimental task itself. Therefore, such boundaries must be considered and suggestions to improve further investigations can be outlined.

Firstly, the task chosen might have not been the best fit. For example, Fagel (2006) also described surprising results in his multimodal task where he presented participants with stimuli made with an emotionally neutral sentence (meaning wise) uttered in four different emotions (content, happy, sad, angry) and asked participants to state what emotion they were perceiving the sentence being uttered in. In his results, he recorded that evaluative meaning (happy or sad) seems to be perceived from the facial expression, whilst stimulatory meaning (angry or content) seems to be perceived more auditorily, in the tone of voice. This could be because the correct perception of

emotion is not only dependent on the dimensions of valence (facial expression) and arousal (tone), but other dimensions as well such as low-level cues (e.g. voice quality parameters. articulation features etc.) Consequently, such cues are used and denoted in both the modalities of audition and vision and incorporated to the perception of emotion, which would severely limit tasks which do not include all such features. Meaning congruency has also been shown to have a significant impact when it comes to the McGurk effect (Windmann, 2004). The effect is perceived more often and more clearly in conditions that are semantically congruent vs incongruent conditions, due to the expectation certain cues can create. Having used stimuli where sometimes the visual facial expression led to the opposed emotional expectation of the auditory word stimulus heard, could therefore also have been a hinderance in this task. It is also worth noting that McGurk and MacDonald (1978) themselves noted that the effect works better with some consonant combinations rather than others. Consonant combinations that used different formations and parts of the mouth when produced seem to have shown a greater McGurk effect than those that have the same mouth formations and therefore this task might not have been the best option for the stimuli chose.

Secondly, emotion recognition studies have suggested that such recognition is extremely categorical, which consequently makes emotions with definite contrasting category boundaries easier to distinguish from each other. One such study is provided by Etcoff & Magee (1992). They argued (like others mentioned in the literature review such as Ekman & Friesen, 1978) that we universally identify the 'main' facial expressions of happiness, sadness, fear, anger, disgust, and surprise. This suggests a perceptual mechanism evolved to distinguish the facial composition that

categorises each of these emotions. To test this, they used groups of computer-generated drawings, each consisting of a series of faces differing by constant physical amounts, moving from one emotional expression to another (or to neutral). The first task was for participants to distinguish between these pairs of faces. In a latter and separate task, they then categorized the emotion displayed by each photo. Faces in different categories that differed by equal physical

amounts were distinguished more easily than faces that formed part of the same category. This is very much the same as categorical perception in language, where for example we can more easily distinguish between different sounds, such as a /p/ and a /b/ rather than variations of /b/ (even though this effect is much more task-dependent than early research suggested, see Schouten, Gerrits, & Van Hessen, 2003). Thus, categorical perception also seems to apply to emotional expressions, and therefore viewing them just as a group of constant physical properties, is not adequate.

Another example is provided by Goren and Wilson (2006). Similarly, to Etcoff and Magee (1992), they also used artificial happy, sad, angry, and fearful facial expressions to define the amount of geometric change in facial movement needed to recognize these emotions. Conditions such as central viewing, peripheral viewing, and inversion were applied in a forced choice task to study recognition of these emotions. The results obtained showed that the pattern of detection was emotion- and task-dependent. Facial expressions presented with low variations of change were more difficult to distinguish from neutral expressions than faces defined by mid or high range of change. Common confusions between fear and sadness, were assigned to the fact that there are smaller physical contrasts in category boundary between these two emotions. Peripheral viewing also made identification more difficult for most emotions. These findings further support the ideas that, at least for these 'main' emotions, representation via the right category elements is important. Such reasoning can also to be applied to this study. Whilst in the experiment presented in this thesis, a pre-test was carried out to ascertain that the meanings for the words used were distinct and recognisable, the same cannot be said for the facial expressions and visemes of the actress in the videos. As both visemes and expressions can vary per speaker, it may be useful for future work to carry out a recognition test for the emotions displayed by the chosen speaker/s to ensure they are categorically distinct enough to be easily recognisable.

Thirdly, the presentation and choice of stimuli might also not have been the best representative combination. Some issue were noticed with the stimuli. For one, the minimal pair *Miet -Mitt* (Engl. 'he died' – 'one hundred') presents a clear ambiguity. *Mitt* (one hundred) is lexically

ambiguous as it can also mean 'I died', which makes it an inflectional variant of the same lexeme as the one it was originally meant to contrast with i.e. *Miet,* therefore potentially removing the lexical variable in this case. As for the number of minimal pairs used, whilst as previously mentioned the number of trials does grow significantly due to the manipulation of different continua, a broader range of lexical items could have supplied more instances of each combination of the Viseme Difference/Congruent Emotion/Incongruent Emotion design improving accuracy and consistency and reducing item specific errors. Additionally, two of the minimal pairs involved the word *mard* (*Mard – Bard* (Engl. 'sickness' – 'cold') and *Mard – Ward* (Engl. 'sickness' – 'roses')). Such repeated exposure to the same word (albeit with a different contrast), especially within a smaller set of stimuli, might also have impacted the outcomes.

As for the presentation of the stimuli, in the experiments carried out by Massaro and Egan (1996) which also used audiovisual cross-combined stimuli, a non-negligible number of the subjects reported a surprising response to one of the stimuli pairs viewed. The audiovisual cross-combined stimuli in this case were made of the word *please* uttered in four different emotions (happy, angry, sad and fearful), with natural audio and synthetic video. When happy audio was played along with a fearful video, 41% of the subjects reported to perceiving surprise rather than any of the two emotional cues involved. This could be the case because Massaro presented the same audio and video parts more than once in the trials, which was also the case in the experiment presented in this paper. Another reason could be the incongruity between the audio (natural) and the video (synthetic) stimulus parts which was also the case in this research (albeit vice versa). Consequently, a task with more holistic stimuli and preferably mimicking the flow of a conversation would be more ecologically valid. This is also key considering the interest in the timing window of the effectiveness of such cues. In real life with free-flowing conversations happening all the time, it could well be the case that facial expressions work as predictive cues in relation to other types of context obtained from real-life conversations, such as the situational context for example. Using a different paradigm, one that creates useful contexts that permit such interactions, and the manipulation of biases that may

be active when listeners are interpreting language in a discourse setting could prove more useful.

The identity of the speaker

The experiments outlined in chapter four and five focused on TSCs (talker-specific characteristics), through which we can tell a lot about the identity of the speaker. Based on the categorizing effect supplied by our biases, can the identity recognized through the voice of the speaker help us distinguish the correct meaning in certain lexically ambiguous situations? Identity in itself, is a very widespread umbrella of characteristics and due to this, these tasks focused on the traits of age, gender and linguistic background. These traits were chosen based on previous studies that served as the inspiration for these sections.

TSCs in active listening: the eye-tracking task

Hagoort & Van Berkum's (2007) study led to the idea of the first experiment dealing with the identity of the speaker. In their study Hagoort & Van Berkum (2007) carried out an ERP experiment in which participants listened to various sentences, some of which contained a speaker mismatch. This incongruity was achieved by employing a specific word, so that the content of the message mismatched with implications about the speaker based on their voice (which provided information about the speaker's gender, age or social status). For example, a male speaker uttering*: I want to look like Beyoncé in her latest photoshoot,* or a child uttering: *I'll have a cigar before I go to sleep*. Their findings indicated a clear N400 effect for in the case of mismatches and was similar both in magnitude and timing to the N400 seen in 'normal' semantic anomalies (for example, *the moon won the eating competition*, as opposed to *the competitive eater won the eating competition*) which suggests that the context achieved from the stereotype of the speaker was taken into account just as linguistic knowledge is take into account for semantic anomalies.

Another important study was Cai et al.'s (2017). In their first task, a word association task, they found that British participants chose the American dominant meaning of a word (for example, the meaning 'hat' for bonnet) more frequently if they heard the words in an American accent rather than a British one. This showed that the speaker's perceived accent was guiding meaning retrieval.

They then carried out a further two tasks that were timed, a speeded semantic decision task and a sentence comprehension task where they used similar stimuli to the first experiment. In both tasks, participants were asked to make quick judgements about the stimuli encountered (in the first task about word relatedness and in the second about utterance sensibility). They found that comprehension of ambiguous words and utterances (due to different meanings across speaker accent) is less effortful when the relevant word meaning was congruent with the speaker's dialect. Their results indicated a process where this characteristic information and world knowledge combine to guide meaning selection towards congruent or biased perspectives making these meanings more easily accessible during on-line meaning processing. Importantly, the results showed that the effects are not triggered by the speaker characteristics carried by the word itself, but by the perceived speaker identity in a given situation.

Similarly, the eye-tracking experiment featured in this thesis (described in chapter 4), used ambiguous utterances to test whether the gender (male vs. female) and age (adult vs. child) of a speaker would influence disambiguation. The ambiguous situations were created when a word could have multiple meanings in an utterance (for example 'play' being used to mean a child playing or an adult gambling). Verbs were identified as an interesting case to investigate such issues. Firstly, this was due to many Maltese verbs having generic and specific meanings. This meant that an analysis could look into whether prediction via TSCs is enabled in generic cases as well as more specified ambiguities. Secondly, due to these meanings being applicable to a gender or age bias, which in turn enabled the analysis of whether these specific TSCs were useful for disambiguation. A corpus study was also carried out to assess these two points were present in the verbs chosen.

The task chosen was a four-alternative forced choice (4AFC) task, applied in a visual world paradigm, as visual world paradigms have proven very useful to investigate language processing since multiple sources of information such as syntactic analyses, predictions, and event representations can be inferred from the direction of the participants eye gaze (Huettig et al., 2011). In an attempt to shed some light on the time frame within which these characteristics had an

impact, two versions of the experiment were created (within which different participants took part). One contained utterances with verbs following a temporal marker (such as, *Is-Sibt li ġej se nilgħab bil-karti. – '*Next Saturday I'll play cards'). The other contained verb-initial utterances (such as, *Se nilgħab bil-karti is-Sibtli ġej. –* 'I'll play cards next Saturday'*).* These sets of utterances had the same meaning, they only varied in the order of the sentence.

Therefore, employing such a design and materials allowed a look at the original hypothesis from three points of view. Firstly, if the TSCs of age and gender did have an impact on sentence level processing. Secondly, if they could be useful both in generic and specified ambiguities. Thirdly, if the issue of timing could be assessed as immediate or not.

In terms of results, congruency effects were investigated in the form of accuracy, response time, and eye movements. In terms of accuracy, in both the verb non-initial and verb initial trials the results indicated that participants were paying attention to the stimuli as they clicked correctly most of the time. In the verb Non-initial category, the results indicate that participants clicked on the expected word around 88.5% of the time, with little variance between the experimental conditions (min: 86.5% (main incongruent), max: 91.3% (main congruent)). Whereas in the Initial category the results indicate that participants clicked on the expected word around 89.25% of the time, also with little variance between the experimental conditions (min: 88% (specific incongruent), max: 89.9% (specific congruent)). In both cases a generalized linear mixed-effect model was used with the correct click response rate as the dependent variable. Results of this analysis highlighted an effect for the independent variable of Congruency on accuracy in the case on the Non-initial verb trials. The better performance in the congruent condition supports an effect of the speaker (in line with the experiments mentioned above such as Cai et al. 2017). Also, in agreement with Cai et al. (2017), no such results were observed in the verb non-initial case, indicating that some time is needed for these effects to set in.

In terms of response time, in both utterance manipulations there was not much of a difference in response times between congruent and incongruent conditions. However, some

numerical differences in response times were noticed in regard to main meaning vs. specific meaning. In the case of Non-initial utterances, the mean response rate for the main meanings was that of 3226.5 ms and 2707 ms for specific meanings. In the case of Initial utterances, the mean response rate for the main meanings was that of 2880 ms and 2323.5 ms for specific meanings. In both cases to further analyse this data, a linear mixed-effect model was used with the reaction time as the dependent variable, the contrast-coded fixed factor for meaning (±0.5) and congruency (−0.5: incongruency, +0.5: congruency), their interaction and random factors per participant and item.

Results for the Non-initial trials and the initial trials both showed a statistically significant effect for the independent variable of Meaning on response time. This entails that, in both versions of the experiment, participants had a preference for the subordinate meaning, which in both cases is the more specific and easily biased meaning (as evidenced by both the means and also the regression analysis).

In terms of eye movements, the analysis was split into a Prediction phase and Recognition phase by looking at different time windows. For reasons explained in (4.1.1), the prediction phase time window was set to 200ms before target onset to 100ms after, so as to focus on early prediction effects on processing, before the crucial target is heard and therefore recognition sets in. For the Recognition phase, the time window 200ms–800ms after target onset was taken into account. These time values were chosen so as to focus on the phase after the target word is heard and recognised and allow for aggregation to reflect the full extent of processing. A linear mixed effect model was used with target preference as a dependent variable for both time windows. In the case of the Non-Initial utterances, results for the prediction phase showed a significant effect of the interaction of Meaning & Congruency. This seemed to be caused by a preference for the target in the congruent condition and the competitor in the incongruent condition for the subordinate meaning (Figure 7), with no clear preference in the main-meaning condition. No significant results were observed for the Recognition phase. In the case of the Initial utterances, no significant effect was observed in the prediction phase, however values showed a significant effect for meaning. This seem to be caused by a

slight preference for the target vs the competitor in the congruent condition and the competitor vs. the target in the incongruent condition in the case of subordinate meaning. No clear preference was seen for main meanings.

Overall, the results from these eye-tracking trials highlighted that the cues of age and gender were useful by participants during the language they were processing in this task, albeit with some constraints. Firstly, the accuracy responses highlighted that there were more correct responses in the congruent conditions, which supports an effect of the speaker when the meaning is congruent with the speaker's identity (in line with the experiments mentioned above such as Cai et al. 2017).

Secondly the fact that these significant results were not obtained in the Non-Initial trials highlighted that some time was indeed needed to enable prediction. Such observations suggest that extralinguistic characteristics that provide information about the identity of the speaker (in this case specifically age and gender) can influence speech categorization and therefore be used in disambiguation, provided that there is enough time for this process to happen. This type of result emphasising a need for an 'allocational' time window in order for prediction to occur, is compatible with others in the literature, such as Huettig and Guerra (2019) who showed that the amount of 'preview' time available influences the possibility of language prediction. They also used the eye-tracking technique for a series of experiments, however their participants listened to some simple sentences (such as 'Look at the exhibited art') whilst viewing four pictures (a target, e.g. a painting, and three unrelated distractors). In all experiments, the visual stimuli and target utterances were the same, however according to the experiment speech rates (slow to normal speech rate) of such utterances, preview time (four seconds, one second and no preview time), and participant instructions were varied. Their results showed that only in the case of a normal speech rate with the maximum time for preview, prediction was observed. Even the clear command to predict the target resulted in only a small anticipation effect under a normal speech rate with a short preview.

It hence seems that listeners seem to make a model of the perceived speaker and then

interpret incoming material according to that model. It follows from this assumption that no effects should be expected when a word is heard at the beginning of a sentence before a model of the speaker can be constructed (the current data) and that the exact amount of accent on a given word is less important than the general accent of a set of words (Cai et al., 2017). This, in effect, also suggests that listeners do employ speaker normalization in word recognition (e.g., Ladefoged & Broadbent, 1957), rather than storing exemplars of words from different speaker. The latter account (e.g., Goldinger, 1998) would predict an immediate effect of speaker characteristics. However, while listeners employ speaker normalization, they do not "throw away" the information that is speaker specific but use it to build a model of the speaker and interpret incoming information accordingly.

Thirdly, it is interesting that in both versions of the experiment, participants had a preference for the subordinate meaning, which in both cases is the more specific and easily biased meaning (as evidenced by both response time and eye-tracking analysis). Therefore, participants found it easier to apply the cues provided towards disambiguation, when the meaning options were more restricted and ultimately more specific. This observation poses an interesting question into what role specificity plays, as it highlights that there was an ease for involving such cues in the more specific of contexts. Is this because due to the categorization effect our biases produce, such cues are more useful towards more specific meanings vs. generic ones? Is it the case that specific meaning needs such decoders to be interpreted as it proves more effortful (Grice, 1989; Levinson, 2000) whereas more generic meaning does not? Such questions pose ground for further studies, whilst adding to the trajectory of TSC inclusive accounts of human speech perception and language processing, where higher level and rather complex social structures are assumed to have an influence on basic processes as phonological categorization of the speech signal (such as, Strand, 1999; van Berkum et al., 2007; Boland & Clark, 2014; Ryallas and Pisoni, 2016, etc.)

TSCs in passive listening: the ERP Investigation

This eye-tracking work mentioned in the previous section inspired an ERP follow up into ambiguities less broad in nature. The style and technique used for this experiment was very much

inspired by work carried out by Hanulikova et al. (2012). Hanulikova et al. (2012), ran an ERP experiment to look into whether the neural processes of syntactic processing are affected by speaker identity. Participants listened to syntactic errors made by both a Dutch native speaker and a fluent, non-native speaker with a clear foreign accent (first generation Turkish speaker). The ERPs obtained for both were compared and the researchers observed that the syntactic errors made by the Dutch native speaker caused a P600 effect, however the same errors made by the non-native Turkish speaker did not cause the same effect. Control sentences with semantic errors caused N400 effects for both speakers, therefore showing no general integration problem in the non-native accented speech. Therefore, just as for Hagoort & Van Berkum's (2007) and Cai et al.'s research mentioned in the eye-tracking section, studies like these show that TSCs (in this case the language background of the speaker), are considered, much as other information such as linguistic knowledge.

Likewise, in chapter 5 this thesis looked at situations where an ambiguity was caused by language mistakes, which can be prevalent in everyday language. Adjectives were identified as an interesting case to investigate such issues, as in Maltese they are subject to gender agreement. For example, the English phrase *I am smart* would translate to either, 'Jien bravu' or 'Jien brava' depending on whether one is male or female, respectively. This agreement can then be applied in two ways. If the agreement is used in a first-person manner, then it describes the speaker themselves (as the example above). If it is used in a third person way, then it is used to describe someone/something else (*Tatiana hija brava* – 'Tatiana is smart') with the rest of the utterance. Therefore, the third-person errors can be resolved by using the linguistic system alone, i.e. by knowing which parts go with which in the sentence. The first-person mismatches however cannot since they need a speaker to be applied to Using such a manipulation also addresses the issue of whether sentence parsing is to be viewed from a modular point of view or an interactive one.

In a Modular view of sentence processing each component engaged in sentence processing is processed as per its own segment, and therefore has restricted interaction with the other components. For example, in such a view syntactic analysis, semantic analysis and context-

dependent cues would all be processed separately. This leads to a feed-forward design where the result of a processing stage is passed on to the next, without a feedback mechanism, hence not allowing the result of the first stage to be changed. Here syntactic processing is the most vital phase which then is added onto semantic processing and other types of information (if this is needed due to processing not being completed). Of the opposite opinion are Interactive views where all available information is processed at the same time and all this information can instantaneously impact the analysis and therefore the final outcome. Therefore, in this view there are no separate steps but rather, syntactic analysis, semantic processing, contextual cues etc. all interact and are processed at the same time in parallel.

Due to these two different sentence structures, two separate versions of the experiment were created. The first tested gender, using the first-person sentence stimuli. It is important to remember that, here, we presented stimuli that were syntactically correct in a written form, but only contained a mistake due to the identity of the speaker. The other tested sociolinguistic background, using the third person sentence stimuli. Both experiment versions followed a 2x2 factorial design. In version A this was achieved by combining gender (male or female) with congruency (congruent or incongruent). In experiment B, on the other hand, sociolinguistic background (Maltese speaker or Maltese English speaker, both male so as not to create further variables) and congruency (congruent or incongruent) were combined. The congruent sentences were always grammatically correct and therefore should have been easier to process, whereas the incongruent sentences were created to be ambiguous and confusing as they were grammatically incorrect, by Maltese language rules.

In the first version of this experiment, which created an ambiguity when the gender of the speakers mismatched with the adjective used to describe themselves, it was anticipated that Maltese participants would be sensitive to these types of mistakes, since correct usage of gender agreement is a crucial part of the everyday Maltese language. Unlike the results observed in the eye-tracking paradigm, the effect of the speaker was not reflected in the ERP results observed. This

implies that in this particular case, the gender of the speaker seems to not have influenced the listeners' choice when disambiguating between ambiguous stimuli. Whilst this could be due to the type of paradigm chosen (which will be discussed further in the next section), such a result also opens up the argument for specificity again. Were such effects evident in the eye-tracking paradigm because this included narrower contexts, whereas the EEG experiment did not?

Similar results were also observed in the second version of the experiment, which focused on a contrast created by the language background of the speakers, i.e. a Maltese speaker and a Maltese English speaker making mistakes in gender agreement when describing someone / something. Much like in Hanulikova et al. (2012) it was expected that a noticeable difference in ERP results would be seen when the Maltese speaker made language mistakes, whereas there would be more leniency towards the Maltese English speaker due to the sociolinguistic background in Malta (described in chapter 2, Bonniċi, 2017; Caruana, 2011). This was also based on previous research on sociophonetics (Martin. et. al, 2016), where it has been argued that lexical integration might be mixed when listening to an unfamiliar dialect. In such cases, less frequent words (such as an adjective used in the wrong gender agreement) should elicit larger LAN / P600 effects in a native or familiar dialect only.

However, the sociolinguistic background of the speaker seems to not have influenced the listeners choice when resolving these mistakes. This is evidenced both in the plots and ANOVA as no LAN / P600 anomalies were observed. Not achieving such results possibly again highlights the broadness of the contexts used, but also maybe be evidencing that this sociolinguistic characteristic is not a strong enough guiding factor for language interpretation in the setting of Maltese sociolinguistics. This could be because there isn't such a contrasting bias between a Maltese and Maltese English speaker as these are variations of the same language rather than two different languages such as in the case of Hanulikova et al., 2012, which used a Dutch and a Turkish speaker both speaking in Dutch. Grey and van Hell (2019) also ran a similarly structured ERP task where participants listened to target sentences embedded in a conversation between two people. Once

again, they used clearly distinctive speakers, a standard native American English accent versus a foreign Chinese-English accent. The target sentences in the study consisted of declarative sentences that were grammatically correct or incorrect (for example a grammar target could consist of a sentence such as: *Mark's was planning to attend the concert but he/*she missed the bus to the venue*). ERP results showed that native-accented speech elicited a frontal negativity (Nref) for grammatical errors and a delayed N400 for semantic errors. Nevertheless, when it came to foreign-accented speech only semantic errors produced an ERP effect, once again a late negativity.

A final consideration concerns the studies that inspired these experiments and other similar studies. Results from multiple studies discussed in this thesis support the idea that we can routinely pre-activate lexical items using cues that reflect the speaker's identity (such as grammatical gender or sociolinguistic status). However, such results have been hard to replicate which could indicate false positives. For example, Kochari & Flecken (2019) attempted and failed to replicate Otten and van Berkum's (2009) study reporting ERP evidence for lexical prediction using Dutch gender-marked articles. Whilst they followed the original set-up closely, they admit that there were some important methodological discrepancies which could have led to the weaker effect reported in their replication study. Similarly, Ito, Martin and Nieuwland (2016) failed to replicate the findings of Martin et al. (2013) and DeLong et al. (2005) where an N400 effect was elicited when native speakers were presented with gender mismatching noun articles versus matching articles. Such discrepancies call for further and diversified research to conclusively argue for use of speaker identity cues and their presence or absence in a potential predictive process.

As for the lack of results of the N400 control condition these remain perplexing, however some thoughts are also to be considered. Starting with the results from the Gender experiment, the statistically significant results for the control stimuli (Position, Condition and the interaction Position:Laterality:Condition) do indicate that the participants were attempting to listen carefully to the stimuli provided. In the follow up t-test done due to the significant interaction of Position:Laterality:Condition, the results showed that condition was significant in almost all electrodes (except for F4, C4 and P3), therefore it seems that the effect of condition only differs in

size across electrodes rather than it being particularly significant in a certain area of laterality. This however was not the same in the sociolinguistic version were no such results were detected.

Whilst researchers have documented issues with the N400 signal and speaker accent (such as Grey and Van Hell, 2017), the situation created in this experiment varies for a number of reasons. Firstly, Maltese English is not exactly a form of Foreign accented speech but rather a variation. It is much more familiar to Maltese speakers than Chinese vs American English as in the case of Grey and Van Hell. Whilst one may not have been raised in that linguistic environment or not use that variation, we are exposed to it all the time since it is used throughout Malta by a large percentage of the population. A great percentage of Maltese raised speakers come in contact regularly with individuals using this variation (whether as friends, co-workers, relatives or even strangers). Secondly a 'neutral' native speaker of Maltese was used to produce the semantic anomalies. This means the speaker did not have a Maltese English accent, but also a Maltese accent that was not too strong. This was done precisely to avoid having the control conditions sounding as either of the experimental conditions and therefore creating any confounds. Hence, looking at the limitations identified might provide further insight.

Furthermore, it might be worth taking into consideration that the stimuli presented in the two versions of the ERP task varied in perspective. This might have had an effect on the participants perspective and attention perhaps even have influenced their reaction (or lack thereof) to the control conditions. Stimuli in the first version were presented in a first-person version to highlight the contrast between the gender of the speakers and the mismatches created. Stimuli presented in the second version were provided in the third person version so as to be able to keep the gender of the speakers the same, whilst achieving a match or mismatch with the actor's sociolinguistic background. This however may have resulted in less attention garnering stimuli as opposed to the first-person ones (Chisholm et al., 2014). Research has shown that we do not instinctively possess the ability to infer the perceptual experiences or cognitive state of others. Whilst there is no consensus on when this skill is developed, the options range anywhere from as young as 3–5 years of age

(Mossler, Marvin, & Greenberg, 1976) to the age of 7 (Piaget & Inhelder, 1956). This learned ability to recognize our experiences, whilst also understanding that others have separate experiences is crucial for issues such as theory of mind. Consequently, it affects communication as we learn to infer the state of others and use such information as a processing aid. Due to this, individual representations of first- and third-person perspective arise from a young age. Yet, though we learn this perspective, we demonstrate an egocentric bias that perseveres throughout adulthood (Epley, Morewedge & Keysar, 2004). Such a stance is even reflected in different patterns of neural activity (David et al. 2006). Hence, due to the fact that we experience life from an egocentric, i.e. first-person perspective, rather than a third person empathic point, such stimuli might have added an extra weight to the processing required and therefore diminished or cancelled the participants attention in this case.

Ultimately considering the overall lack of any effect especially the N400 and the high nosiness of the waveforms, technical issues such as the task itself and the processing of the signal also have to be considered for possible issues. As the task was completely passive with no real instances of interaction and also as it was quite long to complete, it could possibly be that such an environment was much too passive for the participants to be able to direct their attention properly to the stimuli and therefore to observing the desired signals whilst also could have led to noise formation. Finding ways to keep the participants focused and engaged such as, engaging checking questions where participants have to type in answers could limit internal cerebral noise. Providing frequent breaks to allow participants to relax and move around could also help improve the signal in relation to blink and movement artefacts. Although this study was carried out with the utmost care and consideration, the pre-processing part of the should also be doublechecked for errors that could have contributed to the signal to noise ratio. In particular, the steps involving manual processing of the signal, such as for example, the importation of raw data and the removal of hand selected ICA (Individual Component Analysis) components.

Limitations and future work

Whilst these experiments were designed with the utmost care, throughout their running limitations have been identified and it is important to consider them and suggest improvements for future studies. The insight gained from such limitations could potentially explain further the results described, such as, especially the failure of gender and age to be significantly used as disambiguating cues in the ERP experiments.

Firstly, much as in the literature mentioned throughout this thesis, both of the studies described, and their different versions focused on characteristics that were expected to be biased (age, gender and sociolinguistic background). In the eye-tracking case this was achieved by arbitrary differences such as for the female condition, referring to things that are more distinctively female, for example using make-up. In the case of the ERP study this was achieved by a necessary gender agreement. For example, in the case of the sociolinguistic experiment, a person raised as a Maltese speaker would be expected to correctly conjugate an adjective with the appropriate subject, whereas a person raised speaking English or Maltese English might be given more leniency when committing such mistakes. However, as biases are subjective per individual, but also more importantly per social setting it is important to establish that these biases do really exist in the Maltese setting and that they exist to the level expected. If the biases used are not up to the preconceived standard of the task, then it is fair to assume that the then weak bias cannot affect language processing. Whilst there were pre-tests carried out to gauge if the trend was as expected, these were on the small scale. There needs to be a large-scale study carried out on these biases themselves before conducting further research, which should be done both by experimental testing of such biases and also by looking at research from other fields that might have focused on these biases within the Maltese setting. Having a balanced number of participants of different genders and ages would also be ideal. The pretest carried out to evaluate the bias of the stimuli used in the eye -tracking experiment had an asymmetric number of young males and females (30 females and 10 males) as participants. However, with gender and age being the variables under discussion such an imbalance

might have had an impact on the overall evaluation of the stimuli. Moreover, with regards to the ERP stimuli, as the stimuli themselves were not pre-tested (unlike in the McGurk task and the eye-tracking task), an item-specific analysis might be useful to ascertain if the results obtained are due to problems with the experimental materials themselves, rather than the bias applied.

Secondly, the listener's perspective is also to be taken into consideration. Adding onto the previous point, knowledge is also needed regarding the participant's individual biases. This could be carried out via a short anonymous survey to be completed after the task is carried out. As Halley (2001) remarks, "Meaning is assigned based on what is organized, the listener's intent, the listener's value system, and the expectations of the listener or the probability that a particular pattern should occur based on the experience of the listener" (p. 17). Language processing also varies based on the participant's ability to deal with Cognitive Backlog (Beatty, 1981) or the process of dealing with information that continually adds on and then 'backlogs' one's working memory. Listeners exposed to larger message lengths and/or speed may experience diminished listening ability (King & Behnke, 2004). This is especially important in the case of passive listening tasks, such as in the ERP task where due to no interaction, it may be more difficult to keep the participants' attention as is required of the task, versus an active listening task (such as the eye-tracking task), where participants are engaging with both the stimuli and interface.

Thirdly, due to the number of stimuli presented in the ERP task, participants may have 'learnt' the actors' voices and due to this disassociated the bias that should have come with these voices. For example, Lattner & Friederici (2003) also looked into mismatches between utterances and the speaker saying it. In their experiments they presented participants with audio recordings of sentences that contained stereotypical male or female utterances. When congruent, the gender of the speaker matched the stereotypical content, and vice versa when incongruent. For example, in the female congruent condition, stereotypically female utterances were produced by female speakers such as, *'I like to wear blusher everyday',* whereas in the male incongruent condition such an utterance would have been produced by a male speaker. The ERP results showed that for both the

incongruent conditions (male and female incongruent) a late P600 effect was observed, mostly at the posterior electrodes. No such effect was observed in congruent conditions control conditions (male and female congruent). As they did not observe ERP effects earlier on (peak latency was 832ms), they argued that this was because semantic information is accessed first and independently from the speaker's voice, and eventually the speaker characteristics and corresponding stereotypical knowledge and semantic meaning are integrated in a later processing stage. However, Van Berkum et. al (2008) argued that their lack of results earlier on was because of the design of the task and the effect of this on the participants. As the task consisted of many similarly built stimuli with incongruencies always occurring at the sentence-final word (140 congruent and incongruent sentences respectively), whilst not having any fillers, Van Berkum et al. argue that such a structure might have helped participants to learn what the critical target of the experiment was. This repetition may have led the participants to perceive the experimental stimuli in a different way than they would have, had they experienced them in everyday speech comprehension. As previously mentioned, there was no significant effect seen in the ERP tasks carried out in this thesis. However, there were some significant speaker effects observed within the eye-tracking task (albeit only the verb non-initial kind). Therefore, it is important to note a crucial difference between these two paradigms. Whilst the ERP follow-up task described in this thesis did have fillers (unlike Lattner & Friederici (2003)), the sheer amount of experimental, control and filler stimuli were much higher (more than threefold) than the eye-tracking task. This could have contributed to a different perception or a diminished attention towards these stimuli.

Van Berkum et al. also noted that each of the male or female speakers used for the recordings produced a large number of unusual utterances (17 to 18 times per experimental session). Due to the volume of these non-typical utterances, they argued that such occurrences may have allowed the participants to become familiarized with the speakers as individuals who do not fit the gender stereotype assigned for the task, which could then lead to a reduction or elimination of the inconsistency effects that relied only on such stereotypical expectations. As one actor was used per variable, that actor did produce all the typical (congruent) and atypical (incongruent) stimuli for

their assigned conditions. Along the same line of thought, hearing these actors produce so many utterances that went against their preassigned stereotype for this task, might have eradicated them of their preassigned stereotype. Since the chosen stereotypes (gender and sociolinguistic background) and their association with the speakers were essential for the task's success, if the biases were cancelled due to the same reasons Van Berkum et. al noted, the task would not have worked as expected.

Lastly, the type of tasks used to assess these questions needs to be reconsidered, both from the point of ecological validity but mainly also due to this issue of attention. For example, Brown- Schmidt (2009) observed that that speaker-specific interpretation mostly happens in interactive dialog settings. Previous studies had argued that that partner-specific information may not hinder the initial understanding of referring expressions (Kronmüller & Barr, 2007). However, the studies used had consisted of non-interactive tasks. Such tasks, she argued, may limit the use of partner- specific representations. To address this issue, she used eye-tracking tasks to investigate how listeners can create temporary conceptual references for words, based on a speaker specific identity. In version A of her first experiment, she used an interactive conversation methodology in which the experimenter and participant together and at the same time chose terms for various images. During experimental trials, the same experimenter, or a new experimenter described a critical image using a previously decided term, or a new term. Results showed an early, on-line partner-specific effect for processing of previously chosen terms, and initial evidence for an early, partner-specific effect for new terms. Version B of the same experiment used a non-interactive paradigm in which participants completed the same task only by listening to image descriptions (recorded during version A) rather than by conversing. Here the results showed that the previously observed partner-specific effects were not observed anymore. Overall, these results suggest that partner-specific interpretation will more easily occur in interactive dialog settings, even though she noted that the number of trials and stimulus characteristics chosen may also play a role in such experiments. Whilst speaker specific effects have been reported in many studies where there was

no interaction with a partners, due to the sheer amount of stimuli used (as discussed in the previous paragraph), having a more interactive paradigm might have mitigated such consequences in this particular case.

Conclusion

Language processing is an intricate and rapid process. To deal with such complexities it seems that the human brain processes many sources of information, whether these are purely linguistic or not. It also tries to carry out a predictive approach i.e. it tries to generate information about stimuli and outcomes that are more likely to be encountered in order to anticipate them for more effective processing, albeit this seems to be dependent on multiple factors such as timing.

Several studies have shown that that listeners can perceive speech sounds differently depending on the perceived social characteristics of the identity and state of the speaker (Strand, 1999; Johnson et al., 1999; Nygaard & Lunders, 2002; Johnson, 2005; Hay et al., 2006 etc.). Although we failed to find evidence for some of the potential effects of the speaker's states/traits, the studies carried out for this thesis did add further to the body of work already existing within the

'extralinguistic cues' area of study. Much like in other eye-tracking studies concerning the identity of the speaker, it was highlighted that speaker knowledge gleamed through voice characteristics can prompt predictions for visual targets before those targets are stated in speech (Creel, 2012; Horton & Slaten, 2012).

Such results can be explained in two ways. That state and identity can affect speech processing can be seen from an exemplar point of view. In these models of language perception, utterances are stored in the long-term memory contains tokens of concepts/words/utterances stored as distinct exemplars, along with acoustic/phonetic details (Goldinger, 1998) and social information about the speaker (Hay et al., 2006; Sumner et al., 2014). Therefore, it might be that characteristics such as age, gender etc. are stored in long-term memory along with speakers' voices (Walker & Hay, 2011). For example, the expression paint used in the term of makeup would be encountered predominantly from female speakers and therefore would have a distribution of

predominantly female-sounding exemplars whereas the expression paint in terms of DIY would be encountered predominantly from male sounding speakers and therefore have a distribution of predominantly male sounding voices. Any utterance of the expression paint in the context of makeup would then be easier to process when uttered by a female, whereas paint in the context of DIY would be easier to process when uttered by a male speaker due to the gender match between encoding and retrieval.

Comparatively, it could be that lexical entries are not stored along with speaker's characteristics, but that the enabling effect is due to a form of semantic priming. Several studies have posited that a speaker's characteristics could be extracted from speech and aid processing through semantic priming, without being necessarily stored along with lexical tokens (Nygaard & Lunders, 2002; van Berkum et al., 2008). This may explain why such cues seemed more useful in specific cases, as semantic priming induced by speaker's characteristics, seems to be sensitive to its usefulness in a specific task, i.e. it influences speech perception only when it is highly relevant (Creel & Tumlin, 2011). Having said this, the possibility of an interaction between both semantic priming and exemplar using is not impossible (Creel & Tumlin, 2011).

These experiments directly speak to this controversy: the exemplar point of view posits that the effects should have been observed independent of sentence structure, because effects arise at the word level. Therefore, according to this view, the auditory components making up a word trigger examplar tokens for speakers which fall under the same characteristics. This process leads to expectations and biases which are then used as cues to predict outcomes about upcoming utterances. However, this was not observed in the case of the eye-tracking task, as significant results were only observed in the Verb non-initial stimuli, which is very much in line with results observed by Cai et al. (2017). In their research, they observed that that if the speaker identity was established as American or British, the same ambiguous utterance was interpreted according to that preconceived identity. However, no link was seen between the strength of accent components used in target words and the extent of accent-specific meaning access. Similarly, since we only observed

results in the Verb non-initial version, we can argue that, unless a speaker identity is established before the verb, effects were not prominent.

Existing processing models have also not fully addressed which non-linguistic and linguistic sources are integrated at what level and what mechanism allows information to be combined. For example, in interactive models, there is a proposed direct interaction between a variety of cues. Visual cues such as facial expressions and the emotion they convey and speaker information such as identity cues are classified under the broad umbrella of contextual cues. Therefore, such cues should be directly available during the speech perception process, whereas above it was argued that this does not always seem to be the case. However, with such a broad categorisation, an important question is if some contextual cues might be more accessible and prominent than others? Thus, some could just yield an expectation or provide a predictive factor for a particular word rather than all being part of an additional set of directly processed cues. This would in turn mean that the speech recognition process is more sensitive to some contextual cues than others, and in turn it would be interesting find out where different types of contextual cues fall on such a spectrum.

Chapter VII

Conclusion

This thesis was written to describe experimental studies conducted within the field of cognitive science, specifically focusing on psycholinguistics. Throughout this thesis I discussed the influence of the state and identity of the speaker on language processing, specifically how facial expressions and the talker-specific characteristics (TSCs) of age, gender and sociolinguistic background affect language processing in Maltese. This study also attempted to apply such views to the argument of linguistic prediction.

The main hypothesis within this study was that facial expressions and TSCs can aid and streamline language processing by categorising information and thus enabling superior usage and control of the information stream encountered during language processing. In order to test such ideas, three experiments were carried out.

The first was a behavioral study inspired by the McGurk paradigm where facial expressions were expected to improve the disambiguation of phonetically similar yet lexically diverse words. Therefore, in the first experiment it was expected that the interpretation of ambiguous utterances might be guided by facial expressions that make one interpretation more likely than another. The results demonstrated that, at least in the utterance of single words, that this was not the case, even though participants did pay attention to the facial features (as evidence by effects of different visemes). Future work using paradigms that contain whole utterances or free flowing speech with concurrent (congruent and incongruent) facial expressions were suggested to look further into such results, that could have resulted a limitation of the task used.

The second was an eye-tracking experiment containing biased sentence interpretations, based on common gender and age biases. In this experiment the target of the sentence should have been easier to recognise when primed with a voice matching the age or gender of said biased target.

The results showed that this was the case, though not strongly so. Effects of congruency were only observed in some of the eye-tracking measures and response accuracy, but for instance not in reaction times. Moreover, effects of congruency were only observed when the critical verb was not sentence initial and participants could build a model of the speaker before hearing the critical polysemous verb. This result argues against an episodic account of speaker information, but rather indicates that listener do engage in speaker normalization. However, the information about the speaker is not "thrown away" but rather retained to interpret any incoming input.

The third was a trial ERP study inspired by the second experiment, using biased sentences based on common gender and sociolinguistic biases. Consequently, it was expected that the appropriate ERP component would be observed when the stimuli were incongruent, indicating a hinderance in processing. The results showed no clear effects of speaker identity.

As stated in the Introduction chapter, whilst there are studies investigating effects of speaker identity and facial expression, it is to the best of my knowledge, the first time that a study of this kind has been carried out in this manner. It was also the aim of this study use to Maltese language as a medium when using an experimental approach to investigate these hypotheses.

It is my hope and wish that by carrying out this study I have provided an experimental look into the world of situated language processing, specifically the importance of the identity and the state of the speaker when it comes to language processing, and to highlight how these interact whilst also providing a contribution towards this truly intriguing field of study.

References

Alais, D. & Burr, D. (2004). The Ventriloquist Effect Results from Near-Optimal Bimodal Integration. *Current biology*, *14*(3), 257-62. https://doi.org/10.1016/j.cub.2004.01.029

Alemán Bañón, J. & Rothman, J. (2019) Being a Participant Matters: Event-Related Potentials Show That Markedness Modulates Person Agreement in Spanish. *Front. Psychol. 10* (746). https://doi.org/10.3389/fpsyg.2019.00746

Altmann, G. & Kamide, Y. (1999). Incremental interpretation at verbs: restricting the domain of subsequent reference. *Cognition*, *73*(3), 247–264. https://doi.org/10.1016/S0010-0277(99)00059-1

Allport, G. W. (1954). *The Nature of Prejudice.* Cambridge, MA: Addison-Wesley.

Aronoff, J. (2006). How We Recognize Angry and Happy Emotion in People, Places, and Things. *Cross-Cultural Research*, *40*(1), 83–105. https://doi.org/10.1177/1069397105282597

Baddeley, A.D., and Hitch, G.J. (1974). Working memory. In G. Bower (Ed.). *The psychology of learning and motivation* Vol. 8, pp. 47–90. New York: Academic Press.

Bassili, J. N. (1978). Facial motion in the perception of faces and emotional expression. *Journal of Experimental Psychology: Human Perception and Performance, 4*, 373-379. https://doi.org/10.1037/0096-1523.4.3.373

Bertelson, P., Vroomen, J., de Gelder, B., & Driver, J. (2000). The ventriloquist effect does not depend on the direction of deliberate visual attention. *Perception & Psychophysics, 62*(2), 321-332. https://doi.org/10.3758/BF03205552

Boland, J.E., Clark, S.N., Couger, K., Prush, C., Seifeldin, M., & Silfen, J. (2014). Homophone Disambiguation and Vocal Stereotypes. https://sites.lsa.umich.edu/jeboland-lab/wp-content/uploads/sites/606/2018/05/Boland-Clark2014.pdf

Bonhage, C. E., Mueller, J. L., Friederici, A. D. & Fiebach, C. J. (2015). Combined eye tracking and fMRI reveals neural basis of linguistic predictions during sentence comprehension. *Cortex 68*, 33–47. https://doi.org/10.1016/j.cortex.2015.04.011

Bonnici, L. (2017). *Family social background and the pupils' achievement in the Maltese language.* (Unpublished Bachelor's dissertation). University of Malta, Malta.

Brown-Schmidt, S. (2009). Partner-specific interpretation of maintained referential precedents during interactive dialog. *Journal of Memory and Language, 61*(2)*,* 171–190. https://doi.org/10.1016/j.jml.2009.04.003

Broughton, G. (1976). *The degree of proficiency to be aimed at in English in Maltese schools*. Paper presented at the Conference on bilingualism and education with special reference to Malta, Malta.

Buck, R. (1999). The biological affects: A typology. *Psychological Review, 106*(2), 301–336. https://doi.org/10.1037/0033-295X.106.2.301

Burleson, B.R. (2009). Understanding the outcomes of supportive communication: A dual-process approach. *Journal of Social and Personal Relationships,* 26,21–38

Butler, R. N. (1969). Age-ism: Another form of bigotry. *The Gerontologist*. *9*(4), 243–246. https://doi.org/10.1093/geront/9.4_part_1.243.

Cai, Z., Gilbert, R., Davis, M., Gaskell, G., Farrar, L., Adler, S., & Rodd, J. (2017). Accent modulates access to word meaning: Evidence for a speaker-model account of spoken word recognition. *Cognitive Psychology. 98,* 73-101. https://doi.org/10.1016/j.cogpsych.2017.08.003.

Calvert, G., Bullmore, E. T., Brammer, M. J., Campbell, R., Williams, S. C., McGuire, P. K., …David, A. S. (1997). Activation of auditory cortex during silent lipreading. *Science, 276*(5312), 593–596. https://doi.org/10.1126/science.276.5312.593

Cardwell, M. (1996). *Dictionary of Psychology*. Chicago IL: Fitzroy Dearborn.

Carminati M. N., Knoeferle, P. (2013). Effects of Speaker Emotional Facial Expression and Listener Age on Incremental Sentence Processing. *PLoS ONE 8*(9): e72559. https://doi.org/10.1371/journal.pone.0072559

Caruana, S. (2011*). English in Malta: from colonialism to heritage, from social differences to opportunity.* Paper presented at the 9th conference on British and American Studies: Allotropes of difference in contemporary discourse. Retrieved from:

https://www.um.edu.mt/library/oar/bitstream/123456789/45084/1/English_in_Malta.pdf

Chisholm, J., Chapman, C.S., Amm, M., Bischof, W.F., Smilek, D., & Kingstone, A. (2014). A Cognitive Ethology Study of First- and Third-Person Perspectives. *PloSone*, *9*(3):e92696. https://doi.org/10.1371/journal.pone.0092696

Chomsky, N. (1956). Three models for the description of language. *Transactions on Information Theory, 2*(3), 113-124. https://doi.org/10.1109/TIT.1956.1056813

Clark, H. H. (1996). *Using language.* Cambridge, UK: Cambridge University Press. Cowan, N. (1995). *Attention and memory: An integrated framework.* New York: Oxford

Cudd, A. E., Jones, L. E. (2005). *Sexism. A Companion to Applied Ethics.* London, UK: Blackwell.

Culicover, P. W., & Jackendoff, R. (2006). The simpler syntax hypothesis. *Trends in Cognitive Science, 10*, 413–418.

Cutler, A., & Clifton, C. E. (1999). Comprehending spoken language: a blueprint of the listener. In C. M. Brown & P. Hagoort (Eds.), *The neurocognition of language* (pp. 123–166). Oxford, UK: Oxford University Press.

Darwin, C. (1998). *The expression of emotions in man and animals* (3rd ed.). New York: Oxford University Press. (Original work published 1872)

De Gelder, B., & Vroomen, J. (2000). The perception of emotion by ear and by eye. *Cognition and Emotion, 14*(3), 289-311. https://doi.org/10.1080/026999300378824

Depaulo, B. M., & Friedman, H. S. (1998). Nonverbal communication. In D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), *The handbook of social psychology* (pp. 3-40). New York, NY, US: McGraw-Hill.

Dikker, S., Rabagliati, H., Farmer, T. & Pylkkänen, L. (2010). Early occipital sensitivity to syntactic category is based on form typicality. *Psychological Science, 21(5),* 629-634. https://doi.org/10.1177/0956797610367751

Dikker, S. & Pylkkänen, L. (2011). Before the N400: Effects of lexical–semantic violations in visual cortex. *Brain and Language, 118*(1-2)*,* 23-28. https://doi.org/10.1016/j.bandl.2011.02.006

Draxler, C., & Jänsch, K. (2004). Speechrecorder –a universal platform independent multichannel audio recording software. *Proc.LREC'04.*

Dolan, R.J., Morris, J. and de Gelder, B. (2001) Crossmodal binding of fear in voice and face. Proc. Natl. Acad. Sci., 98: 10006–10010.

Driver, J. *(1992).* A selective review of selective attention research from the past century. *British Journal of Psychology, 92, 53–79*

Ekman, P., & Friesen, W. V. (1978). *Facial action coding system (FACS): A technique for the measurement of facial action.* Palo Alto, CA: Consulting Psychologists Press.

Ekman, P., Davidson, R. J., & Friesen, W. V. (1990). The Duchenne Smile: Emotional Expression and Brain Physiology II. *Journal of Personality and Social Psychology*, *58*(2), 342-353. https://doi.org/10.1037/0022-3514.58.2.342

Ekman, P. (1993). Facial expression and emotion. *American Psychologist*, *48*(4), 384-392. https://doi.org/10.1037/0003-066X.48.4.384

Ekman, P. (1997). Expression or communication about emotion. In N. Segal, G. E. Weisfeld & C. C. Weisfeld (Eds.), *Genetic, Ethological and Evolutionary Perspectives on Human Development: Essays in Honor of Dr Daniel G. Freedman (pp 315-338)*. Washington, DC: American Psychological Association.

Fagel, S. (2006, May). *Emotional McGurk Effect.* Proceedings of the 3rd Speech Prosody, Dresden. https://www.isca-speech.org/archive/sp2006/papers/sp06_006.pdf

Federmeier, K. D. (2007). Thinking ahead: the role and roots of prediction in language comprehension. *Psychophysiology, 44*(4)*,* 491-505. https://doi.org/10.1111/j.1469-8986.2007.00531.x

Fodor, J. D. 1983. *The modularity of mind.* Cambridge, MA: MIT Press.

Foucart, A., Garcia, X., Ayguasanosa, M., Thierry, G., Martin, C., & Costa, A. (2015). Does the speaker matter? Online processing of semantic and pragmatic information in L2 speech comprehension. *Neuropsychologia*, *75*, 291-303.

Fought, C. 2003. *Chicano English in Context*. New York, NY: Palgrave MacMillan.

Fowler, C.A., Dekle D. (1991). Listening with eye and hand: cross-modal contributions to speech perception. *Journal of Experimental Psychology, Human Perception and Performance, 17*(3), 816–

828. https://doi.org/10.1037/0096-1523.17.3.816

Frazier, L., & Rayner, K. (1982). Making and correcting errors during sentence comprehension: Eye movements in the analysis of structurally ambiguous sentences. *Cognitive Psychology, 14*(2), 178–210. https://doi.org/10.1016/0010-0285(82)90008-1

Frazier, L., & Clifton, C., Jr. (1997). Construal: Overview, motivation, and some new evidence. *Journal of Psycholinguistic Research, 26*(3), 277–295. https://doi.org/10.1023/A:1025024524133

Frith, C. (2009). Role of facial expressions in social interactions. *Philosophical transactions of the Royal Society of London. Series B, Biological sciences*, *364*(1535), 3453–3458. https://doi.org/10.1098/rstb.2009.0142

Gambi, C., Gorrie, F., Pickering, M., & Rabagliati, H. (2018). The development of linguistic prediction: Predictions of sound and meaning in 2-to-5 year olds. *Journal of Experimental Child Psychology*, *173*, 351-370. https://doi.org/10.1016/j.jecp.2018.04.012.

Ganong, W. F. (1980). Phonetic categorization in auditory word perception. *Journal of Experimental Psychology: Human Perception and Performance, 6*(1), 110-125. https://doi.org/10.1037/0096-1523.6.1.110

Girbau, D. (2018). Direct object pronoun sentence processing in Spanish-English children with/without Specific Language Impairment and adults: A cross-modal priming study. *Journal of Communication Disorders* 72, pages 97-110.

Goldinger, S. D., Pisoni, D. B., & Luce, P. (1996). Speech perception and spoken word recognition: Research and theory. In N. J. Lass (Ed.), *Principles of experimental phonetics* (pp 277-327). St. Louis, MO: Mosby Year-Book.

Goss, B. (1995). *The Psychology of human communication.* Prospect Heights, IL: Waveland

Gough, C. (2019). *Distribution of computer and video gamers in the United States from 2006 to 2019, by gender.* Statista. https://www.statista.com/statistics/232383/gender-split-of-us-computer-and-video-gamers/

Grice, P. (1967a). Logic and conversation. in D. Davidson and G. Harman (eds.) 1975, *The Logic of Grammar* (pp 64–75). Encino, LA: Dickenson.

Grice, P. (1957) “Meaning”, *The Philosophical Review*, *66*(3): 377. Reprinted in Grice 1989: 213–223. https://doi.org/10.2307/2182440

Grossberg, S., & Myers, C. W. (2000). The resonant dynamics of speech perception: Interword integration and duration-dependent backward effects. *Psychological Review, 107*(4), 735-767. https://doi.org/10.1037/0033-295X.107.4.735

Hagoort P. (2005). On Broca, brain, and binding: a new framework. *Trends Cogn Sci*., *9*(9):416-423. https://doi.org/10.1016/j.tics.2005.07.004

Hagoort P., & Van Berkum, J. (2007). Beyond the sentence given. *Philosophical transactions of the Royal Society of London. Series B, Biological sciences. 362*(1481). 801-11. https://doi.org/10.1098/rstb.2007.2089.

Hanulíková, A., van Alphen, P. M., van Goch, M. M., & Weber, A. (2012). When one person’s mistake is another’s standard usage: The effect of foreign accent on syntactic processing. *Journal of Cognitive Neuroscience, 24*(4), 878-887. https://doi.org/10.1162/jocn_a_00103

Hay J., Walker A., Sanchez K., & Thompson K. (2019). Abstract social categories facilitate access to socially skewed words. *PLoS ONE 14*(2): e0210793. https://doi.org/10.1371/journal.pone.0210793

Hickok, G., & Poeppel, D. (2000). Towards a functional neuroanatomy of speech perception. *Trends in Cognitive Sciences, 4,* 131–138.

Hickok, G., & Poeppel, D. (2004). Dorsal and ventral streams: A framework for understanding aspects of the functional anatomy of language. *Cognition, 92,* 67–99.

Hickok, G., & Poeppel, D. (2007). The cortical organization of speech processing. *Nature Reviews Neuroscience, 8,* 393–402.

Hietanen, J. K., Leppänen, J. M., Peltola, M. J., Linna-aho, K., and Ruuhiala, H. J. (2008). Seeing direct and averted gaze activates the approach-avoidance motivational brain systems. *Neuropsychologia 46*(9)*,* 2423–2430. https://doi.org/10.1016/j.neuropsychologia.2008.02.029

Huettig, F., & McQueen, J.M. (2007). The Tug of War between Phonological, Semantic and Shape Information in Language-Mediated Visual Search. *Journal of Memory and Language 57*(4):460-

482. https://doi.org/10.1016/j.jml.2007.02.001

Huettig, F., et. al., (2011). Using the visual world paradigm to study language processing: a review and critical evaluation. *Acta psychologica, 137 2*, 151-71 .

Huettig, F., & Guerra, E. (2019). Effects of speech rate, preview time of visual context, and participant instructions reveal strong limits on prediction in language processing. Brain Research, 1706, 196-208. https://doi.org/10.1016/j.brainres.2018.11.013.

Izard, C. E. (1994). Innate and universal facial expressions: Evidence from developmental and cross-cultural research. *Psychological Bulletin*, *115*(2)*,* 288-299. https://doi.org/10.1037/0033-2909.115.2.288

Jackendoff, R. (2003). *Foundations of language: brain, meaning, grammar, evolution.* Oxford, UK: Oxford University Press.

Janusik, L. (2005). Conversational listening span: A proposed measure of conversational listening. *International Journal of Listening,* 19, 12–30.

Johnson, K. (1997) Speech perception w/o speaker normalization: An exemplar model. In K. Johnson & J. W. Mullennix (Eds.), *Talker variability in Speech Processing* (pp. 145-165). San Francisco, CA: Morgan Kaufmann Publishers Inc.

Johnson, K., & Strand, E. A. (1998, January). Speech perception without normalization or higher order invariants. Paper presented in the “Paradigms and Problems in Phonetic Research” workshop at the annual meeting of the Lingustic Society of America, New York City.

Juckel, G., Heinisch, C., Welpinghus, A., & Brüne, M. (2018). Understanding Another Person's Emotions-An Interdisciplinary Research Approach. *Frontiers in psychiatry*, *6*(9), 414. https://doi.org/10.3389/fpsyt.2018.00414

Just, M.A., Carpenter, P.A., and Keller, T.A. (1996). The capacity theory of comprehension: New frontiers of evidence and arguments. *Psychological Review*, 103, 773–80.

Kamide, Y., Altmann, G. & Haywood, S. (2003). The time-course of prediction in incremental sentence process-ing: evidence from anticipatory eye movements. *Journal of Memory and Language, 49,* 133–159. https://doi.org/10.1016/S0749-596X(03)00023-8

Kane, M.J., and Engle, R.W. (2000). Working-memory capacity, proactive interference, and divided attention: Limits on long-term memory retrieval. *Journal of Experimental Psychology: Learning, Memory, and Cognition,* 26, 336–58.

Kawahara, H., Masuda-Katsuse, I., & de Cheveign´e, A. (1999). Restructuring speech representations using a pitch-adaptive time-frequency smoothing and an instantaneous-frequency-based F0 extraction. *Speech Communication*, *27*(3-4), 187–207. https://doi.org/10.1016/s0167-6393(98)00085-5

Kim, J. (2016). Perceptual Associations Between Words and Speaker Age. *Laboratory Phonology: Journal of the Association for Laboratory Phonology*, *7*(1), 18. https://doi.org/10.5334/labphon.33

Koch, A. J., D'Mello, S. D., & Sackett, P. R. (2015). A meta-analysis of gender stereotypes and bias in experimental simulations of employment decision making. *Journal of Applied Psychology, 100*(1), 128–161. https://doi.org/10.1037/a0036734

Kochari, A. R. & Flecken, M. (2018). Lexical prediction in language comprehension: a replication study of grammatical gender effects in Dutch. *Journal of Language, Cognition and Neuroscience, 34*(2), 239-253. https://doi.org/10.1080/23273798.2018.1524500

Koops, C., Gentry, E., & Pantos, A. (2008). The effect of perceived speaker age on the perception of PIN and PEN vowels in Houston, Texas. *University of Pennsylvania Working Papers in Linguistics*, *14*(2), 91-101. https://repository.upenn.edu/pwpl/vol14/iss2/1

Kuperberg, G. R., Sitnikova, T., Caplan, D., Holcomb, P. (2003). Electrophysiological distinctions in processing conceptual relationships within simple sentences. *Cognitive Brain Research, 17*(1)*,* 117-129. https://doi.org/10.1016/s0926-6410(03)00086-7

Kuperberg, G. R. (2007). Neural mechanisms of language comprehension: challenges to syntax. *Brain Research, 18*(1146*),* 23-49. https://doi.org/10.1016/j.brainres.2006.12.063

Kuperberg, G. R., & Jaeger, T. F. (2016). What do we mean by prediction in language comprehension? *Language, cognition and neuroscience*, *31*(1), 32–59. https://doi.org/10.1080/23273798.2015.1102299

Kutas, M., & Hillyard, S. A. (1980). Reading senseless sentences: Brain potentials reflect semantic

incongruity. *Science*. 207 (4427): 203–208. https://doi.org/10.1126/science.7350657

Ladefoged, P. & Broadbent, D. E. (1957). Information conveyed by vowels. *Journal of the Acoustic Society of America, 29*(1)*,* 98-104. https://doi.org/10.1121/1.1908694

Lazalde, O. & Maddock, S. (2010). Comparison of Different Types of Visemes using a Constraint-based Coarticulation Model. Theory and Practice of Computer Graphics 2010, TPCG 2010 - Eurographics UK Chapter Proceedings. 199-206. 10.2312/LocalChapterEvents/TPCG/TPCG10/199-206.

Lattner, S. & Friederici, A. D. 2003 Talker's voice and gender stereotype in human auditory sentence processing—evidence from event-related brain potentials. *Neurosci. Lett. 339*(3), 191–194. https://doi.org/10.1016/S0304-3940(03)00027-2

Laver, J. (Ed.). (1991). *The Gift of Speech: Papers in the Analysis of Speech and Voice*. Edinburgh, UK: University Press.

Levy, R. (2008). Expectation-based syntactic comprehension. *Cognition*, *106* (3), 1126-1177. https://doi.org/10.1016/j.cognition.2007.05.006

Lauter, P., & Howe, F. (1971). *Conspiracy of the Young.* New York, NY: Meridian Press.

Levy, R. (2011, June). *Integrating surprisal and uncertain-input models in online sentence comprehension: formal techniques and empirical results*. Paper presented at the Proceedings of the 49th Annual Meeting of the Association for Computational Linguistics*,* Portland: Oregon. Retrieved from: https://dl.acm.org/citation.cfm?id=2002606

Lundsteen, S.W. (1993) Metacognitive listening. In A.D. Wolvin and C.G. Coakley (Eds.) *Perspectives on listening*, pp. 106–23. Norwood, NJ: Ablex

MacDonald, M., Perlmutter, N., & Seidenberg, M. (1994). The lexical nature of syntactic ambiguity resolution. *Psychol. Rev.* 101, 676–703.

Mancini, S., Molinaro, N., Rizzi, L., & Carreiras, M. (2011). When persons disagree: An ERP study of Unagreement in Spanish. *Psychophysiology, 48,* 1361-71. https://doi.org/10.1111/j.1469-8986.2011.01212.x.

Marslen-Wilson, W., & Tyler, L. K. (1980). The temporal structure of spoken language

understanding. *Cognition, 8*(1), 1–71. https://doi.org/10.1016/0010-0277(80)90015-3

Martin, C. D., Garcia, X., Potter, D., Melinger, A., & Costa, A. (2016). Holiday or vacation? The processing of variation in vocabulary across dialects. *Language, Cognition and Neuroscience, 31*(3), 375–390. https://doi.org/10.1080/23273798.2015.1100750

Martin, C. D., Branzi, F. M. & Bar, M. (2018). Prediction is Production: The missing link between language production and comprehension. *Scientific Reports 8*(1). https://doi.org/10.1038/s41598-018-19499-4

Massaro D.W., Cohen M.M. Evaluation and integration of visual and auditory information in speech perception. *J. Exp. Psychol. Hum. Percept. Perform.* 1983;9:753–771. doi: 10.1037/0096-1523.9.5.753.

Massaro, D. W., & Egan, P. B. (1996). Perceiving affect from the voice and the face. *Psychonomic Bulletin & Review, 3*(2), 215-221. https://doi.org/10.3758/BF03212421

Massaro, D.W. (1998a). *Perceiving Talking Faces: From Speech Perception to a Behavioral Principle.* Cambridge, Massachusetts: MIT Press.

McGurk H., & MacDonald J. (1976). Hearing lips and seeing voices. *Nature 264*(5588), 746–748. https://doi.org/10.1038/264746a0

McLennan, C. T., & Luce, P. A. (2005). Examining the Time Course of Indexical Specificity Effects in Spoken Word Recognition. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 31*(2), 306–321. https://doi.org/10.1037/0278-7393.31.2.306

Mitterer, H., & McQueen, J. M. (2009). Foreign subtitles help but native-language subtitles harm foreign speech perception. *PLoS ONE, 4*(11), e7785. https://doi.org/10.1371/journal.pone.0007785

McGarty, C., Yzerbyt, V. Y., & Spears, R. (Eds.). (2002). *Stereotypes as explanations: The formation of meaningful beliefs about social groups.* New York, NY, US: Cambridge University Press.

Mossler, D. G., Marvin, R. S., & Greenberg, M. T. (1976). Conceptual perspective taking in 2- to 6-year-old children. *Developmental Psychology, 12*(1), 85–86. https://doi.org/10.1037/0012-1649.12.1.85

Myers, E., & Blumstein, S. (2008). The Neural Bases of the Lexical Effect: An fMRI Investigation. *Cerebral Cortex*, *18*(2), 278–288. https://doi.org/10.1093/cercor/bhm053

Neely, J. (1991). Semantic priming in visual word recognition: a selective review of current theories and findings. In D. Besner & G. W. Humphreys (Eds.), *Basic processes in reading: visual word recognition* (pp. 264 –336). Hillsdale, NJ: Erlbaum Associates.

Newby, H.A., and Popelka, G.R. (1992). *Audiology*. Englewood Cliffs, NJ: Prentice-Hall.

Norris, D. G., McQueen, J. M., & Cutler, A. (2000). Merging information in speech recognition: Feedback is never necessary. *Behavioral and Brain Sciences, 23*(3), 299–370. https://www.ncbi.nlm.nih.gov/pubmed/11301575

Norris, D., McQueen, J. M., & Cutler, A. (2016). Prediction, Bayesian inference and feedback in speech recognition. *Language, cognition and neuroscience*, *31*(1), 4–18. https://doi.org/10.1080/23273798.2015.1081703

Nygaard, L. C., & Lunders, E. R. (2002). Resolution of lexical ambiguity by emotional tone of voice. *Memory & Cognition, 30*(4), 583–593. https://doi.org/10.3758/BF03194959

Ostrand, R., Blumstein, S. E., Ferreira, V. S., & Morgan, J. L. (2016). What you see isn't always what you get: Auditory word signals trump consciously perceived words in lexical access. *Cognition*, *151*, 96–107. https://doi.org/10.1016/j.cognition.2016.02.019

Otten, M., & Van Berkum, J. J. A. (2009). Does working memory capacity affect the ability to predict upcoming words in discourse? *Brain Research, 1291,* 92–1 https://doi.org/10.1016/j.brainres.2009.07.042

Piaget, J., & Inhelder, B. (1956). *The Child's Conception of Space*. London: Routledge & Kegan Paul.

Pickering, M., & Gambi, C. (2018). Predicting While Comprehending Language: A Theory and Review. *Psychological Bulletin, 144*(10) 1002-1044. https://doi.org/10.1037/bul0000158.

Porter, S. C., Rheinschmidt Same, M., & Richeson, J. (2015). Inferring Identity From Language: Linguistic Intergroup Bias Informs Social Categorization. *Psychological Science*, *27*(1), 94-102. https://doi.org/10.1177/0956797615612202.

Premack, D., Woodruff, G. (1978). "Does the chimpanzee have a theory of mind?". *Behavioral and*

Brain Sciences. 1(4): 515–526. https://doi.org/10.1017/S0140525X00076512.

Rhode, H., & Ettlinger, M. (2012). Integration of pragmatic and phonetic cues in spoken word recognition. *Journal of experimental psychology. Learning, memory, and cognition*, *38*(4), 967–983. https://doi.org/10.1037/a0026786

Ryalls, B. O., & Pisoni, D. B. (1997). The effect of talker variability on word recognition in preschool children. *Developmental psychology*, *33*(3), 441–452. https://doi.org/10.1037//0012-1649.33.3.441

Ryskin, R., Shukhan, N. G., Mimnaugh, K., Brown-Schmidt, S. & Federmeier, K. (2019) Talker-specific predictions during language processing, Language, Cognition and Neuroscience. https://doi.org/10.1080/23273798.2019.1630654

Samuel, A.G. (1981). Phonemic restoration: Insights from a new methodology. *Journal of Experimental Psychology: General, 110*(4)*,* 474-94. https://doi.org/10.1037/0096-3445.110.4.474

Sams, M., Aulanko, R., Hämäläinen, M., Hari, R., Lounasmaa, O. V., Lu, S.-T., & Simola, J. (1991). Seeing speech: visual information from lip movements modifies activity in the human auditory cortex. *Neuroscience Letters,* 127(1), 141-145. https://doi.org/10.1016/0304-3940(91)90914-F

Santrock, J.W. (2008). *A Topical Approach to Life-Span Development*. New York, NY: McGraw-Hill

Scott, S. K., McGettigan, C. & Eisner, F. A. (2009). A little more conversation, a little less action—candidate roles for the motor cortex in speech perception. *Nat. Rev. Neurosci. 10*(4), 295–302. https://doi.org/10.1038/nrn2603

Semin, G. R., Fiedler, K. (1988). The cognitive functions of linguistic categories in describing persons: Social cognition and language. Journal of Personality and Social Psychology, 54, 558–568.

Senior Planning Services. (2016). *Ageism in America is hurting us all. Senior Planning Services.* https://www.seniorplanningservices.com/2017/08/21/ageism-america-hurting-us/

Silbert, L. J., Honey, C. J., Simony, E., Poeppel, D. & Hasson, U. (2014). Coupled neural systems underlie the production and comprehension of naturalistic narrative speech. *PNAS 111*(43), E4687–96. https://doi.org/10.1073/pnas.1323812111

Skutnabb-Kangas, T. & Phillipson, R. (1989). 'Mother Tongue': The Theoretical and Sociopolitical

Construction of a Concept. In A. Ulrich (Ed.), *Status and Function of Languages and Language Varieties*, (pp. 450-477). Berlin, NY: Walter de Gruyter & Co.

Smith, J. L., & White, P. H. (2002). An examination of implicitly activated, explicitly activated, and nullified stereotypes on mathematical performance: It's not just a woman's issue. *Sex Roles, 47,*179–19 1.

Strand, E. (1999). Uncovering the Role of Gender Stereotypes in Speech Perception. *Journal of Language and Social Psychology, 18*(1), 86-100. https://doi.org/10.1177/0261927X99018001006

Steinhauer, K., Alter, K., & Friederici, A.D. (1999). Brain potentials indicate immediate use of prosodic cues in natural speech processing. *Nature Neuroscience, 2*, 191-196.

Stekelenburg, J.J., & Vroomen, J. (2007). Neural Correlates of Multisensory Integration of Ecologically Valid Audiovisual Events. *Journal of Cognitive Neuroscience, 19*(12), 1964-1973. https://doi.org//10.1162/jocn.2007.19.12.1964

Stone, G. O., & Van Orden, G. C. (1993). Strategic control of processing in word recognition. *Journal of Experimental Psychology: Human Perception and Performance, 19*(4), 744–774. https://doi.org/10.1037/0096-1523.19.4.744

Sumby, W.H., & Pollack I. (1954). Visual contribution to speech intelligibility in noise. *Journal Acoustic Society of America*. *26*, 212–215. https://doi.org/10.1121/1.1907309

Summerfield, Q. (1987). Some preliminaries to a comprehensive account of audio-visual speech perception. In B. Dodd & R. Campbell (Eds.), *Hearing by eye: The psychology of lip-reading* (pp. 3-51). Hillsdale, NJ, US: Lawrence Erlbaum Associates, Inc.

Tajfel, H. (1981). Social stereotypes and social groups. In J. C. Turner & H. Giles (Eds.). *Intergroup behavior* (pp. 144–167). Oxford: Blackwell.

Tesink, C. M. J. Y., Magnus Petersson, K., van Berkum, J. A., van den Brink, D., Buitelaar, J. K. & Hagoort, P. (2009). Unification of Speaker and Meaning in Language Comprehension: An fMRI Study. *Journal of Cognitive Neuroscience, 21*(11), 2085-2099. https://doi.org/10.1162/jocn.2008.21161

The Legal Aid Society-Employment Law Center & the ACLU Foundation of North California. (2002).

Language Discrimination: Your Legal Rights. ACLU Nor Cal. http://www.aclunc.org/library/publications/asset_upload_file489_3538.pdf

Thoman, D. B., White, P. H., Yamawaki, N., Koishi, H. (2008). Variations of Gender–math Stereotype Content Affect Women's Vulnerability to Stereotype Threat. *Sex Roles: A Journal of Research, 58*(9–10): 702–712. https://doi.org/10.1007/s11199-008-9390-x.

Thusat, J., Anderson, E., Davis, S., Ferris, M., Javed, A., Laughlin, A., McFarland, C., Sangsiri, R., Sinclair, J., Vastalo, V., Whelan, W. & Wrubel, J. (2009). Maltese English and the nativization phase of the dynamic model, in English Today, 25:25-32.

Trueswell, J. & Tanenhaus, M. (Eds.). (2005). *Approaches to studying world-situated language use: bridging the languages-product and language-action traditions*. Cambridge, MA: MIT Press.

Tuinman, A., Mitterer, H., & Cutler, A. (2014). Use of Syntax in Perceptual Compensation for Phonological Reduction. *Language and Speech*, *57*(1), 68–85. https://doi.org/10.1177/0023830913479106

van Berkum, J. J., Hagoort, P. & Brown, C. M. (1999). Semantic integration in sentences and discourse: evidence from the N400. *Journal of Cognitive Neuroscience. 11*(6)*,* 657–671. https://doi.org/10.1162/089892999563724

van Berkum, J.J., Koornneef, A., Otten, M. & Nieuwland, M. (2007). Establishing reference in language comprehension: An electrophysiological perspective. *Brain research. 1146*(1). 158-71. https://doi.org/10.1016/j.brainres.2006.06.091.

van Berkum, J.J., Brink, D.V., Tesink, C.M., Kos, M., & Hagoort, P. (2008). The Neural Integration of Speaker and Message. *Journal of Cognitive Neuroscience, 20*,580-591.

Van Dijk, T.A., and Kintsch, W. (1983). *Strategies of discourse comprehension.* New York: Academic Press

Van Petten, C., & Luka, B. J. (2012). Prediction during language comprehension: Benefits, costs, and ERP components. *International Journal of Psychophysiology*, *83*(2), 176–190. https://doi.org/10.1016/j.ijpsycho.2011.09.015

Wagner, D., & Berger, J. (1997). Gender and Interpersonal Task Behaviors: Status Expectation

Accounts. *Sociological Perspectives, 40*(1), 1-32. https://doi.org/10.2307/1389491

Walker, A. & Hay, J. (2019). Congruence between 'word age' and 'voice age' facilitates lexical access. *Laboratory Phonology, 2*(1), 219-237. doi: 10.1515/labphon.2011.007

Warren, R. M. (1970). Perceptual restoration of missing speech sounds. *Science, 167*(3917), 392-393. https://doi.org/10.1126/science.167.3917.392

Warren, P., Grabe, E., & Nolan, F. (1995). Prosody, phonology and parsing in closure ambiguities. *Language and Cognitive Processes, 10*(5), 457–486. https://doi.org/10.1080/01690969508407112

Williams, J. E., & Best, D. L. (1990). *Cross-cultural research and methodology series, Vol. 13. Sex and psyche: Gender and self viewed cross-culturally.* Sage Publications, Inc.

Wilkinson, J., & Ferraro, K. (2002). Thirty Years of Ageism Research. In T. Nelson (Ed.). *Ageism: Stereotyping and Prejudice Against Older Persons* (339-358). Cambridge, MA: MIT Press

Witt, J. (2017). *SOC 2018* (5th ed.). New York, NY: McGraw-Hill Education.

Wolvin, Andrew. (2010). *Listening and Human Communication in the 21st Century*. https://doi.org/10.1002/9781444314908.ch1. West Sussex, UK: Wiley-Blackwell Press.

Zenn, J. (2018). *The Biggest Mobile Gaming Consumers In 2018 (And Beyond) Are Women.* Game Analytics. https://gameanalytics.com/blog/mobile-consumers-women-2018.html

Zwaan, R. A. (2004). The immersed experiencer: toward an embodied theory of language comprehension. In B. H. Ross (Ed.) *The psychology of learning and motivation (*pp. 35–62). New York, NY: Academic Press.

Appendices

Appendix A

Full list of verbs used in Experiment 2 and targets per speaker.

Age – Child and Adult

Verb	Main Meaning	Sub Meaning	Voice Main	Voice Sub
Se nġemma	To collect	To save up	Child	Adult
Se nirkeb	To ride / mount	To get a lift	Child	Adult
Se nibda	To start	To begin a new job	Child	Adult
Se naqa'	To fall	To lapse / sin	Child	Adult
Se nidħaq	To laugh	To laugh at / mock	Child	Adult
Se nibni	To build / erect	To stack / set up	Adult	Child
Se ngħaddi	To pass physically	To get through an exam	Adult	Child
Se nħassar	To rub off / erase	To cancel / ruin	Child	Adult
Se naqbeż	To jump	To jump a queue	Child	Adult
Se naqta’	To cut	To quit	Child	Adult
Se mmexxi	To steer	To lead / conduct	Child	Adult

Se nirbaħ	To win	To defeat / be victorious	Child	Adult
Se ndoqq	To play an instrument	To play professionally	Child	Adult
Se nġib	To get	Achieve a good grade	Adult	Child
Se nkanta	To sing	To sing professionally	Child	Adult
Se naħfer	To forgive	To remit /reduce a prisonsentence	Child	Adult
Se nidħol	To enter	To be employed	Child	Adult
Se niekol	To eat	To go out to eat	Child	Adult
Se niftaħ	To open	To declare open / inaugurate	Child	Adult
Se niġbed	To pull	To withdraw money	Child	Adult
Se nikteb	To write	To write professionally	Child	Adult
Se nilgħab	To play	To gamble	Child	Adult
Se nilħaq	To reach	To be promoted	Child	Adult

Se nitlaq	To leave	To leave permanently / retire	Child	Adult
Se noħroġ	To go out off / leave	To go out to	Child	Adult

Gender – Male and Female

Verb	Main Meaning	Sub Meaning	Voice Main	Voice Sub
Se niżboħ	To paint	To apply make-up	Male	Female
Se nagħmel	To make do	To have done for you	Male	Female
Se nerfa’	To lift	To put away / store	Male	Female
Se nħabbat	To knock	To whisk / beat eggs	Female	Male
Se nżomm	To hold	To keep	Male	Female
Se jkolli	To have	To have a baby	Male	Female
Se ngħolli	To raise / lift	To raise financially	Female	Male
Se nrabbi	To bring up	To rear	Female	Male

Se npitter	To paint	To apply make-up	Male	Female
Se niġri	To run	To race	Male	Female
Se naħdem	To work	To act in a play	Male	Female
Se nsewwi	To repair	To mend / patch	Male	Female
Se nbiddel	To change something	To change into a different outfit	Male	Female
Se nħallat	To mix	To mix drinks	Female	Male
Se nlegleg	To gulp down	To gulp drinks	Male	Female
Se nsegwi	To follow / understand	To stalk	Male	Female
Se nagħti	To give	To beat / strike	Female	Male
Se naħtaf	To grab	To kidnap	Female	Male
Se niflaħ	To be in good health	To endure	Female	Male
Se nifred	To separate	To break up	Male	Female

Se nikkoregi	To correct	To mark exam papers	Female	Male
Se nilqa’	To catch / receive	To welcome	Male	Female
Se nikser	To break an item	To break rules / laws	Female	Male
Se niżfen	To dance	To dance professionally	Male	Female

Appendix B

List of sentences starting with a temporal marker and associated translations used in Experiment 2.

Age and Gender

Sentence	Translation
Għada *se nġemma* l-istickers	Tomorrow *I'll collect* the stickers
Għada *se nirkeb* ir-rota	Tomorrow *I'll ride* the bike
Ġimgħa oħra *se nibda* l-puzzle	Next Friday *I'll start* the puzzle
Dalwaqt *se naqa'* mir-rota	*I'll* soon *fall* off the bike
Illejla *se nidħaq* bil-film	Tonight *I'll laugh* at the film
Dalwaqt *se nibni* bil-Lego	*I'll* soon *build (play)* with Lego
Il-Ġimgħa *se ngħaddi* mill-bypass	Next Friday *I'll pass* through the bypass
Illejla *se nħassar* l-istampa	Tonight *I'll remove (rub off)* the picture
Issa *se naqbeż* il-ħabel	*I'll* soon *skip* the rope
Illum *se naqta'* l-karti	Today *I'll cut* the paper
Filgħaxija *se mmexxi* liż-żiemel	Tonight *I'll steer* the horse
Għada *se nirbaħ* il-premju	Tomorrow *I'll win* the prize
Fil-weekend *se ndoqq* il-pjanu	During the weekend *I'll play* the piano
Għada *se nġib* kelb	Tomorrow *I'll get* a dog
Illum *se nkanta* happy birthday	Today *I'll sing* happy birthday
Għada *se naħfer* lil-sieħbi	Tomorrow *I'll forgive* my friend
Ġimgħa oħra *se nidħol* fil-librerija	Next week *I'll go* into the library
Il-Ħadd *se niekol* l-ispaghetti	On Sunday *I'll eat* the spaghetti
Is-Sibt li ġej *se niftaħ* it-tieqa	Next Saturday *I'll open* the window
Issa *se niġbed* il-lazz	Now *I'll pull* the laces
Fil weekend *se nikteb* kompożizzjoni	This weekend *I'll write* a composition

Is-Sibt li ġej *se nilgħab* bil-ballun	Next Saturday *I'll play* ball
Dalwaqt *se nilħaq* tal-linja	*I'll* soon *get* the bus
Dalwaqt *se nitlaq* mill-klassi	*I'll* soon *leave* the classroom
Siegħa oħra *se noħrog* mill-klassi	In an hour *I'll go out* of the classroom
Għada *se nġemma* l-flus	Tomorrow *I'll save* money
Għada *se nirkeb* ma' Anita	Tomorrow *I'll ride* with Anita
Ġimgħa oħra *se nibda* fir-restaurant	Next Friday *I'll start (working)* at the restaurant
Dalwaqt *se naqa'* fit-tentazzjoni	*I'll* soon *fall* into temptation
Illejla *se nidħaq* b'Martina	Tonight *I'll laugh* at Martina
Dalwaqt *se nibni* l-iskultura	*I'll* soon *build* the sculpture
Il-Ġimgħa *se ngħaddi* mill-eżami	Next Friday *I'll pass* the exam
Illejla *se nħassar* il-party	Tonight *I'll cancel* the party
Issa *se naqbeż* il-kju	Now *I'll skip* the queue
Illum *se naqta'* ix-xorb	Today *I'll cut* down on alcohol
Filgħaxija *se mmexxi* l-meeting	This evening *I'll lead* the meeting
Għada *se nirbaħ* il-ġlieda	Tomorrow *I'll win* the fight
Fil-weekend *se ndoqq* fil-kunċert	In the weekend *I'll play* in the concert
Għada *se nġib* marka tajba	Tomorrow *I'll get* a good grade
Illum *se nkanta* fuq it-televixin	Today *I'll sing* on TV
Għada *se naħfer* lill-ħabsi	Tomorrow *I'll forgive* the prisoner
Ġimgħa oħra *se nidħol* il-bank	Next week *I'll start working* at the bank
Il-Ħadd *se niekol* ġo restaurant	This Sunday *I'll eat* at the restaurant
Is-Sibt li ġej *se niftaħ* negozju	This Saturday *I'll open* a business
Issa *se niġbed* il-flus	Now *I'll withdraw* the money

Fil-weekend *se nikteb* artiklu	During the weekend *I'll write* an article
Is-Sibt li ġej *se nilgħab* karti	Next Saturday *I'll play (gamble)* cards
Dalwaqt *se nilħaq* team leader	*I'll* soon *be promoted* to team leader
Dalwaqt *se nitlaq* mix-xogħol	*I'll* soon *leave* my job
Siegħa oħra *se noħroġ* sar-restaurant	In an hour *I'll go out* to the restaurant

Gender – Male and Female

Sentence	Translation
Illejla *se niżboħ* l-ħajt	Tonight *I'll paint* the wall
Għada *se nagħmel* il-puzzle	Tomorrow *I'll do* the puzzle
Dalwaqt *se nerfa'* l-ħwejjeġ	*I'll* soon *put* away the clothes
Illum *se nħabbat* il-bajd	Today *I'll beat* the eggs
Illejla *se nżomm* il-kaxxi	Tonight *I'll hold* the boxes
Dalwaqt *se jkolli* uġigħ ta' ras	*I'll* soon *have* a headache
Illum se *ngħolli* s-siġġu	Today *I'll lift* the chair
Dalwaqt *se nrabbi* l-labradors	*I'll* soon *breed* the Labradors
Filgħaxija *se npitter* ix-xena	This evening *I'll paint* the scene
Issa *se niġri* għal tal-linja	Now *I'll run* for the bus
Il-Ġimgħa *se naħdem* fl-uffiċċju	This Friday *I'll work* in the office
Is-Sibt *se nsewwi* l-flokk	This Saturday *I'll mend* the sweater
Illejla *se nbiddel* il-batteriji	Tonight *I'll change* the batteries
Is-Sibt li ġej *se nħallat* it-taħlita	Next Saturday *I'll mix* the batter
Fis-sajf *se nlegleg* l-birra	This summer *I'll down* the beer
Filgħaxija *se nsegwi* lill-avukat	This evening *I'll stalk* the lawyer
Il-ġimgħa li ġejja *se nagħti* rigal	Next week *I'll give* a gift
Il-Ġimgħa *se naħtaf* il-basket	This Friday *I'll snatch* the bag

Ġimgħatejn oħra *se niflaħ* nimxi	In two weeks' time *I'll manage* to walk
Nhar l-Erbgħa *se nifred* l-iskart	Next Wednesday *I'll separate* the trash
Illum *se nikkoreġi* lit-tifel	Today *I'll correct* the child
Il-Ħadd *se nilqa'* lill-mistednin	This Sunday *I'll welcome* the guests
Is-Sibt *se nikser* iż-żarbun	This Saturday *I'll break* the shoe
Is-Sibt *se niżfen* f'Paceville	This Saturday *I'll dance* in Paceville
Illejla *se niżboħ* difrejja	Tonight *I'll paint* my nails
Għada *se nagħmel* xagħri	Tomorrow *I'll do* my hair
Dalwaqt *se nerfa'* l-kaxxi	*I'll* soon *lift* the boxes
Illum *se nħabbat* fuq il-bieb	Today *I'll knock* on the door
Illejla *se nżomm* it-tfal	Tonight *I'll keep of* the children
Dalwaqt *se jkolli* tarbija	*I'll* soon *have* a baby
Illum *se ngħolli* l-pagi	Today *I'll raise* the wages
Dalwaqt *se nrabbi* tifla	*I'll* soon *bring up* the child
Filgħaxija *se npitter* wiċċi	This evening *I'll put* make up on my face
Issa *se niġri* fil-maratona	Now *I'll run* in the marathon
Il-Ġimgħa *se naħdem* fil-play	This Friday *I'll act* in the play
Is-Sibt *se nsewwi* l-vit	This Saturday *I'll fix* the tap
Illejla *se nbiddel* il-flokk	Tonight *I'll change* the shirt
Is-Sibt li ġej *se nħallat* fix-xorb	Next Saturday *I'll mix* different drinks
Fis-sajf *se nlegleg* l-ilma	This summer *I'll gulp* the water
Filgħaxija *se insegwi* d-dibattitu	Tonight *I'll follow* the debate
Il-ġimgħa li ġejja s*e nagħti* daqqa ta' ponn	Next week *I'll throw* a punch
Il-Ġimgħa *se naħtaf* lit-tifel	This Friday *I'll kidnap* the child
Ġimgħatejn oħra *se niflaħ* 70 kilos	In two weeks' time *I'll be able to lift* 70 kilos

Nhar l-Erbgħa *se nifred* lill-koppja	Next Wednesday *I'll break up* the couple
Illum *se nikkoreġi* l-eżamijiet	Today *I'll correct* the exams
Il-Ħadd *se nilqa'* l-ballun	This Sunday *I'll catch* the ball
Is-Sibt *se nikser* il-liġi	This Saturday *I'll break* the law
Is-Sibt *se niżfen* fit-teatru	This Saturday *I'll dance* in the theatre

Appendix C

List of sentences ending with a temporal marker and associated translations used in Experiment 2.

Age and Gender

Sentence	Translation
Se nġemma l-istickers għada	*I'll collect* the stickers tomorrow
Se nirkeb ir-rota għada	*I'll ride* the bike tomorrow
Se nibda l-puzzle ġimgħa oħra	*I'll start* the puzzle next week
Se naqa' mir-rota dalwaqt	*I'll fall* off the bike soon
Se nidħaq bil-film illejla	*I'll laugh* at the film tonight
Se nibni bil-Lego dalwaqt	I'll *build (play)* with Lego soon
Se ngħaddi mill-bypass il-Ġimgħa	I'll *pass through* the bypass on Friday
Se nħassar l-istampa illejla	*I'll remove* the picture tonight
Se naqbeż il-ħabel issa	*I'll skip* the rope now
Se naqta' l-karti illum	*I'll cut* the paper today
Se mmexxi liż-żiemel filgħaxija	*I'll steer (lead)* the horse this evening
Se nirbaħ il-premju għada	*I'll win* the prize tomorrow
Se ndoqq il-pjanu fil-weekend	*I'll play* the piano this weekend
Se nġib kelb għada	*I'll get* a dog tomorrow
Se nkanta happy birthday illum	*I'll sing* happy birthday today
Se naħfer lil-sieħbi għada	*I'll forgive* my friend tomorrow
Se nidħol fil-librerija gimgħa oħra	*I'll go* into the library next week
Se niekol l-ispaghetti l-Ħadd	*I'll eat* the spaghetti on Sunday
Se niftaħ it-tieqa s-Sibt li ġej	*I'll open* the window next Saturday
Se niġbed il-lazz issa	*I'll pull* the lace now
Se nikteb kompożizzjoni fil-weekend	*I'll write* a composition in the weekend

Se nilgħab bil-ballun is-Sibt li ġej	*I'll play* ball next Saturday
Se nilħaq tal-linja dalwaqt	I'll *reach (get)* the bus soon
Se nitlaq mill-klassi dalwaqt	*I'll leave* the classroom soon
Se noħroġ mill-klassi siegħa oħra	*I'll go out* of the classroom soon
Se inġemma il-flus għada	*I'll save* money tomorrow
Se nirkeb ma' Anita għada	*I'll ride* with Anita tomorrow
Se nibda fir-restaurant ġimgħa oħra	*I'll start (working)* at the restaurant next week
Se naqa' fit-tentazzjoni dalwaqt	*I'll fall* into temptation soon
Se nidħaq b'Martina l-lejla	*I'll laugh* at Martina tonight
Se nibni l-iskultura dalwaqt	*I'll build* the sculpture soon
Se ngħaddi mill-eżami il-Ġimgħa	*I'll pass* the exam next Friday
Se nħassar il-party il-lejla	*I'll cancel* the party tonight
Se naqbeż il-kju issa	*I'll skip* the queue today
Se naqta' x-xorb illum	*I'll cut down* on alcohol today
Se mmexxi l-meeting filgħaxija	*I'll lead* the meeting this evening
Se nirbaħ il-ġlieda għada	*I'll win* the fight tomorrow
Se ndoqq fil-kunċert fil-weekend	*I'll play* in the concert during the weekend.
Se nġib marka tajba għada	*I'll get* a good grade tomorrow
Se nkanta fuq it-televixin illum	*I'll sing* on TV today
Se naħfer lill-ħabsi għada	*I'll forgive* the prisoner tomorrow
Se nidħol il-bank ġimgħa oħra	*I'll start working* at the bank next week
Se niekol go-restaurant il-Ħadd	*I'll eat* at the restaurant on Sunday
Se niftaħ negozju s-Sibt li ġej	*I'll open* a business next Saturday
Se niġbed il-flus issa	*I'll withdraw* the money now

Se nikteb ktieb fil-weekend	*I'll write* the article in the weekend
Se nilgħab bil-karti s-Sibt li ġej	*I'll play* cards (gamble) on Saturday
Se nilħaq team leader dalwaqt	*I'll become* a team leader soon
Se nitlaq mix-xogħol dalwaqt	*I'll resign from* my job soon
Se noħrog sar-restaurant siegħa oħra	*I'll go out* to the restaurant in an hour

Gender – Male and Female

Sentence	Translation
Se niżboħ l-ħajt illejla	*I'll paint* the wall tonight
Se nagħmel il-puzzle għada	*I'll do* the puzzle tomorrow
Se nerfa' l-ħwejjeġ dalwaqt	*I'll put away* the clothes soon
Se nħabbat il-bajd illum	*I'll beat* the eggs today
Se nżomm il-kaxxi llejla	*I'll keep* the boxes tonight
Se jkolli uġigħ ta' ras dalwaqt	*I'll have* a headache soon
Se ngħolli is-siġġu llum	*I'll lift* the chair today
Se nrabbi il-labradors dalwaqt	*I'll breed* the Labradors soon
Se npitter ix-xena filgħaxija	*I'll paint* the scene this evening
Se niġri għal tal-linja issa	*I'll run* to catch the bus now
Se naħdem fl-uffiċċju l-Ġimgħa	*I'll work* in the office on Friday
Se nsewwi l-flokk is-Sibt	*I'll mend* the sweater on Saturday
Se nbiddel il-batteriji l-lejla	*I'll change* the batteries tonight
Se nħallat it-taħlita s-Sibt li ġej	*I'll mix* the batter next Saturday
Se nlegleg l-birra fis-sajf	*I'll down* the beer in summer
Se nsegwi lill-avukat filgħaxija	*I'll stalk* the lawyer tonight
Se nagħti rigal il-Ġimgħa li ġejja	*I'll give* a gift next Friday
Se naħtaf il-basket il-Ġimgħa	*I'll grab* the bag on Friday

Se niflaħ nimxi gimgħatejn oħra	*I'll be able to* walk in two weeks
Se nifred l-iskart nhar l-Erbgħa	*I'll separate* the trash next Wednesday
Se nikkoreġi lit-tifel illum	*I'll correct* the child today
Se nilqa' lill-mistednin il-Ħadd	*I'll welcome* the guests on Sunday
Se nikser iż-żarbun is-Sibt	*I'll break* the shoe on Saturday
Se nisfen f'Paceville is-Sibt	*I'll dance* in Paceville on Satuday
Se niżboħ difrejja llejla	*I'll paint* my nails tonight
Se nagħmel xagħri għada	*I'll do* my hair tomorrow
Se nerfa' l-kaxxi dalwaqt	*I'll lift* the boxes soon
Se nħabbat fuq il-bieb illum	*I'll knock* on the door today
Se nżomm it-tfal illejla	*I'll take care of* the children tonight
Se jkolli tarbija dalwaqt	*I'll have* a baby soon
Se ngħolli l-pagi llum	*I'll raise* the wages today
Se nrabbi tifla dalwaqt	*I'll raise* the child soon
Se npitter wiċċi filgħaxija	*I'll put* make up on my face tonight
Se niġri fil-maratona issa	*I'll run* in the marathon now
Se naħdem fil-play il-Ġimgħa	*I'll act* in the play on Friday
Se nsewwi l-vit is-Sibt	*I'll fix* the tap on Saturday
Se nbiddel il-flokk illejla	*I'll change* the shirt tonight
Se nħallat fix-xorb is-Sibt li ġej	*I'll have* different drinks on Saturday
Se nlegleg l-ilma fis-sajf	*I'll gulp* the water in summer
Se nsegwi d-dibattitu filgħaxija	*I'll follow* the debate tonight
Se nagħti daqqa ta' ponn il-ġimgħa li ġejja	*I'll throw* a punch next Friday
Se naħtaf lit-tifel il-Ġimgħa	*I'll kidnap* the child on Friday
Se niflaħ 70 kilos ġimgħatejn oħra	*I'll be able to* lift 70 kilos in two weeks' time

Se nifred lill-koppja nhar l-Erbgha	*I'll break up* the couple on Wednesday
Se nikkoreġi l-eżamijiet illum	*I'll correct* the exams today
Se nilqa' il-ballun il-Ħadd	*I'll catch* the ball on Sunday
Se nikser il-ligi s-Sibt	*I'll break* the law on Saturday
Se nisfen fit-teatru s-Sibt	*I'll dance (professionally)* in the theatre on Saturday

Appendix D

List of fillers used in experiment 2.

Non-verb initial

Sentence	Translation
Għada se naħbi l-istickers	Tomorrow I'll hide the stickers
Għada se napprezza r-rota	Tomorrow I'll appreciate the bike
Ġimgħa oħra se infittex il-jigsaw puzzle	Next week I'll look for the jigsaw puzzle
Dalwaqt se nevita r-rota	Soon I'll avoid the bike
Dalwaqt se insib il-Lego	Soon I'll find the Lego
Il-Ġimgħa se insemmi l-bypass	On Friday I'll name the bypass
Illejla se nikkritika x-xena	Tonight I'll critique the scene
Issa se nittawwal lejn l-ħabel	Now I'll look at the rope
Filgħaxija se immur ħdejn iż-żiemel	Tonight I'll go next to the horse
Għada se niddeskrivi l-premju	Tomorrow I'll describe the gift
Fil-weekend se nipprattika l-pjanu	During the weekend I'll practise the piano
Għada se nirċievi kelb	Tomorrow I'll receive a dog
Illum se ngħid happy birthday	Today I'll say happy birthday
Għada se nitħadded ma' sieħbi	Tomorrow I'll talk to my friend
Ġimgħa oħra se napplika fil-librerija	Next week I'll apply at the library
Il-Ħadd se inħallas l-spaghetti	Sunday I'll pay for the spaghetti
Is-Sibt li ġej se narma t-tieqa	Next Saturday I'll set up the window
Issa se nuża l-lazz	Now I'll use the lace
Fil weekend se nibgħat komponiment	During the weekend I'll send a composition
Is-Sibt li ġej se narmi ballun	Next Saturday I'll find the ball
Dalwaqt se nilmaħ tal-linja	I'll soon catch the bus

Dalwaqt se nasal fil-klassi	I'll soon arrive in class
Siegħa oħra se inpoġġi fil-klassi	In an hour I'll sit in class
Illejla se inaddaf l-ħajt	Tonight I'll clean the wall
Għada se nirranġa l-jigsaw puzzle	Tomorrow I'll fix the puzzle
Illum se narmi l-bajd	Today I'll throw away the eggs
Illejla se nistenna l-kaxxi	Tonight I'll wait for the boxes
Dalwaqt se nikkalma l-uġigħ ta' ras	I'll soon calm my headache
Illum se nuża s-siġġu	Today I'll use the chair
Dalwaqt se naħseb fil-klieb	I'll soon think about the dogs
Filgħaxija se inħares lejn ix-xena	Tonight I'll look at the painting
Il-Ġimgħa se ngħin fl-uffiċċju	On Friday I'll help in the office
Is-Sibt se naħsel l-flokk	On Saturday I'll wash the sweater
Illejla se inwaddab l-batteriji	Tonight I'll throw away the batteries
Is-Sibt li ġej se nagħmel it-taħlita	Next Saturday I'll make the batter
Filgħaxija se nifhem l-avukat	In the evening I'll understand the lawyer
Il-Ġimgħa li ġejja se nakkwista rigal	Next Friday I'll acquire a gift
Il-Ġimgħa se niġbor basket	Friday I'll pick up the bag
Ġimgħatejn oħra se nasal nimxi	In two weeks' time I'll arrive walking
Nhar l-Erbgħa se neħles mill l-iskart	On Wednesday I'll get rid of the rubbish
Illum se immur għat-tifel	Today I'll pick the child
Il-Ħadd se indaħħal il-mistiednin	On Sunday I'll let in the guests
Is-Sibt se inlesti iz-zarbun	On Saturday I'll finish the shoe
Illum se nimxi f'Paceville	Tonight I'll walk around Paceville
Għada se naħbi l-flus	Tomorrow I'll hide the money

Għada se napprezza lil Anita	Tomorrow I'll appreciate Anita
Ġimgħa oħra se infittex ir-ristorant	Next week I'll find a restaurant
Dalwaqt se nevita t-tentazzjoni	I'll soon avoid temptation
Dalwaqt se insib l-iskultura	I'll soon find the sculpture
Il-Ġimgħa se insemmi l-eżami	On Friday I'll name the exam
Illejla se nikkritika l-party	Tonight I'll critique the party
Issa se nittawwal lejn l-kju	Now I'll look at the queue
Filgħaxija se immur l-meeting	Tonight I'll go to the meeting
Għada se niddeskrivi l-ġlieda	Tomorrow I'll describe the fight
Fil-weekend se nipprattika għall-kunċert	During the weekend I'll practice for the concert
Għada se nirċievi marka tajba	Tomorrow I'll receive a good grade
Illum se ngħid fuq it-televixin	Today I'll speak on TV
Għada se nitħadded mal-prigunier	Tomorrow I'll talk to the prisoner
Ġimgħa oħra se napplika l-bank	Friday I'll apply at the bank
Il-Ħadd se inħallas fir-ristorant	On Sunday I'll pay at the restaurant
Is-Sibt li ġej se narma negozju	Next Saturday I'll set up a business
Issa se nuża l-flus	Now I'll use the money
Fil weekend se nibgħat l-artiklu	During the weekend I'll send the article
Is-Sibt li ġej se nilmaħ l-karti	Next Saturday I'll throw away the papers
Dalwaqt se nilmaħ lit-team leader	I'll soon spot the team leader
Dalwaqt se nasal fl-uffiċċju	I'll soon arrive at the office
Siegħa oħra se inpoġġi fir-ristorant	In an hour I'll sit at the restaurant
Illejla se innaddaf difrejja	Tonight I'll clean my nails
Għada se nirranġa xagħri	Tomorrow I'll fix my hair
Illum se narmi l-bieb	Today I'll throw away the door

Illejla se nistenna lit-tfal	Tonight I'll wait for the kids
Dalwaqt se nikkalma lit-tarbija	I'll soon calm down the baby
Illum se nuża l-paga	Today I'll use my wage
Dalwaqt se naħseb fit-tifel	I'll soon think of the child
Filgħaxija se inħares lejn l-makeup	This evening I'll look at the make-up
Il-Ġimgħa se ngħin fit-teatru	On Friday I'll help in the theatre
Is-Sibt se naħsel l-vit	On Saturday I'll wash the tap
Illejla se inwaddab l-flokk	Tonight I'll throw the shirt
Is-Sibt li ġej se nagħmel l-alkoħol	Next Saturday I'll make the alcohol
Filgħaxija se nifhem id-dibattitu	Tonight I'll understand the debate
Il-Ġimgħa li ġejja se nakkwista	Next Friday I'll acquire a beating
Il-Ġimgħa se niġbor lit-tifel	On Friday I'll pick up the child
Ġimgħatejn oħra se nasal b'sebgħin kilo	In two weeks I'll arrive with 70 kilos
Nhar l-Erbgħa se neħles mill-koppja	Next Wednesday I'll get rid of the couple
Illum se immur għall-eżami	Today I'll go to the exam
Il-Ħadd se indaħħal l-ballun	On Sunday I'll get the ball in
Is-Sibt se inlesti l-liġi	On Saturday I'll finish the law
Illum se nimxi sat-teatru	Today I'll walk till the theatre

Verb initial

Sentence	Translation
Se naħbi l-istickers għada	I'll hide the stickers tomorrow
Se napprezza r-rota għada	I'll appreciate the bike tomorrow
Se infittex l-jigsaw puzzle ġimgħa oħra	I'll look for the jigsaw puzzle next week
Se nevita r-rota dalwaqt	I'll avoid the bike soon
Se insib il-lego dalwaqt	I'll find the lego soon

Se insemmi l-bypass il-Ġimgħa	I'll name the bypass on Friday
Se nikkritika x-xena illejla	I'll critique the scene on Friday
Se nittawwal lejn l-ħabel issa	I'll look at the rope now
Se immur għaż-żiemel filgħaxija	I'll go for the horse tonight
Se niddeskrivi l-premju għada	I'll describe the gift tomorrow
Se nipprattika l-pjanu fil-weekend	I'll practice the piano during the weekend
Se nirċievi kelb għada	I'll receive the dog tomorrow
Se ngħid happy birthday illum	I'll say happy birthday today
Se nitħadded ma' sieħbi għada	I'll talk to my friend tomorrow
Se napplika l-librerija ġimgħa oħra	I'll apply at the library next week
Se inħallas l-spagetti il-Ħadd	I'll pay for the spaghetti on Sunday
Se narma t-tieqa is-Sibt li ġej	I'll set up the window on Saturday
Se nuża l-lazz issa	I'll use the lace now
Se nibgħat il-komponiment fil-weekend	I'll send the composition during the weekend
Se narmi l-ballun is-Sibt li ġej	I'll throw away the ball next Saturday
Se nilmaħ tal-linja dalwaqt	I'll spot the bus soon
Se nasal fil-klassi dalwaqt	I'll arrive in class soon
Se inpoġġi fil-klassi siegħa oħra	I'll sit in class in an hour
Se inaddaf l-ħajt illejla	I'll clean the wall soon
Se nirranġa l-jigsaw puzzle għada	I'll fix the jigsaw puzzle tomorrow
Se narmi l-bajd Illum	I'll throw away the eggs soon
Se nistenna l-kaxxi illejla	I'll wait for the boxes tonight
Se nikkalma l-uġigħ dalwaqt	I'll calm down the headache soon
Se nuża s-siġġu illum	I'll use the chair today
Se naħseb fil-klieb dalwaqt	I'll think about the dogs soon

Se inħares lejn x-xena filgħaxija	I'll look at the painting this evening
Se ngħin fl-uffiċċju il-Ġimgħa	I'll help in the office this Friday
Se naħsel il-flokk is-Sibt	I'll was the sweater tonight
Se inwaddab il-batteriji illejla	I'll throw away the batteries tonight
Se nagħmel it-taħlita is-Sibt li ġej	I'll make the cake batter this Saturday
Se nifhem l-avukat filgħaxija	I'll understand the lawyer this evening
Se nakkwista r-rigal il-ġimgħa li ġejja	I'll acquire the gift next friday
Se niġbor l-basket il-ġimgħa	I'll pick up the bag on Friday
Se nibda nimxi ġimgħatejn oħra	I'll start walking in two weeks
Se neħles mill-iskart nhar l-Erbgħa	I'll get rid of the rubbish next Wednesday
Se immur għat-tifel illum	I'll pick up the child soon
Se indaħħal il-mistiednin il-Ħadd	I'll welcome the guests on Sunday
Se inlesti ż-żarbun is-Sibt	I'll finish the shoe on Saturday
Se nimxi f'Paċeville illum	I'll walk around Paceville today
Se naħbi l-flus għada	I'll hide the money tomorrow
Se napprezza l-Anita għada	I'll appreciate Anita tomorrow
Se infittex ristorante ġimgħa oħra	I'll look for the restaurant next week
Se nevita it-tentazzjoni dalwaqt	I'll avoid the temptation soon
Se insib l-iskultura dalwaqt	I'll find the sculpture soon
Se insemmi l-eżami il-Ġimgħa	I'll name the exam next Friday
Se nikkritika l-party illejla	I'll critique the party tonight
Se nittawwal lejn l-kju issa	I'll look at the queue now
Se immur għal-meeting filgħaxija	I'll go to the meeting this evening
Se niddeskrivi l-ġlieda għada	I'll describe the fight today
Se nipprattika fil-kunċert fil-weekend	I'll practice in the concert this weekend

Se nirċievi marka tajba għada	I'll get a good grade tomorrow
Se ngħid fuq it-televixin illum	I'll talk on the tv today
Se nitħadded mal-priġunier għada	I'll talk to the prisoner tomorrow
Se napplika l-bank ġimgħa oħra	I'll apply at the bank next week
Se inħallas fir-ristorant il-Ħadd	I'll pay at the restaurant on Sunday
Se narma n-negozju is-Sibt li ġej	I'll set up the business next Saturday
Se nuża l-flus issa	I'll use the money now
Se nibgħat l-artiklu fil-weekend	I'll send the article during the weekend
Se narmi l-karti is-Sibt li gej	I'll throw away the paper on Saturday
Se nilmaħ lit-team leader dalwaqt	I'll spot the team leader soon
Se nasal fl-uffiċju dalwaqt	I'll arrive at the office soon
Se inpoġġi fir-ristorant siegħa oħra	I'll sit at the restaurant in an hour
Se inaddaf difrejja illejla	I'll clean my nails soon
Se nirranġa xagħri għada	I'll fix my hair tonight
Se narmi l-bieb illum	I'll throw away the door today
Se nistenna lit-tfal illejla	I'll wait for the children soon
Se nikkalma t-tarbija dalwaqt	I'll calm down the baby soon
Se nuża l-paga illum	I'll use the wages today
Se naħseb fit-tifel dalwaqt	I'll think of the of the child soon
Se inħares lejn l-makeup filgħaxija	I'll look at the makeup this evening
Se ngħin fit-teatru il-ġimgħa	I'll help in the theatre this Friday
Se naħsel il-vit is-Sibt	I'll clean the tap this Saturday
Se inwaddab il-flokk illejla	I'll throw away the sweater tonight
Se nagħmel l-alkoħol is-Sibt li ġej	I'll make the alcohol next Saturday
Se nifhem id-dibattitu filgħaxija	I'll understand the debate tonight

Se nakkwista daqqa ta’ ponn il-ġimgħa li ġejja	I’ll acquire a punch next week
Se niġbor lit-tifel il-Ġimgħa	I’ll pick up the child on Friday
Se nibda b’sebgħin kilo Ġimgħatejn oħra	I’ll start with seventy kilos in two weeks
Se neħles mill-koppja nhar l-Erbgħa	I’ll get rid of the couple next Wednesday
Se immur għal eżami illum	I’ll go to the exam today
Se indaħħal il-ballun il-Ħadd	I’ll take the ball in on Sunday
Se inlesti l-liġi is-Sibt	I’ll finish the law on Saturday
Se nimxi sat-teatru illum	I’ll walk to the theatre today

Appendix E

List of adjectives used in experiment 3 for target sentences.

Verb Male	Verb Female	Meaning
Ambigwu	Ambigwa	Ambiguous
Ambizzjuż	Ambizzjuża	Ambitious
Antipatku	Antipatka	Annoying
Anzjan	Anzjana	Old
Artistiku	Artistika	Artistic
Attiv	Attiva	Active
Beżgħan	Beżgħana	Fearful
Bravu	Brava	Smart
Ċajtier	Ċajtiera	Humorous
Dħuli	Dħulija	Friendly
Edukat	Edukata	Polite
Egoist	Egoista	Egoistical
Esaġerat	Esaġerata	Exaggerated
Ferħan	Ferħana	Happy-go-lucky
Ferrieħi	Ferrieħa	Joyous
Fitt	Fitta	Finicky
Fqir	Fqira	Poor
Ġdid	Ġdida	New
Ġellied	Ġellieda	Quarrelsome
Għajjur	Għajjura	Jealous
Għażżien	Għażżiena	Lazy

Giddieb	Giddieba	Liar
Grazzjuż	Grazzjuża	Graceful
Gustuż	Gustuża	Handsome
Ħabrieki	Ħabrieka	Hard worker
Ħafif	Ħafifa	Light
Ħażin	Ħażina	Bad
Ħelu	Ħelwa	Nice
Onest	Onesta	Honest
Ħosbieni	Ħosbiena	Anxious
Idealist	Idealista	Idealist
Iebes	Iebsa	Hard / Inflexible
Imbroljun	Imbroljuna	Liar / Cheater
Imdaqqas	Imdaqqsa	Huge
Imdejjaq	Imdejqa	Sad
Imgerfex	Imgerfxa	Scatterbrain
Impenjat	Impenjata	Busy
Imqareb	Imqarba	Naughty
Informattiv	Informattiva	Informative
Irqiq	Irqiqa	Thin
Irrabjat	Irrabjata	Angry
Kalm	Kalma	Calm
Kattiv	Kattiva	Cruel
Kbir	Kbira	Big
Kiesaħ	Kiesħa	Show off
Komdu	Komda	Comfortable

Kreattiv	Kreattiva	Creative
Kuntent	Kuntenta	Content
Kuraġġuż	Kuraġġuża	Courageous
Kwiet	Kwieta	Quiet
Loġiku	Loġika	Logical
Maledukat	Maledukata	Rude
Miġnun	Miġnuna	Crazy
Mimli	Mimlija	Full
Negattiv	Negattiva	Negative
Niexef	Niexfa	Dry
Organizzat	Organizzata	Organised
Paċenzjuż	Paċenzjuża	Patient
Passiv	Passiva	Passive
Perfett	Perfetta	Perfect
Posittiv	Posittiva	Positive
Prattiku	Prattika	Practical
Pront	Pronta	Alert
Pulit	Pulita	Well-mannered
Qalbieni	Qalbiena	Courageous
Qammiela	Qammiela	Miser
Qasir	Qasira	Short
Riservat	Riservata	Reserved
Sabiħ	Sabiħa	Beautiful
Salvaġġ	Salvaġġa	Rough
Serju	Serja	Serious

Sinjur	Sinjura	Rich
Skur	Skura	Dark
Sogħod	Sogħda	Dependable
Sportiv	Sportiva	Sporty
Storbjuż	Storbjuża	Loud
Tajjeb	Tajba	Good
Tqil	Tqila	Heavy
Twil	Twila	Tall
Żgħir	Żgħira	Small

Appendix F

List of target sentences used in experiment 3.

Male Correct and Incorrect

Correct	Incorrect	Translation
Ħadd ma fehmni waqt it-taħdita, kont *ambigwu* wisq għal nies mhux speċjaliżżati.	Ħadd ma fehmni waqt it-taħdita, kont *ambigwa* wisq għal nies mhux speċjaliżżati.	No one understood me during the talk, I was too *ambiguous* for people who aren't specialized.
Jien nistudja ħafna, jien *ambizzjuż* u irrid nilħaq tabib.	Jien nistudja ħafna, jien *ambizzjuża* u irrid nilħaq tabiba.	I study a lot, I am *ambitious* and want to become a doctor.
Meta kont iżgħar sħabi kienu igergru dwari, kont *antipatku* u tal-klassi ma kienux jaħmluwni.	Meta kont izgħar sħabi kienu igergru dwari, kont *antipatka* u tal-klassi ma kienux jaħmluwni.	When I was younger my friends used to complain about me, I was *annoying*, and my classmates didn't like me.
Se nibda nfaddal għal meta nikber, meta inkun *anzjan* se ikolli bżonn home.	Se nibda nfaddal għal meta nikber, meta inkun *anzjana* se ikolli bżonn home.	I'm going to start saving up for when I'm *old*, as I'll need to be able to afford a care home.
Jiena inpitter, nikteb u nisfen, inħossni *artistiku* ħafna u nixtieq nitgħallem inkanta.	Jiena inpitter, nikteb u nisfen, inħossni *artistika* ħafna u nixtieq nitgħallem inkanta.	I paint, write and dance, I feel very *artistic* and would like to learn to sing.

Inħobb ħafna mmur il-baħar, jiena *attiv* u jogħġobni l-eżerċizzju.	Inħobb ħafna mmur il-baħar, jiena *attiva* u jogħġobni l-eżerċizzju.	I love to go to the beach, I'm *active* and love to exercise.
Mort għall-kura, jiena *beżgħan* wisq u l-biża qed taffetwali ħajti.	Mort għall-kura, jiena *beżgħana* wisq u l-biża qed taffetwali ħajti.	I went to therapy, I'm too *fearful*, and the fear is affecting my life.
Se nispeċjaliżża biex insir kardjologu, jiena *bravu* u dejjem studjajt bis-serjetà.	Se nispeċjalizza biex insir kardjologu, jiena *brava* u dejjem studjajt bis- serjetà .	I'm going to specialize to become a cardiologist, I'm *smart* and I've always studied seriously.
Lili kulħadd iħobbni, jiena *ċajtier* ħafna u dejjem ikolli xi storja xi ngħid.	Lili kulħadd iħobbni, jiena *ċajtiera* ħafna u dejjem ikolli xi storja xi ngħid.	Everyone loves me, I'm very *humorous* and always have a story to tell.
Għandi ħafna ħbieb, jiena *dħuli* ħafna u kulħadd iħobbni.	Għandi ħafna ħbieb, jiena *dħulija* ħafna u kulħadd iħobbni.	I have a lot of friends, I am very *friendly* and everyone loves me.
Irċevejt premju mill-iskola, jiena *edukat* u l-għalliema tiegħi jħobbuni ħafna.	Irċevejt premju mill-iskola, jiena *edukata* u l-għalliema tiegħi jħobbuni ħafna.	I received a prize from school, I am very *polite*, and my teachers love me.
Dejjem naħseb fija nnifsi l-ewwel, jien *egoist* u dejjem nara kif se niggwadanja.	Dejjem naħseb fija nnifsi l-ewwel, jien *egoista* u dejjem nara kif se niggwadanja.	I always think of myself first, I'm very *egotistical* and I always try to turn things in my favor.

Kultant ma niftakarx l-affarijiet sew u meta ngħid storja nkun *esaġerat* mingħajr ma ninduna.	Kultant ma niftakarx l-affarijiet sew u meta ngħid storja inkun *esaġerata* mingħajr ma ninduna.	Sometimes I don't remember things well and when I tell a story I *exaggerate* without realizing.
Nipprova inkun soċjevoli, jiena *ferħan* u kulħadd jieħu gost miegħi.	Nipprova inkun soċjevoli, jiena *ferħana* u kulħadd jieħu gost miegħi.	I try to be sociable, I'm *happy-go-lucky* and everyone enjoys my company.
In-nies jieħdu gost miegħi, jiena *ferrieħi* u dejjem lest biex ngħin.	In-nies jieħdu gost miegħi, jiena *ferrieħa* u dejjem lest biex ngħin.	People always have fun with me, I'm *joyous* and always ready to help.
Kollox irid ikun nadif u f'postu, jiena *fitt* u jekk nara naqra imbarazz nirrabja.	Kollox irid ikun nadif u f'postu, jiena *fitta* u jekk nara naqra imbarazz nirrabja.	Everything has to be clean and tidy, I'm very *finicky* and chaos bothers me.
Fraħt ħafna bil-ġakketta l-ġdida li qlajt, jiena *fqir* u ma kellix minn fejn nixtri waħda.	Fraħt ħafna bil-ġakketta l-ġdida li qlajt, jiena *fqira* u ma kellix minn fejn nixtri waħda.	I was very happy with the new jacket I got, I'm *poor* and couldn't afford to buy a new one.
Dax-xahar bdilt l-kors, jiena *ġdid* u għadni ma sirtx naf nies.	Dax-xahar bdilt l-kors, jiena *ġdida* u għadni ma sirtx naf nies.	This month I changed my university course, I'm still *new* and I still haven't gotten to know many people.
Kelli xi ngħid ma sħabi, jiena *ġellied* u ma inħallija lixxa lil-ħadd.	Kelli xi ngħid ma sħabi, jiena *ġellieda* u ma inħallija lixxa lil-ħadd.	I had an argument with my friends, I'm *quarrelsome* and never let anyone have the final word.

Sħabi kienu waqfu jkellmuni, jien kont *għajjur* ħafna u ma felħunix iżjed.	Sħabi kienu waqfu jkellmuni, jien kont *għajjura* ħafna u ma felħunix iżjed.	My friends had stopped speaking to me, I was very *jealous* and they couldn't stand me anymore.
Jien inqatta kulljum id-dar, inħossni *għażżien* u lanqas biss irrid insib xogħol.	Jien inqatta kulljum id-dar, inħossni *għażżiena* u lanqas biss irrid insib xogħol.	I spend every day at home, I feel *lazy* and I don't even want to find a job.
Meta kont iżgħar tlift lil sħabi kollha, kont *giddieb* u ħadd ma beda jafdani.	Meta kont iżgħar tlift lil sħabi kollha, kont *giddieba* u ħadd ma beda jafdani.	When I was younger, I lost all my friends, I was a *liar*, and no one trusted me.
Nisfen il-ballet, jiena *grazzjuż* ħafna u għandi futur fiż-żfin.	Nisfen il-ballet, jiena *grazzjuża* ħafna u għandi futur fiż-żfin.	I dance ballet, I'm very *graceful* and I have a future in dancing.
Qed nibda nimmudella, jien *gustuż* u qed nagħmel ħafna suċċess f'dan ix-xogħol.	Qed nibda nimmudella, jien *gustuża* u qed nagħmel ħafna suċċess f'dan ix-xogħol.	I started modelling, I'm *handsome* and I'm being very successful in this job.
Għandi l-kumpanija tiegħi, jiena *ħabrieki* u naħdem siegħat twal.	Għandi l-kumpanija tiegħi, jiena *ħabrieka* u naħdem siegħat twal.	I have my own company, I'm a *hard worker* and I work long hours.
Mindu bdejt id-dieta inħossni aħjar, inħossni *ħafif* iktar u inqas għejjien.	Mindu bdejt id-dieta inħossni aħjar, inħossni *ħafifa* iktar u inqas għejjien.	Ever since I started a diet, I feel better, I feel much *lighter* and less tired.
Qed nipprova ninbidel, ġieli inkun *ħażin* u inweġġa lin-nies.	Qed nipprova ninbidel, ġieli inkun *ħażina* u inweġġa lin-nies.	I'm trying to change, sometimes I'm a *bad* person and I hurt people.

Għandi ħafna ħbieb, inkun *ħelu* u n-nies malajr ikelmuni.	Għandi ħafna ħbieb, inkun *ħelwa* u n-nies malajr ikelmuni.	I have a lot of friends, I'm *nice* to everyone and people find me easy to speak to.
Dejjem ngħid il-verità, jien *onest* wisq tant li kultant niġi fl-inkwiet.	Dejjem ngħid il-verità, jien *onesta* wisq tant li kultant niġi fl-inkwiet.	I always tell the truth, I'm so *honest* that sometimes I get in trouble.
Għamilt sagħtejn ninkwieta, jien *ħosbieni* ħafna u nispiċċa ninkwieta għalxejn.	Għamilt sagħtejn ninkwieta, jien *ħosbiena* ħafna u nispiċċa ninkwieta għalxejn.	I spent two hours worrying, I'm very *anxious* and I end up worrying for nothing.
Dejjem noħlom b'għajnejja miftuħa, jiena *idealist* wisq u ma inqisx ir-realta.	Dejjem noħlom b'għajnejja miftuħa, jiena *idealista* wisq u ma inqisx ir-realta.	I always dream with my eyes open, I am too *idealistic* and not realistic enough.
Għandi bżonn iktar eżerċizzju, inħossni *iebes* u mhux qed inkun nista' nimxi sew.	Għandi bżonn iktar eżerċizzju, inhossni *iebsa* u mhux qed inkun nista' nimxi sew.	I need more exercise, I feel *inflexible* and I'm having trouble walking.
Sraqt lil-klijenti tiegħi, jiena *imbroljun* u ħadd ma induna qabel kien tard wisq.	Sraqt lil-klijenti tiegħi, jiena *imbroljuna* u ħadd ma induna qabel kien tard wisq.	I stole from my clients, I'm a *cheater* and no one noticed before it was too late.
Bid-dieta u eżerċizzju inqast, kont *imdaqqas* mhux ħazin u bdejt inbati bil-problemi tas-saħħa.	Bid-dieta u eżerċizzju inqast, kont *imdaqqsa* mhux ħazin u bdejt inbati bil-problemi tas-saħħa.	With diet and exercise I've lost weight, I was huge and I started having health problems.
Qed inħasseb lil sħabi, inkun *imdejjaq* u ma irrid nitkellem ma ħadd.	Qed inħasseb lil sħabi, inkun *imdejjqa* u ma irrid nitkellem ma ħadd.	I'm worrying my friends, I'm *sad* and I don't want to talk to anyone.

Għandi bżonn l-għajnuna, inħossni *mgerfex* u mhux	Għandi bżonn l-għajnuna, inħossni *mgerfexa* u mhux	I need help, I feel *scatterbrained* and I'm finding it hard to make decisions.
dejjem inkun nista nieħu deċizjoni.	dejjem inkun nista nieħu deċizjoni.	
M'għandi ċans ta' xejn, jiena *impenjat* ħafna u l-ħin kollu nipprova inlaħħaq ma ħafna affarijiet.	M'għandi ċans ta' xejn, jiena *impenjata* ħafna u l-ħin kollu nipprova inlaħħaq ma ħafna affarijiet.	I don't have time for anything, I'm very *busy* and I'm always trying to cope with everything.
Illum qlajt kastig, qagħdt *imqareb* u u ivvintajt l-inkwiet.	Illum qlajt kastig, qagħdt *imqarba* u u ivvintajt l-inkwiet.	Today I got a punishment, I was *naughty*, and I caused trouble.
Il-programm tiegħi intlaqa' sew, kont *informattiv* ħafna speċjalment għall-ġenituri.	Il-programm tiegħi intlaqa' sew, kont *informattiva* ħafna speċjalment għall-ġenituri.	My TV program was very well-received, I was very *informative* especially for the parents.
Jiena nagħmel ħafna eżerċizzju kulljum, jiena *irqiq* u b'saħħti ħafna.	Jiena nagħmel ħafna eżerċizzju kulljum, jiena *irqiqa* u b'saħħti ħafna.	I do a lot of exercise, I'm thin and very fit.
Għajjat ħafna mat-tifel, inħossni *irrabjat* għax gidibli dwar l-eżami.	Għajjat ħafna mat-tifel, inħossni *irrabjata* għax gidibli dwar l-eżami.	I screamed a lot at my child, I feel *angry* because he lied about the exam.
Il-paniku ma jogħġobniex, jiena *kalm* u nieħu l-affarijiet bil-mod.	Il-paniku ma jogħġobniex, jiena *kalma* u nieħu l-affarijiet bil-mod.	I don't like chaos, I'm *calm* and I like to take things slowly.

Tlift lill-sħabi kollha, jien kont *kattiv* u ġibt ruħi ħażin magħom.	Tlift lill-sħabi kollha, jien kont *kattiva* u ġibt ruħi ħażin magħom.	I lost all my friends, I was *cruel* and I behaved badly with them.
Jiena għandi tletin sena u jiena l-*kbir* fost ħuti.	Jiena għandi tletin sena u jiena l-*kbira* fost ħuti.	I'm thirty years old and I'm the *eldest* of my siblings.
Qabel kulħadd kien jevitani, kont *kiesaħ* u dejjem naqla l-inkwiet.	Qabel kulħadd kien jevitani, kont *kiesħa* u dejjem naqla l-inkwiet.	Everyone used to avoid me, I was a *showoff* and always tried to cause trouble.
Jogħġobni ħafna ix-xogħol tiegħi, jiena *komdu* u ikolli ġranet interessanti.	Jogħġobni ħafna ix-xogħol tiegħi, jiena *komda* u ikolli ġranet interessanti.	I really like my job, I am *comfortable* and my days are interesting.
Inkanta u niddisinja l-ħwejjeġ, jiena *kreattiv* ħafna u dejjem nara x'se nivvinta.	Inkanta u niddisinja l-ħwejjeġ, jiena *kreattiva* ħafna u dejjem nara x'se nivvinta.	I sing and design clothes, I'm very *creative* and I always see what I can come up with.
Jiena iżżewwiġt ta' 30 sena, *kuntent* ħafna u se jkollna l-ewwel tifel.	Jiena iżżewwiġt ta' 30 sena, *kuntenta* ħafna u se jkollna l-ewwel tifel.	I got married when I was 30, I'm very *content*, we're about to have our first child.
Se insir pulizija, jiena *kuraġġuż* ħafna u inħobb ngħin lin-nies.	Se insir pulizija, jiena *kuraġġuża* ħafna u nħobb ngħin lin-nies.	I'm going to become a policeman, I'm very *courageous* and I love to help people.
Immur tajjeb l-iskola, jiena *kwiet* u qatt ma naqla' nkwiet.	Immur tajjeb l-skola, jiena kwieta u qatt ma naqla' nkwiet.	I d0 well at school, I'm quiet and I never cause trouble.

Inħobb il-matematika, jiena *loġiku* ħafna u nħobb nirraġuna.	Inħobb il-matematika, jiena *loġika* ħafna u nħobb nirraġuna.	I love mathematics, I'm very *logical* and I love reasoning.
Qlajt għajta mingħand l-għalliema, jiena kont *maledukat* u qlajt l-inkwiet fil-klassi.	Qlajt għajta mingħand l-għalliema, jiena kont *maledukata* u qlajt l-inkwiet fil-klassi.	My teacher scolded me, I was *rude* and I caused trouble in class.
X'ħin ħsibt li tlift lit-tifel qbadt nagħajjat, ħasbuni *miġnun* in-nies li kien hemm madwari.	X'ħin ħsibt li tlift lit-tifel qbadt nagħajjat, ħasbuni *miġnuna* in-nies li kien hemm madwari.	When I thought I lost my child I started shouting, the people around me thought I was going *crazy.*
Naħseb kilt wisq, inħossni *mimli* u għandi bżonn nimxi ftit.	Naħseb kilt wisq, inħossni *mimlija* u għandi bżonn nimxi ftit.	I think I ate too much, I feel *full* and I need to walk around for a bit.
Ħafna drabi jkolli burdata ħażina, jiena *negattiv* ħafna u dejjem nara l-ħażin fil-ħajja.	Ħafna drabi ikolli burdata ħażina, jiena *negattiva* ħafna u dejjem nara l-ħażin fil-ħajja.	Many times, I'm in a bad mood, I'm very *negative* and I always focus on the bad things in life.
Kont niekol u nixrob bla waqfien, issa *niexef* u nqast 50 kilo.	Kont niekol u nixrob bla waqfien, issa *niexfa* u nqast 50 kilo.	I used to eat and drink all the time, now I'm *thin* and I lost 50 kilos.
Il-kumpanija tiegħi sejra tajjeb ħafna, jien *organizzat* u kollox inżomm kif suppost.	Il-kumpanija tiegħi sejra tajjeb ħafna, jien *organizzata* u kollox inżomm kif suppost.	My company is performing very well. I'm *organized* and I keep everything in check.

Nipprova nittratta lil kulħadd sew, inkun *paċenzjuż* u nara l-aħjar f'kulħadd.	Nipprova nittratta lil kulħadd sew, inkun *paċenzjuża* u nara l-aħjar f'kulħadd.	I try to treat everyone well, I'm *patient* and I try to see the best in everyone.
Il-ġlied nipprova nevitaħ, jien *passiv* u nobgħod sitwazzjonijiet ta' konflitt.	Il-ġlied nipprova nevitaħ, jien *passiva* u nobgħod sitwazzjonijiet ta' konflitt.	I try to avoid conflict, I'm *passive* and I hate conflict.
L-istatwi li nagħmel jiswew ħafna flus, jiena *perfett* u nagħmel kollox bil-galbu.	L-istatwi li nagħmel jiswew ħafna flus, jiena *perfetta* u nagħmel kollox bil-galbu.	The statues I make are worth a lot of money, I'm *perfect* and I do everything well.
Dejjem nidħaq, jiena *pożittiv* ħafna u dejjem nara it-tajjeb fin-nies.	Dejjem nidħaq, jiena *pożittiva* ħafna u dejjem nara it-tajjeb fin-nies.	I'm always smiling, I'm very *positive* and always see the good in people.
Il-fantażija ma togħġobniex, jiena *prattiku* u nippreferi r-realiżmu.	Il-fantażija ma togħġobniex, jiena *prattika* u nippreferi r-realiżmu.	Fantasy doesn't appeal to me, I'm *practical* and prefer realism.
Id-dibattitu mar tajjeb, jiena kont *pront* bir-risposti tajbin.	Id-dibattitu mar tajjeb, jiena kont *pronta* bir-risposti tajbin.	The debate went well, I was very *alert* and quick-witted.
Dejjem nitkellem bil-galbu, jien *pulit* u nemmen fil-manjieri tajbin.	Dejjem nitkellem bil-galbu, jien *pulita* u nemmen fil-manjieri tajbin.	I always think before I speak, I'm *polite* and believe in being well-mannered.
Se nidħol ma' l-armata, jiena *qalbieni* ħafna u nixtieq inservi lill-pajjiżi.	Se nidħol ma' l-armata, jiena *qalbiena* ħafna u nixtieq inservi lill-pajjiżi.	I'm going to join the army, I'm *brave* and I'd like to serve my country.
Qatt ma noffri drink, jien *qammiel* u niddejjaq nonfoq il-flus.	Qatt ma noffri drink, jien *qammiela* u niddejjaq nonfoq il-flus.	I never offer someone a drink, I'm a miser and I don't like to spend money.

Dejjem inġib il-banketta, jiena *qasir* u nbati biex innaddaf l-ixkaffa.	Dejjem inġib il-banketta, jiena *qasira* u nbati biex innaddaf l-ixkaffa.	I always get a stool, I'm short and otherwise I can't reach the shelves.
Inħobb naqra u nieħu kafè bil-kwiet, jien *riservat* u l-postijiet mimlijin nies idejquni.	Inħobb naqra u nieħu kafè bil-kwiet, jien *riservata* u l-postijiet mimlijin nies idejquni.	I love to read and have a coffee in peace and quiet, I'm very reserved and places full of people bother me.
Ħadt gost il-bieraħ, qaluli li jiena *sabiħ* waqt il-party.	Ħadt gost il-bieraħ, qaluli li jiena *sabiħa* waqt il-party.	I had a great time yesterday, I was told I'm *beautiful* at the party.
Ġieli inbeżża lil-kulħadd, inkun *salvaġġ* u naħtafhom meta nitkellem.	Ġieli inbeżża lil-kulħadd, inkun *salvaġġa* u naħtafhom meta nitkellem.	Sometimes I scare people, I'm *rough* and I snap at them when I talk.
Ma tantx iħobb noħroġ, jiena *serju* ħafna u nippreferi noqgħod waħdi.	Ma tantx iħobb noħroġ, jiena *serja* ħafna u nippreferi noqgħod waħdi.	I don't like to go out much, I'm *serious* and I'd rather be alone.
Illum xtrajt karozza tad-ditta Porsche, jiena *sinjur* u l-ħin kollu nixtri l-affarijiet ġodda.	Illum xtrajt karozza tad-ditta Porsche, jiena *sinjura* u l-ħin kollu nixtri l-affarijiet ġodda.	Today I bought a Porsche, I'm *rich* and I'm always buying new things.
Inħobba ħafna ix-xemx, inkun *skur* fis-sajf għax immur ħafna l-baħar.	Inħobba ħafna ix-xemx, inkun *skura* fis-sajf għax immur ħafna l-baħar.	I love the sun, I get very *tanned* in summer because I go to the beach a lot.
Ġieli naqa' fit-tentazzjoni, nipprova inkun *sogħod* imma ġieli infalli.	Ġieli naqa' fit-tentazzjoni, nipprova inkun *sogħoda* imma ġieli infalli.	Sometimes I fall into temptation, I try to be but sometimes I fail.

Nilgħab il-basketball professjonalment, jiena *sportiv* minn dejjem u ippruvajt ħafna sports f'ħajti.	Nilgħab il-basketball professjonalment, jiena *sportiva* minn dejjem u ippruvajt ħafna sports f'ħajti.	I play basketball professionally, I'm very *sporty* and I've tried many different sports in my life.
Ikolli xi ngħid mal-ġirien, jiena *storbjuż* speċjalment fit-tard.	Ikollu xi ngħid mal-ġirien, jiena *storbjuża* speċjalment fit-tard.	Sometimes I fight with my neighbors, I'm *loud* especially later on during the day.
Nipprova ma inweġġa lil-ħadd, jiena *tajjeb* u nipprova inkun l-aħjar li nista'.	Nipprova ma inweġġa lil-ħadd, jiena *tajba* u nipprova inkun l-aħjar li nista'.	I try not to hurt anyone, I'm *good* and I try to be the best person I can.
Illum kważi kissirt il banketta, jiena *tqil* wisq biex nitla fuqha.	Illum kważi kissirt il banketta, jiena *tqila* wisq biex nitla fuqha.	Today I almost broke a stool, I'm too *heavy* to use it.
Insiba diffiċli nixtri l-ħwejjeġ, jiena *twil* 6''2.	Insiba diffiċli nixtri l-ħwejjeġ, jiena *twila* 6''2.	I find it hard to buy clothes, I'm 6"2 *tall*.
Jien għandi 18 il-sena u jiena *ż-żgħir* fil-familja tiegħi.	Jien għandi 18 il-sena u jiena *ż-żgħira* fil-familja tiegħi.	I'm 18 years old and I'm the *youngest* of the family.

Female Correct and Incorrect

Correct	Incorrect	Translation
Ħadd ma fehmni waqt it-taħdita, kont *ambigwa* wisq għal nies mhux speċjaliżżati.	Ħadd ma fehmni waqt it-taħdita, kont *ambigwu* wisq għal nies mhux speċjaliżżati.	No one understood me during the talk, I was too *ambiguous* for people who aren't specialized.

Jien nistudja ħafna, jien *ambizzjuża* u irrid nilħaq tabiba.	Jien nistudja ħafna, jien *ambizzjuż* u irrid nilħaq tabib.	I study a lot, I am *ambitious* and want to become a doctor.
Meta kont izgħar sħabi kienu igergru dwari, kont *antipatka* u tal-klassi ma kienux jaħmluwni.	Meta kont iżgħar sħabi kienu igergru dwari, kont *antipatku* u tal-klassi ma kienux jaħmluwni.	When I was younger my friends used to complain about me, I was *annoying*, and my classmates didn't like me.
Se nibda nfaddal għal meta nikber, meta inkun *anzjana* se ikolli bżonn home.	Se nibda nfaddal għal meta nikber, meta inkun *anzjan* se ikolli bżonn home.	I'm going to start saving up for when I'm *old*, as I'll need to be able to afford a care home.
Jiena inpitter, nikteb u nisfen, inħossni *artistika* ħafna u nixtieq nitgħallem inkanta.	Jiena inpitter, nikteb u nisfen, inħossni *artistiku* ħafna u nixtieq nitgħallem inkanta.	I paint, write and dance, I feel very *artistic* and would like to learn to sing.
Inħobb ħafna mmur il-baħar, jiena *attiva* u jogħġobni l-eżerċizzju.	Inħobb ħafna mmur il-baħar, jiena *attiv* u jogħġobni l-eżerċizzju.	I love to go to the beach, I'm *active* and love to exercise.
Mort għall-kura, jiena *beżgħana* wisq u l-biża qed taffetwali ħajti.	Mort għall-kura, jiena *beżgħan* wisq u l-biża qed taffetwali ħajti.	I went to therapy, I'm too *fearful*, and the fear is affecting my life.
Se nispeċjalizza biex insir kardjologu, jiena *brava* u dejjem studjajt bis-serjetà .	Se nispeċjaliżża biex insir kardjologu, jiena *bravu* u dejjem studjajt bis- serjetà .	I'm going to specialize to become a cardiologist, I'm *smart* and I've always studied seriously.

Lili kulħadd iħobbni, jiena *ċajtiera* ħafna u dejjem ikollu xi storja xi ngħid.	Lili kulħadd iħobbni, jiena *ċajtier* ħafna u dejjem ikolli xi storja xi ngħid.	Everyone loves me, I'm very *humorous* and always have a story to tell.
Għandi ħafna ħbieb, jiena *dħulija* ħafna u kulħadd iħobbni.	Għandi ħafna ħbieb, jiena *dħuli* ħafna u kulħadd iħobbni.	I have many friends, I am very *friendly* and everyone loves me.
Irċevejt premju mill-iskola, jiena *edukata* u l-għalliema tiegħi jħobbuni ħafna.	Irċevejt premju mill-iskola, jiena *edukat* u l-għalliema tiegħi jħobbuni ħafna.	I received a prize from school, I am very *polite*, and my teachers love me.
Dejjem naħseb fija nnifsi l-ewwel, jien *egoista* u dejjem nara kif se niggwadanja.	Dejjem naħseb fija nnifsi l-ewwel, jien *egoist* u dejjem nara kif se niggwadanja.	I always think of myself first, I'm very *egotistical* and I always try to turn things in my favour.
Kultant ma niftakarx l-affarijiet sew u meta ngħid storja inkun *esaġerata* mingħajr ma ninduna.	Kultant ma niftakarx l-affarijiet sew u meta ngħid storja nkun *esaġerat* mingħajr ma ninduna.	Sometimes I don't remember things well, and when I tell a story I *exaggerate* without realizing.
Nipprova inkun soċjevoli, jiena *ferħana* u kulħadd jieħu gost miegħi.	Nipprova inkun soċjevoli, jiena *ferħan* u kulħadd jieħu gost miegħi.	I try to be sociable, I'm *happy go lucky* and everyone enjoys my company.
In-nies jieħdu gost miegħi, jiena *ferrieħa* u dejjem lest biex ngħin.	In-nies jieħdu gost miegħi, jiena *ferrieħi* u dejjem lest biex ngħin.	People always have fun with me, I'm *joyous* and always ready to help.
Kollox irid ikun nadif u f'postu, jiena *fitta* u jekk nara naqra imbarazz nirrabja.	Kollox irid ikun nadif u f'postu, jiena *fitt* u jekk nara naqra imbarazz nirrabja.	Everything has to be clean and tidy, I'm very *finicky* and chaos bothers me.

Fraħt ħafna bil-ġakketta l-ġdida li qlajt, jiena *fqira* u ma kellix minn fejn nixtri waħda.	Fraħt ħafna bil-ġakketta l-ġdida li qlajt, jiena *fqir* u ma kellix minn fejn nixtri waħda.	I was very happy with the new jacket I got, I'm *poor* and couldn't afford to buy a new one.
Dax-xahar bdilt l-kors, jiena *ġdida* u għadni ma sirtx naf nies.	Dax-xahar bdilt l-kors, jiena *ġdid* u għadni ma sirtx naf nies.	This month I changed my university course, I'm still *new* and I still haven't gotten to know many people.
Kelli xi ngħid ma sħabi, jiena *ġellieda* u ma inħallija lixxa lil-ħadd.	Kelli xi ngħid ma sħabi, jiena *ġellied* u ma inħallija lixxa lil-ħadd.	I had an argument with my friends, I'm *quarrelsome* and never let anyone have the final word.
Sħabi kienu waqfu jkellmuni, jien kont *għajjura* ħafna u ma felħunix iżjed.	Sħabi kienu waqfu jkellmuni, jien kont *għajjur* ħafna u ma felħunix iżjed.	My friends had stopped speaking to me, I was very *jealous* and they couldn't stand me anymore.
Jien inqatta kulljum id-dar, inħossni *għażżiena* u lanqas biss irrid insib xogħol.	Jien inqatta kulljum id-dar, inħossni *għażżien* u lanqas biss irrid insib xogħol.	I spend every day at home, I feel *lazy* and I don't even want to find a job.
Meta kont iżgħar tlift lil sħabi kollha, kont *giddieba* u ħadd ma beda jafdani.	Meta kont iżgħar tlift lil sħabi kollha, kont *giddieb* u ħadd ma beda jafdani.	When I was younger, I lost all my friends, I was a *liar*, and no one trusted me.
Nisfen il-ballet, jiena *grazzjuża* ħafna u għandi futur fiż-żfin.	Nisfen il-ballet, jiena *grazzjuż* ħafna u għandi futur fiż-żfin.	I dance ballet, I'm very *graceful* and I have a future in dancing.

Qed nibda nimmudella, jien *gustuża* u qed nagħmel ħafna suċċess f'dan ix-xogħol.	Qed nibda nimmudella, jien *gustuż* u qed nagħmel ħafna suċċess f'dan ix-xogħol.	I started modelling, I'm *handsome* and I'm being very successful in this job.
Għandi l-kumpanija tiegħi, jiena *ħabrieka* u naħdem siegħat twal.	Għandi l-kumpanija tiegħi, jiena *ħabrieki* u naħdem siegħat twal.	I have my own company, I'm a *hard-worker* and I work long hours.
Mindu bdejt id-dieta inħossni aħjar, inħossni *ħafifa* iktar u inqas għejjien.	Mindu bdejt id-dieta inħossni aħjar, inħossni *ħafif* iktar u inqas għejjien.	Ever since I started a diet, I feel better, I feel much *lighter* and less tired.
Qed nipprova ninbidel, ġieli inkun *ħażina* u inweġġa lin-nies.	Qed nipprova ninbidel, ġieli inkun *ħażin* u inweġġa lin-nies.	I'm trying to change, sometimes I'm a *bad* person and I hurt people.
Għandi ħafna ħbieb, inkun *ħelwa* u n-nies malajr ikelmuni.	Għandi ħafna ħbieb, inkun *ħelu* u n-nies malajr ikelmuni.	I have a lot of friends, I'm *nice* to everyone and people find me easy to speak to.
Dejjem ngħid il-verità, jien *onesta* wisq tant li kultant niġi fl-inkwiet.	Dejjem ngħid il-verità, jien *onest* wisq tant li kultant niġi fl-inkwiet.	I always tell the truth, I'm so *honest* that sometimes I get in trouble.
Għamilt sagħtejn ninkwieta, jien *ħosbiena* ħafna u nispiċċa ninkwieta għalxejn.	Għamilt sagħtejn ninkwieta, jien *ħosbieni* ħafna u nispiċċa ninkwieta għalxejn.	I spent two hours worrying, I'm very *anxious* and I end up worrying for nothing.
Dejjem noħlom b'għajnejja miftuħa, jiena *idealista* wisq u ma inqisx ir-realta'.	Dejjem noħlom b'għajnejja miftuħa, jiena *idealist* wisq u ma inqisx ir-realta'.	I always dream with my eyes open, I am too *idealistic* and not realistic enough.

Għandi bżonn iktar eżerċizzju, inhossni *iebsa* u mhux qed inkun nista' nimxi sew.	Għandi bżonn iktar eżerċizzju, inħossni *iebes* u mhux qed inkun nista' nimxi sew.	I need more exercise, I feel *inflexible* and I'm having trouble moving.
Sraqt lil-klijenti tiegħi, jiena *imbroljuna* u ħadd ma induna qabel kien tard wisq.	Sraqt lil-klijenti tiegħi, jiena *imbroljun* u ħadd ma induna qabel kien tard wisq.	I stole from my clients, I'm a *cheater* and no one noticed before it was too late.
Bid-dieta u eżerċizzju inqast, kont *imdaqqsa* mhux ħazin u bdejt inbati bil-problemi tas-saħħa.	Bid-dieta u eżerċizzju inqast, kont *imdaqqas* mhux ħazin u bdejt inbati bil-problemi tas-saħħa.	With diet and exercise I've lost weight, I was huge and I started having health problems.
Qed inħasseb lil sħabi, inkun *imdejjqa* u ma irrid nitkellem ma ħadd.	Qed inħasseb lil sħabi, inkun *imdejjaq* u ma irrid nitkellem ma ħadd.	I'm worrying my friends, I'm *sad* and I don't want to talk to anyone.
Għandi bżonn l-għajnuna, inħossni *mgerfexa* u mhux dejjem inkun nista nieħu deċizjoni.	Għandi bżonn l-għajnuna, inħossni *mgerfex* u mhux dejjem inkun nista nieħu deċizjoni.	I need help, I feel *scatterbrained* and I'm finding it hard to make decisions
M'għandi ċans ta' xejn, jiena *impenjata* ħafna u l-ħin kollu nipprova inlaħħaq ma, ħafna affarijiet.	M'għandi ċans ta' xejn, jiena *impenjat* ħafna u l-ħin kollu nipprova inlaħħaq ma, ħafna affarijiet.	I don't have time for anything, I'm very *busy* and I'm always trying to cope with everything.
Illum qlajt kastig, qagħdt *imqarba* u u ivvintajt l-inkwiet.	Illum qlajt kastig, qagħdt *imqareb* u u ivvintajt l-inkwiet.	Today I got a punishment, I was *naughty*, and I caused trouble.

Il-programm tiegħi intlaqa' sew, kont *informattiva* ħafna speċjalment għall-ġenituri.	Il-programm tiegħi intlaqa' sew, kont *informattiv* ħafna speċjalment għall-ġenituri.	My TV program was very well-received, I was very *informative* especially for the parents.
Jiena nagħmel ħafna eżerċizzju kulljum, jiena *irqiqa* u b'saħħti ħafna.	Jiena nagħmel ħafna eżerċizzju kulljum, jiena *irqiq* u b'saħħti ħafna.	I do a lot of exercise, I'm thin and very fit.
Għajjat ħafna mat-tifel, inħossni *irrabjata* għax gidibli dwar l-eżami.	Għajjat ħafna mat-tifel, inħossni *irrabjat* għax gidibli dwar l-eżami.	I screamed a lot at my child, I feel *angry* because he lied about the exam.
Il-paniku ma jogħġobniex, jiena *kalma* u nieħu l-affarijiet bil-mod.	Il-paniku ma jogħġobniex, jiena *kalm* u nieħu l-affarijiet bil-mod.	I don't like chaos, I'm *calm* and I like to take things slowly.
Tlift lill-sħabi kollha, jien kont *kattiva* u ġibt ruħi ħażin magħom.	Tlift lill-sħabi kollha, jien kont *kattiv* u ġibt ruħi ħażin magħom.	I lost all my friends, I was *cruel* and I behaved badly with them.
Jiena għandi tletin sena u jiena l-*kbira* fost ħuti.	Jiena għandi tletin sena u jiena l-*kbir* fost ħuti.	I'm thirty years old and I'm the *eldest* of my siblings.
Qabel kulħadd kien jevitani, kont *kiesħa* u dejjem naqla l-inkwiet.	Qabel kulħadd kien jevitani, kont *kiesaħ* u dejjem naqla l-inkwiet.	Everyone used to avoid me, I was a *showoff* and always tried to cause trouble.
Jogħġobni ħafna ix-xogħol tiegħi, jiena *komda* u ikolli ġranet interessanti.	Jogħġobni ħafna ix-xogħol tiegħi, jiena *komdu* u ikolli ġranet interessanti.	I really like my job, I am *comfortable* and my days are interesting.

Inkanta u niddisinja l-ħwejjeġ, jiena *kreattiva* ħafna u dejjem nara x'se nivvinta.	Inkanta u niddisinja l-ħwejjeġ, jiena *kreattiv* ħafna u dejjem nara x'se nivvinta.	I sing and design clothes, I'm very *creative* and I always see what I can come up with.
Jiena iżżewwiġt ta' 30 sena, *kuntenta* ħafna u se jkollna l-ewwel tifel.	Jiena iżżewwiġt ta' 30 sena, *kuntent* ħafna u se jkollna l-ewwel tifel.	I got married when I was 30, I'm very *content*, we're about to have our first child.
Se insir pulizija, jiena *kuraġġuża* ħafna u inħobb ngħin lin-nies.	Se insir pulizija, jiena *kuraġġuż* ħafna u inħobb ngħin lin-nies.	I'm going to become a policeman, I'm very *courageous* and I love to help people.
Immur tajjeb l-skola, jiena kwieta u qatt ma naqla' nkwiet.	Immur tajjeb l-iskola, jiena *kwiet* u qatt ma naqla' nkwiet.	I do well at school, I'm quiet and I never cause trouble.
Inħobb il-matematika, jiena *loġika* ħafna u nħobb nirraġuna.	Inħobb il-matematika, jiena *loġiku* ħafna u nħobb nirraġuna.	I love mathematics, I'm very *logical* and I love reasoning.
Qlajt għajta mingħand l-għalliema, jiena kont *maledukata* u qlajt l-inkwiet fil-klassi.	Qlajt għajta mingħand l-għalliema, jiena kont *maledukat* u qlajt l-inkwiet fil-klassi.	My teacher scolded me, I was *rude* and I caused trouble in class.
X'ħin ħsibt li tlift lit-tifel qbadt nagħajjat, ħasbuni *miġnuna* in-nies li kien hemm madwari.	X'ħin ħsibt li tlift lit-tifel qbadt nagħajjat, ħasbuni *miġnun* in-nies li kien hemm madwari.	When I thought I lost my child I started shouting, the people around me thought I was going *crazy.*

Naħseb kilt wisq, inħossni *mimlija* u għandi bżonn nimxi ftit.	Naħseb kilt wisq, inħossni *mimli* u għandi bżonn nimxi ftit.	I think I ate too much, I feel *full* and I need to walk around for a bit.
Ħafna drabi ikolli burdata ħażina, jiena *negattiva* ħafna u dejjem nara l-ħażin fil-ħajja.	Ħafna drabi jkolli burdata ħażina, jiena *negattiv* ħafna u dejjem nara l-ħażin fil-ħajja.	Many times, I'm in a bad mood, I'm very *negative* and I always focus on the bad things in life.
Kont niekol u nixrob bla waqfien, issa *niexfa* u nqast 50 kilo.	Kont niekol u nixrob bla waqfien, issa *niexef* u nqast 50 kilo.	I used to eat and drink all the time, now I'm *thin* and I lost 50 kilos.
Il-kumpanija tiegħi sejra tajjeb ħafna, jien *organizzata* u kollox inżomm kif suppost.	Il-kumpanija tiegħi sejra tajjeb ħafna, jien *organizzat* u kollox inżomm kif suppost.	My company is going very well. I'm *organized* and I keep everything in check.
Nipprova nittratta lil kulħadd sew, inkun *paċenzjuża* u nara l-aħjar f'kulħadd.	Nipprova nittratta lil kulħadd sew, inkun *paċenzjuż* u nara l-aħjar f'kulħadd.	I try to treat everyone well, I'm *patient* and I try to see the best in everyone.
Il-ġlied nipprova nevitaħ, jien *passiva* u nobgħod sitwazzjonijiet ta' konflitt.	Il-ġlied nipprova nevitaħ, jien *passiv* u nobgħod sitwazzjonijiet ta' konflitt.	I try to avoid conflict, I'm *passive* and I hate conflict.
L-istatwi li nagħmel jiswew ħafna flus, jiena *perfetta* u nagħmel kollox bil-galbu.	L-istatwi li nagħmel jiswew ħafna flus, jiena *perfett* u nagħmel kollox bil-galbu.	The statues I make are worth a lot of money, I'm *perfect* and I do everything well.
Dejjem nidħaq, jiena *pożittiva* ħafna u dejjem nara it-tajjeb fin-nies.	Dejjem nidħaq, jiena *pożittiv* ħafna u dejjem nara it-tajjeb fin-nies.	I'm always smiling, I'm very *positive* and always see the good in people.

Il-fantażija ma togħġobniex, jiena *prattika* u nippreferi r-realiżmu.	Il-fantażija ma togħġobniex, jiena *prattiku* u nippreferi r-realiżmu.	Fantasy doesn't appeal to me, I'm *practical* and prefer realism.
Id-dibattitu mar tajjeb, jiena kont *pronta* bir-risposti tajbin.	Id-dibattitu mar tajjeb, jiena kont *pront* bir-risposti tajbin.	The debate went well, I was very *alert* and quick witted.
Dejjem nitkellem bil-galbu, jien *pulita* u nemmen fil-manjieri tajbin.	Dejjem nitkellem bil-galbu, jien *pulit* u nemmen fil-manjieri tajbin.	I always think before I speak, I'm *polite* and believe in being well-mannered.
Se nidħol ma' l-armata, jiena *qalbiena* ħafna u nixtieq inservi lill-pajjiżi.	Se nidħol ma' l-armata, jiena *qalbieni* ħafna u nixtieq inservi lill-pajjiżi.	I'm going to join the army, I'm *brave* and I'd like to serve my country.
Qatt ma noffri drink, jien *qammiela* u niddejjaq nonfoq il-flus.	Qatt ma noffri drink, jien *qammiel* u niddejjaq nonfoq il-flus.	I never offer someone a drink, I'm a miser and I don't like to spend money.
Dejjem inġib il-banketta, jiena *qasira* u nbati biex inaddaf l-ixkaffa.	Dejjem inġib il-banketta, jiena *qasir* u nbati biex inaddaf l-ixkaffa.	I always get a stool, I'm short and otherwise I can't reach the shelves.
Inħobb naqra u nieħu kafè bil-kwiet, jien *riservata* u l-postijiet mimlijin nies idejquni.	Inħobb naqra u nieħu kafè bil-kwiet, jien *riservat* u l-postijiet mimlijin nies idejquni.	I love to read and have a coffee in peace and quiet, I'm very reserved and places full of people bother me.
Ħadt gost il-bieraħ, qaluli li jiena *sabiħa* waqt il-party.	Ħadt gost il-bieraħ, qaluli li jiena *sabiħ* waqt il-party.	I had a great time yesterday, I was told I'm *beautiful* at the party.

Ġieli inbeżża lil-kulħadd, inkun *salvaġġa* u naħtafhom meta nitkellem.	Ġieli inbeżża lil-kulħadd, inkun *salvaġġ* u naħtafhom meta nitkellem.	Sometimes I scare people, I'm *rough* and I snap at them when I talk.
Ma tantx inħobb noħroġ, jiena *serja* ħafna u nippreferi noqgħod waħdi.	Ma tantx inħobb noħroġ, jiena *serju* ħafna u nippreferi noqgħod waħdi.	I don't like to go out much, I'm *serious* and I'd rather be alone.
Illum xtrajt karozza tad-ditta Porsche, jiena *sinjura* u l-ħin kollu nixtri l-affarijiet ġodda.	Illum xtrajt karozza tad-ditta Porsche, jiena *sinjur* u l-ħin kollu nixtri l-affarijiet ġodda.	Today I bought a Porsche, I'm *rich* and I'm always buying new things.
Inħobbha ħafna ix-xemx, inkun *skura* fis-sajf għax immur ħafna l-baħar.	Inħobbha ħafna ix-xemx, inkun *skur* fis-sajf għax immur ħafna l-baħar.	I love the sun, I get very *tanned* in summer because I go to the beach a lot.
Ġieli naqa' fit-tentazzjoni, nipprova inkun *sogħoda* imma ġieli infalli.	Ġieli naqa' fit-tentazzjoni, nipprova inkun *sogħod* imma ġieli infalli.	Sometimes I fall into temptation, I try to be but sometimes I fail.
Nilgħab il-basketball professjonalment, jiena *sportiva* minn dejjem u ippruvajt ħafna sports f'ħajti.	Nilgħab il-basketball professjonalment, jiena *sportiv* minn dejjem u ippruvajt ħafna sports f'ħajti.	I play basketball professionally, I'm very *sporty* and I've tired many different sports in my life.
Ikollu xi ngħid mal-ġirien, jiena *storbjuża* speċjalment fit-tard.	Ikolli xi ngħid mal-ġirien, jiena *storbjuż* speċjalment fit-tard.	Sometimes I fight with my neighbors, I'm *loud* especially later on during the day.
Nipprova ma nweġġa lilħadd, jiena *tajba* u nipprova inkun l-aħjar li nista'.	Nipprova ma nweġġa lilħadd, jiena *tajjeb* u nipprova inkun l-aħjar li nista'.	I try not to hurt anyone, I'm *good* and I try to be the best person I can.

Illum kważi kissirt il banketta, jiena *tqila* wisq biex nitla fuqha.	Illum kważi kissirt il banketta, jiena *tqil* wisq biex nitla fuqha.	Today I almost broke a stool, I'm too *heavy* to use it.
Insiba diffiċli nixtri l-ħwejjeġ, jiena *twila* 6''2.	Insiba diffiċli nixtri l-ħwejjeġ, jiena *twil* 6''2.	I find it hard to buy clothes, I'm 6"2 *tall*.
Jien għandi 18 il-sena u jiena *ż-żgħira* fil-familja tiegħi.	Jien għandi 18 il-sena u jiena *ż-żgħir* fil-familja tiegħi.	I'm 18 years old and I'm the *youngest* of the family.

Maltese and Maltese English Correct and Incorrect

Congruent	Incongruent	Translation
L-artiklu ħadd ma fehmu, huwa *ambigwu* wisq għal nies mhux speċjaliżżati.	L-artiklu ħadd ma fehmu, huwa *ambigwa* wisq għal nies mhux speċjaliżżati.	No one understood the article, it was too *ambiguous* for people who aren't specialized.
Martina studjat ħafna, hija *ambizzjuża* u trid tilħaq tabiba.	Martina studjat ħafna, hija *ambizzjuż* u trid tilħaq tabiba.	Martina studied a lot, she is *ambitious* and wants to become a doctor.
Is-siġġu għandu bżonn ħafna tiswija, huwa *antik* ħafna u l-injam qed jitmermer.	Is-siġġu għandu bżonn ħafna tiswija, huwa *antika* ħafna u l-injam qed jitmermer.	The chair needs to be repaired, it's an *antique* and it's very decayed.
Sarah kulħadd igerger dwara, hija *antipatka* u tal-klassi tagħha ma jaħmluwiex.	Sarah kulħadd igerger dwara, hija *antipatku* u tal-klassi tagħha ma jaħmluwiex.	Everyone complains about Sarah, she's *annoying* and her classmates don't like her.
In-nannu sejjer ġo home, huwa *anzjan* u m'għadux jiflaħ joqgħod waħdu.	In-nannu sejjer ġo home, huwa *anzjana* u m'għadux jiflaħ joqgħod waħdu.	My grandfather is going to a care home, he's *geriatric* and he can't live alone.

Moira tpitter, tikteb u tisfen, hija *artistika* ħafna u issa tixtieq titgħallem tkanta.	Moira tpitter, tikteb u tisfen, hija *artistiku* ħafna u issa tixtieq titgħallem tkanta.	Moira paints, writes and dances, she's very *artistic* and she'd like to learn to sing.
Marija tħobb ħafna tmur il-baħar, hija *attiva* u jogħġobha l-eżerċizzju.	Marija tħobb ħafna tmur il-baħar, hija *attiv* u jogħġobha l-eżerċizzju.	Marija loves to go to the beach, she's *active* and loves to exercise.
James mar għall-kura, huwa *beżgħan* wisq u l-biża kienet qed taffetwalu ħajtu.	James mar għall-kura, huwa *beżgħana* wisq u l-biża kienet qed taffetwalu ħajtu.	James went to therapy, he's too *fearful*, and the fear was affecting his life.
Lara se tispeċjalizza biex issir kardjologa, hija *brava* u dejjem studjat dis-serjetà .	Lara se tispeċjalizza biex issir kardjologa, hija *bravu* u dejjem studjat dis-serjetà .	Lara is going to specialize to become a cardiologist, she's *smart* and always studies hard.
Michael kulħadd iħobbu, huwa *ċajtier* ħafna u dejjem ikollu xi storja xi jgħid.	Michael kulħadd iħobbu, huwa *ċajtiera* ħafna u dejjem ikollu xi storja xi jgħid.	Everyone loves Michael, he's very *humorous* and always has a story to tell.
Eric għandu ħafna ħbieb, huwa *dħuli* ħafna u kulħadd iħobbu.	Eric għandu ħafna ħbieb, huwa *dħulija* ħafna u kulħadd iħobbu.	Eric has a lot of friends, he's very *friendly* and everyone loves him.
Chiara qalgħet premju mill-iskola, hija *edukata* u l-għalliema tagħha jħobbuwha ħafna.	Chiara qalgħet premju mill-iskola, hija *edukat* u l-għalliema tagħha jħobbuwha ħafna.	Chiara received a prize from school, she's very *polite* and her teachers love her.

Mark dejjem jaħseb fih innifsu, huwa *egoist* u dejjem jara kif se jiggwadanja.	Mark dejjem jaħseb fih innifsu, huwa *egoista* u dejjem jara kif se jiggwadanja.	Mark always thinks of himself first, he's very *egotistical* and always tries to turn things in his favor.
Il-kera dejjem togħla, hija *esaġerata* u qed isir impossibbli li issib post.	Il-kera dejjem togħla, hija *esaġerat* u qed isir impossibbli li issib post.	The rent is always getting higher, it's *exaggerated* and it's becoming impossible to find a place.
Duncan jagħmel ħbieb malajr, huwa *ferħan* u kulħadd jieħu gost miegħu.	Duncan jagħmel ħbieb malajr, huwa *ferħana* u kulħadd jieħu gost miegħu.	Daniel makes friends quickly, he's *happy-go-lucky* and everyone enjoys his company.
Andre kulħadd iħobbu, huwa *ferrieħi* u dejjem lest biex jgħin.	Andre kulħadd iħobbu, huwa *ferrieħa* u dejjem lest biex jgħin.	Everyone loves Andre, he's *joyous* and always ready to help.
Doris ferħet bil-ġakketta l-ġdida li qalgħet, hija *fqira* u ma kellix minn fejn tixtri waħda.	Doris ferħet bil-ġakketta l-ġdid li qalgħet, hija *fqir* u ma kellix minn fejn tixtri waħda.	Doris was very happy with the new jacket she received, she's *poor* and couldn't afford to buy a new one.
L-ilma tal-baħar pjaċevoli wisq, huwa *frisk* u jtaffi is-sħana tas-sajf.	L-ilma tal-baħar pjaċevoli wisq, huwa *friska* u jtaffi is-sħana tas-sajf.	The sea water is very pleasant, it's *fresh* and cools you down from the summer heat.
Il-ktieb jiswa 50 ewro, huwa *ġdid* u fih sittin kapitlu.	Il-ktieb jiswa 50 ewro, huwa *ġdida* u fih sittin kapitlu.	The book is worth 50 euros, it's *new* and contains sixty chapters.

Kristjan kellu xi jgħid ma sieħbu, huwa *ġellied* u ma jħallija lixxa lil-ħadd.	Kristjan kellu xi jgħid ma sieħbu, huwa *ġellieda* u ma jħallija lixxa lil-ħadd.	Kristjan had an argument with his friend, he's very quarrelsome and never lets anyone have the final word.
Frankie telqitu it-tfajla, huwa *għajjur* ħafna u hi ma felħitux iżjed.	Frankie telqitu it-tfajla, huwa *għajjura* ħafna u hi ma felħitux iżjed.	Frankie's girlfriend broke up with him, he's very *jealous* and she couldn't stand him anymore.
Sabrina tqatta kulljum id-dar, hija *għażżiena* u lanqas biss trid issib xogħol.	Sabrina tqatta kulljum id-dar, hija *għażżien* u lanqas biss trid issib xogħol.	Sabrina spends every day at home, she is *lazy* and doesn't even want to find a job.
Anthea tilfet lil sħaba kollha, hija *giddieba* u ħadd ma beda jafda.	Anthea tilfet lil sħaba kollha, hija *giddieb* u ħadd ma beda jafda.	Anthea lost all her friends, she's a *liar*, and no one trusted her.
Anita tisfen il-ballet, hija *grazzjuża* ħafna u għanda futur fi-sfin.	Anita tisfen il-ballet, hija *grazzjuż* ħafna u għanda futur fi-sfin.	Anita dances ballet, she is very *graceful* and has a future in dancing.
Alvin qed jimmudella, huwa *gustuż* u qed jagħmel ħafna suċċess f'dan ix-xogħol.	Alvin qed jimmudella, huwa *gustuża* u qed jagħmel ħafna suċċess f'dan ix-xogħol.	Alvin started modelling, he's handsome and is being very successful in this job.
Josef għandu l-kumpanija tiegħu, huwa *ħabrieki* u jaħdem sigħat twal.	Josef għandu l-kumpanija tiegħu, huwa *ħabrieka* u jaħdem sigħat twal.	Josef has his own company, he's a *hard worker* and works long hours.

Il-bagalja malajr ġarrejta fl-ajruport, hija *ħafifa* għax bilkemm tfajt affarijiet fija.	Il-bagalja malajr ġarrejta fl-ajruport, hija *ħafif* għax bilkemm tfajt affarijiet fija.	The luggage was very easy to carry, it was *light* because I barely put anything in it.
Il-mobile li tawni ma jaħdimx, huwa *ħażin* u mhux qed naqbad lill-ħadd.	Il-mobile li tawni ma jaħdimx, huwa *ħażina* u mhux qed naqbad lill-ħadd.	The phone they gave me doesn't work, it's *bad* and I can't get hold of anyone.
Id-diska rebħet l-ewwel premju, hija *ħelwa* u tibqa' f'moħħok.	Id-diska rebħet l-ewwel premju, hija *ħelu* u tibqa' f'moħħok.	The song that won first place is *sweet* and memorable.
Christina għamlet sagħtejn tinkwieta, hi *ħosbiena* ħafna u tispiċċa tinkwieta għalxejn.	Christina għamlet sagħtejn tinkwieta, hi *ħosbieni* ħafna u tispiċċa tinkwieta għalxejn.	Christina spent two hours worrying, she's very *anxious* and ends up worrying about nothing.
Mario dejjem joħlom b'għajnejh miftuħa, huwa *idealist* wisq u ma jqisx ir-realtà.	Mario dejjem joħlom b'għajnejh miftuħa, huwa *idealista* wisq u ma jqisx ir-realtà.	Mario always dreams with his eyes open, he's too *idealistic* and not realistic enough.
L-eżami tal-matematika ftit jgħaddu minnu, huwa *iebes* u ħafna studenti majkunux preparati sew.	L-eżami tal-matematika ftit jgħaddu minnu, huwa *iebsa* u ħafna studenti majkunux preparati sew.	Only a few people pass the Maths exam, it's *hard* and many students aren't prepared enough.
Clare serqet lil-klijenti tagħha, hija *imbroljuna* u ħadd ma induna qabel kien tard wisq.	Clare serqet lil-klijenti tagħha, hija *imbroljun* u ħadd ma induna qabel kien tard wisq.	Clare stole from her clients, she's a *cheater* and no one noticed before it was too late.

Id-dar il-ġdida dalwaqt lesta, hija *imdaqqsa* mhux ħażin u fija ħafna dawl.	Id-dar il-ġdida dalwaqt lesta, hija *imdaqqas* mhux ħażin u fija ħafna dawl.	The new house will soon be ready, it's *huge* and has a lot of light.
Eliza qed tħasseb lil sħaba, hija *imdejjqa* u ma trid titkellem ma ħadd.	Eliza qed tħasseb lil sħaba, hija *imdejjaq* u ma trid titkellem ma ħadd.	Eliza is worrying her friends, she's *sad* and doesn't want to talk to anyone.
Il-kamra għanda bżonn tindifa, hija *imgerfxa* u hemm l-imbarazz kullimkien.	Il-kamra għanda bżonn tindifa, hija *imgerfex* u hemm l-imbarazz kullimkien.	The room needs tidying, it's *untidy* and there's clutter everywhere.
Arnold m'għandu ċans ta' xejn, huwa *impenjat* ħafna u l-ħin kollu jipprova jlaħħaq ma' ħafna affarijiet.	Arnold m'għandu ċans ta' xejn, huwa *impenjata* ħafna u l-ħin kollu jipprova jlaħħaq ma' ħafna affarijiet.	Arnold doesn't have time for anything. He's very *busy* and he always tries to cope with everything.
Krista qalgħet kastig, hija *imqarba* u dejjem tara x'se tivvinta.	Krista qalgħet kastig, hija *imqareb* u dejjem tara x'se tivvinta.	Krista got a punishment, she was *naughty*, and caused trouble.
Il-programm intlaqa sew, huwa *informattiv* ħafna speċjalment għall-ġenituri.	Il-programm intlaqa sew, huwa *informattiv* ħafna speċjalment għall-ġenituri.	The TV program was very well-received, it was very *informative* especially for the parents
Ommi rat ġakketta li għoġbitha, kienet *irħisa* u iddeċidiet li sejra tixtrija.	Ommi rat ġakketta li għoġbitha, kienet *irħis* u iddeċidiet li sejra tixtrija.	My mum saw a jacket she liked, it was *cheap,* so she bought it.

Mario jagħmel ħafna eżerċizzju kulljum, huwa *irqiq* u b'saħħtu ħafna.	Mario jagħmel ħafna eżerċizzju kulljum, huwa *irqiqa* u b'saħħtu ħafna.	Mario does a lot of exercise every day, he's *thin* and very fit.
Jessica il-paniku ma jogħġobhiex, hija *kalma* u tieħu l-affarijiet bil-mod.	Jessica il-paniku ma jogħġobhiex, hija *kalm* u tieħu l-affarijiet bil-mod.	Jessica doesn't like chaos, she's *calm* and takes things slowly.
Malcolm tilef lill-sħabu kollha, huwa *kattiv* u kien jġib ruħu ħażin magħhom.	Malcolm tilef lill-sħabu kollha, huwa *kattiva* u kien jġib ruħu ħażin magħhom.	Malcolm lost all his friends, he was *cruel* and behaved badly with them.
Marija għanda għoxrin sena, hija *l-kbira* fost it-tlett ħutha l-bniet.	Marija għanda għoxrin sena, hija *l-kbir* fost it-tlett ħutha l-bniet.	Maria is twenty years old and is the *eldest* of her female siblings.
Anna kulħadd jevita, hija *kiesħa* u dejjem taqla' l-inkwiet.	Anna kulħadd jevita, hija *kiesaħ* u dejjem taqla' l-inkwiet.	Everyone avoids Anna, she's a *showoff* and always trying to cause trouble.
Is-sufan xtrajtu illum, huwa *komdu* u se ipoġġih ħdejn it-tieqa.	Is-sufan xtrajtu illum, huwa *komda* u se ipoġġiha ħdejn it-tieqa.	I bought a new sofa today, it's *comfortable* and I'm going to place it near the window.
Krista tkanta u tiddisinja l-ħwejjeġ, hija *kreattiva* ħafna u dejjem tara x'se tivvinta.	Krista tkanta u tiddisinja l-ħwejjeġ, hija *kreattiv* ħafna u dejjem tara x'se tivvinta.	Krista sings and designs clothes, she's very *creative* and always comes up with something new.
John iżżewweġ ta 30 sena, huwa *kuntent* ma' martu u se jkollhom l-ewwel tifel.	John iżżewweġ ta 30 sena, huwa *kuntenta* ma' martu u se jkollhom l-ewwel tifel.	John got married when he was 30, he's very *content* and

		they're about to have their first child.
Ġina se ssir pulizija, hija *kuraġġuża* ħafna u tħobb tgħin lin-nies.	Ġina se ssir pulizija, hija *kuraġġuż* ħafna u tħobb tgħin lin-nies.	Gina is going to become a policeman, she's very *courageous* and loves to help people.
Anthea tmur tajjeb l-skola, hija *kwieta* u qatt ma taqla' l-inkwiet.	Anthea tmur tajjeb l-skola, hija *kwiet* u qatt ma taqla' l-inkwiet.	Anthea does well at school, she's *quiet* and never causes trouble.
Esther tħobb il-matematika, hija *loġika* ħafna u tħobb tirraġuna.	Esther tħobb il-matematika, hija *loġiku* ħafna u tħobb tirraġuna.	Esther loves mathematics, she's *logical* and loves reasoning.
Daniela qalet għajta mingħand l-għalliema, hija *maledukata* u dejjem taqla' l-inkwiet fil-klassi.	Daniela qalet għajta mingħand l-għalliema, huwa *maledukat* u dejjem taqla' l-inkwiet fil-klassi.	Daniela was scolded by his teacher, she was *rude* and caused trouble in class.
Il-karus ilu għandi sentejn, huwa *mimli* u rrid nizvujtah.	Il-karus ilu għandi sentejn, huwa *mimlija* u rrid nizvujtah.	I've had the money box for two years, it's *full* and I need to empty it.
Paul dejjem bil-burdata, huwa *negattiv* ħafna u dejjem jara l-ħażin fil-ħajja	Paul dejjem bil-burdata, huwa *negattiva* ħafna u dejjem jara l-ħażin fil-ħajja	Paul is always in a bad mood, he's very *negative* and always sees the negative in life.
Il-pjanta għanda bżonn l-ilma, hija *niexfa* u dalwaqt se tmut.	Il-pjanta għanda bżonn l-ilma, hija *niexfa* u dalwaqt se tmut.	The plant needs watering, it's *dry* and about to die soon.

James dejjem jgħid il-verità, huwa *onest* wisq tant li kultant jiġi fl-inkwiet.	James dejjem jgħid il-verità, huwa *onesta* wisq tant li kultant jiġi fl-inkwiet.	James always tells the truth, he's too *honest* which sometimes gets him in trouble.
Il-kumpanija sejra tajjeb ħafna, hija *organizzata* u kollox miżmum kif suppost.	Il-kumpanija sejra tajjeb ħafna, hija *organizzat* u kollox miżmum kif suppost.	My company is going very well, everything's *organized,* and I keep everything in check.
Anton jipprova jittratta lil kulħadd sew, huwa *paċenzjuż* u jara l-aħjar f'kulħadd.	Anton jipprova jittratta lil kulħadd sew, huwa *paċenzjuża* u jara l-aħjar f'kulħadd.	Anton tries to treat everyone well, he's *patient* and tries to see the best in everyone.
Martin Il-ġlied jipprova jevitaħ, huwa *passiv* u jogħbod sitwazzjonijiet ta' konflitt.	Martin Il-ġlied jipprova jevitaħ, huwa *passiva* u jogħbod sitwazzjonijiet ta' konflitt.	Martin always tries to avoid *conflict*, he's passive and hates conflict.
L-istatwa ta' l-irħam tiswa' ħafna flus, hija *perfetta* u magħmula bil-galbu.	L-istatwa ta' l-irħam tiswa' ħafna flus, hija *perfett* u magħmula bil-galbu.	The statue made of marble is worth a lot of money, it is *perfect* and well made.
Amelia dejjem tidħaq, hija *pożittiva* ħafna u dejjem tara it-tajjeb fin-nies.	Amelia dejjem tidħaq, hija *pożittiv* ħafna u dejjem tara it-tajjeb fin-nies.	Amelia is always smiling, she's very *positive* and always sees the good in people.
Anthea il-fantażija ma tantx togħġobha, hija *prattika* u tippreferi r-realizmu.	Anthea il-fantażija ma tantx togħġobha, hija *prattiku* u tippreferi r-realizmu.	Fantasy doesn't appeal to Anthea, she's *practical* and prefers realism.

Janet tmur tajjeb fid-dibattiti, hija *pronta* u dejjem ikollha risposti tajbin.	Janet tmur tajjeb fid-dibattiti, hija *pront* u dejjem ikollha risposti tajbin.	Janet did well in the debate, she was very *alert* and quick-witted.
Anthea dejjem titkellem bil-galbu, hija *pulita* u temmen fil-manjieri tajbin.	Anthea dejjem titkellem bil-galbu, hija *pulit* u temmen fil-manjieri tajbin.	Anthea always thinks before she speaks, she's *polite* and believes in being well-mannered.
Clive se jidħol ma l-armata, huwa *qalbieni* ħafna u jixtieq iservi lill-pajjiżu.	Clive se jidħol ma l-armata, huwa *qalbieni* ħafna u jixtieq iservi lill-pajjiżu.	Clive is going to join the army, he's *brave* and would like to serve his country.
Jessica qatt ma toffri drink, hija *qammiela* u l-ħin kollu tipprova tapprofitta ruħa.	Jessica qatt ma toffri drink, hija *qammiel* u l-ħin kollu tipprova tapprofitta ruħa.	Jessica never offers someone a drink, she's a *miser* and doesn't like to spend money.
Aldo jġib banketta biex jilħaq, hu *qasir* u jbati biex inaddaf l-ixkaffi.	Aldo jġib banketta biex jilħaq, hu *qasira* u jbati biex inaddaf l-ixkaffi.	Aldo got a stool, he's *short* and can't reach the shelves.
James inħobb jaqra u jieħu kafè bil-kwiet, huwa *riservat* u l-postijiet mimlijin nies idejquħ.	James inħobb jaqra u jieħu kafè bil-kwiet, huwa *riservata* u l-postijiet mimlijin nies idejquħ.	James loves to read and have a coffee in peace and quiet, he's very *reserved* and places full of people bother him.
Martina ħadet gost il-bieraħ, qalulha hija *sabiħa* waqt il-party.	Martina ħadet gost il-bieraħ, qalulha hija *sabiħ* waqt il-party.	Martina had a great time yesterday, she was told she's *beautiful* at the party

It-tigra beżżgħet lil-annimali l-oħra, hija *salvaġġa* u werwrithom malli rawha.	It-tigra beżżgħet lil-annimali l-oħra, hija *salvaġġ* u werwrithom malli rawha.	The tiger scared the other animals, she's *rough* and she terrified them.
Dennis ma tantx iħobb joħroġ, huwa *serju* ħafna u jippreferi joqgħod waħdu.	Dennis ma tantx iħobb joħroġ, huwa *serja* ħafna u jippreferi joqgħod waħdu.	Dennis doesn't like to go out much, he's *serious* and would rather be alone.
Marija xtrat karozza tad-ditta Porsche, hija *sinjura* u l-ħin kollu tixtri l-affarijiet ġodda.	Marija xtrat karozza tad-ditta Porsche, hija *sinjur* u l-ħin kollu tixtri l-affarijiet ġodda.	Marija bought a Porsche, she's *rich* and is always buying new things.
Il-gwardarobba tesgħa ħafna ħwejjeġ, hija *skura* bil-bibien ħomor.	Il-gwardarobba tesgħa ħafna ħwejjeġ, hija *skur* bil-bibien ħomor.	The wardrobe is very spacious, it's *dark* with red doors.
Il-bieb se jitwaħħal għada, huwa *sogħod* u magħmul mill-injam.	Il-bieb se jitwaħħal għada, huwa *sogħoda* u magħmul mill-injam.	The door will be fitted tomorrow, it's *sturdy* and made of wood.
Clara tilgħab il-basketball professjonalment, hija *sportiva* minn dejjem u ippruvat ħafna sports f'ħajjitha.	Clara tilgħab il-baketball professjonalment, hija *sportiv* minn dejjem u ippruvat ħafna sports f'ħajjitha.	Clara plays basketball professionally, she's very *sporty* and has tired many different sports in life.
Alexei ikollu xi jgħid mal-ġirien, huwa *storbjuż* speċjalment fit-tard.	Alexei ikollu xi jgħid mal-ġirien, huwa *storbjuża* speċjalment fit-tard.	Alexei sometimes fights with his neighbors, he's *loud* especially later on during the day.

It-torta se tintogħġob minn kulħadd, hija *tajba* u kollha dekorazzjonijiet.	It-torta se tintogħġob minn kulħadd, hija *tajjeb* u kollha dekorazzjonijiet.	Everyone is going to like the pie, it's *good* and nicely decorated.
Ħafna tfal mhux se jgħaddu, il-karta hi *tqila* wisq għal-livell tagħhom.	Ħafna tfal mhux se jgħaddu, il-karta hi *tqil* wisq għal-livell tagħhom.	Many children won't pass, the exam is too *hard* for their level.
It-tifel għandu bżonn ħwejjeġ ġodda, ta' 3 snin ġa hu *twil* daqs tifel ta 5 snin.	It-tifel għandu bżonn ħwejjeġ ġodda, ta' 3 snin ġa hu *twila* daqs tifel ta 5 snin.	My son needs new clothes, he's only 3 years old but is already as *tall* as a 5-year-old.
Martin għandu tlett snin, huwa *iż-żgħir* fil-familja tiegħu.	Martin għandu tlett snin, huwa *iż-żgħira* fil-familja tiegħu.	Martin is three years old, he's the *youngest* of the family.

Appendix G

List of checking questions used in experiment 3.

Gender Questions

Question	Translation
Kulħadd fehmni?	Did everyone understand me?
Nistudja ħafna?	Do I study a lot?
Sħabi kienu jgergru dwari?	Did my friends complain about me?
Jien anzjan?	Am I old?
Jien inpitter?	Do I paint?
Nogħbod il-baħar?	Do I hate the beach?
Mort għal-kura?	Did I go to therapy?
Nixtieq insir pulizija?	Do I want to join the police?
Kulħadd iħobbni?	Does everyone love me?
Għandi ħafna ħbieb?	Do I have a lot of friends?
Irċevejt midalja?	Did I receive a medal?
Inħobb niġġwadanja?	Am I an opportunist?
Niftakar kollox?	Do I have a good memory?
Jiena soċjevoli?	Am I sociable?
Inħobb ngħin lin-nies?	Do I like to help people?
Inħobb l-indafa?	Do I like cleanliness?
Qlajt qmis ġdida?	Did I receive a new shirt?
Bqajt fl-stess kors?	Did I change my course?
Hriġt ma sieħbi?	Did I go out with my friend?
Sħabi jgħiru għalija?	Are my friends jealous?

Noħroġ kulljum?	Do I go out daily?
Kont nigdeb spiss?	Do I lie constantly?
Niżfen il-ballet?	Do I dance ballet?
Jiena nimmudella?	Do I model?
Għandi kumpanija?	Do I have a business?
Bdejt dieta?	Did I start a diet?
Qed nipprova ninbidel?	Am I trying to change?
Malajr nagħmel ħbieb?	Do I make friends easily?
Qatt ma niġi fl-inkwiet?	Do I never get in trouble?
Ma ninkwetax?	Do I worry?
Inħobb nimmaġina?	Do I like to daydream?
Nagħmel ħafna eżerċizzju?	Do I do a lot of exercise?
Ħallast lill-klijenti?	Did I pay the clients?
Kont irqiq?	Was I thin?
Jiena ferħana?	Am I happy?
Inħobb niddeċiedi?	Do I like to make decisions?
Ikolli ħafna x'nagħmel?	Am I very busy?
Ilbieraħ qlajt kastig?	Did I receive a punishment?
Nagħmel programm?	Do I host a tv program?
Nagħmel l-eżerċizzju?	Do I exercise?
Għandi tifel?	Do I have a child?
Inħobb l-għaġġla?	Do I like to do things quickly?
Għandi ħafna ħbieb?	Do I have a lot of friends?
Għandi tletin sena?	Am I thirty years old?
Kulħadd kien jevitani?	Does everyone avoid me?

Ix-xogħol idejjaqni?	Do I hate work?
Jiena inkanta?	Do I sing?
Se jkolli tifel?	Am I going to have a child?
Se insir infermira?	Am I going to be a nurse?
Immur tajjeb l-iskola?	Do I do well in school?
Inħobb il-Franċiż?	Do I like French?
Immur l-iskola?	Do I go to school?
Qbadt ngħajjat?	Did I scream?
Kilt wisq?	Did I eat too much?
Dejjem inkun burdata tajba?	Am I always in a good mood?
Kont niżen ħafna?	Was I much heavier?
Għandi klinika?	Do I own a clinic?
Jitlawli malajr?	Do I lose my temper easily?
Idejjaqni l-konflitt?	Do I hate conflict?
Jiena inpinġi?	Do I draw?
Nara t-tajjeb fin-nies?	Do I always see the good in people?
Inħobb ir-realiżmu?	Am I realistic?
Kelli risposti tajbin?	Did I give good answers?
Għandi nuqqas ta manjieri?	Am I ill-mannered?
Se insir avukat?	Am I going to be a lawyer?
Inħobb noffri x-xorb?	Do I like to buy drinks?
Ma nużax il-banketta?	Did I use the stool?
Inħobb il-qari?	Do I like to read?
Mort party?	Did I go to a party?
Ħadd ma jibża minni?	Are people afraid of me?

Inħobb il-kumpanija?	Do I like company?
Xtrajt Porsche?	Did I buy a Porsche?
Nobgħod ix-xemx?	Do I dislike the sun?
Qatt ma infalli?	Did I never fail?
Nilgħab il-basketball?	Do I play basketball?
Nagħmel l-istorbju?	Do I make a lot of noise?
Nipprova inkun antipatku?	Do I try to be annoying?
Kissirt banketta?	Did I break the stool?
Insiba faċli nixtri l-ħwejjeġ?	Do I find it easy to buy clothes?
Għandi għoxrin sena?	Am I twenty years old?

Language Questions

Question	Translation
Kulħadd fehem l-artiklu?	Did everyone understand the article?
Martina tistudja ħafna?	Does Martina study a lot
L-injam qed jitmermer?	Is the wood decaying?
Sarah igergru dwara?	Do people complain about Sarah?
In-nannu qiegħed l-isptar?	Is grandpa in hospital?
Moira tpitter?	Does Moira paint?
Marija togħbod il-baħar?	Does Marija hate the beach?
James mar għal-kura?	Did James go to therapy?
Lara tixtieq issir pulizija?	Does Lara want to join the police?
Michael kulħadd iħobbu?	Does everyone love Michael?
Eric għandu ħafna ħbieb?	Does Eric have a lot of friends?
Chiara irċeviet midalja?	Did Chiara receive a medal?
Mark iħobb jiġġwadanja?	Is Mark and opportunist?

Il-kera irħisa?	Is rent cheap?
Duncan soċjevoli?	Is Duncan sociable?
Andre iħobb jgħin lin-nies?	Does Andre like to help people?
Doris qalet qmis ġdida?	Did Doris receive a new shirt?
L-ilma tal-baħar frisk?	Is the sea water fresh?
Il-ktieb jiswa sittin ewro?	Is the book worth sixty euros?
Kristjan ħareġ ma sieħbu?	Did Kristjan go out with his friend?
Frankie se jiżżewweġ?	Is Frankie getting married?
Sabrina toħroġ ħafna?	Does Sabrina go out a lot?
Anthea kienet tigdeb spiss?	Does Anthea lie a lot?
Anita tiżfen il-ballet?	Does Anita dance ballet?
Alvin jimmudella?	Does Alvin model?
Josef għandu kumpanija?	Does Josef have a business?
Il-bagalja ġarrejtha?	Did I carry the luggage?
Il-mobile ma jaħdimx?	Is the mobile not working?
Id-diska ħelwa?	Is the song nice?
Christina ma tinkwetax?	Does Christina worry?
Mario jħobb jimmaġina?	Does Mario like to daydream?
L-eżami ħafif?	Is the exam easy?
Claire ħallset lill-klijenti?	Did Claire pay her clients?
Id-dar lesta?	Is the house done?
Eliza ferrieħa?	Is Eliza happy go lucky?
Il-kamra nadifa?	Is the room clean?
Arnold ikollu ħafna x'jagħmel?	Is Arnold always busy?
Krista qalgħet premju?	Did Krista receive a gift?

Il-programm mar tajjeb?	Was the program well received?
Ommi għoġbitha l-ġakketta?	Did my mother like the jacket?
Mario jagħmel l-eżerċizzju?	Does Mario exercise?
Jessica tħobb l-għaġġla?	Does Jessica like to do things quickly?
Malcolm għandu ħafna ħbieb?	Does Malcolm have many friends?
Marija għanda għoxrin sena?	Is Marija twenty years old?
Anna kulħadd jevita?	Does everyone avoid Anna?
Is-sufan skomdu?	Is the sofa uncomfortable?
Krista tkanta?	Does Krista sing?
John se jkollu tifel?	Is John going to have a child?
Ġina se issir infermiera?	Is Ġina going to become a nurse?
Anthea tmur tajjeb l-iskola?	Does Anthea do well in school?
Esther tħobb il-Franċiż?	Does Esther like French?
Daniela tmur l-iskola?	Does Daniela go to school?
Il-karus mimli?	Is the money bank full?
Paul dejjem burdata tajba?	Is Paul always in a good mood?
Il-pjanta trid l-ilma?	Does the plant need water?
James qatt ma jiġi fl-inkwiet?	Does James never get in trouble?
Il-kumpanija sejra ħażin?	Is the business going badly?
Anton jitlawlu malajr?	Does Anton lose his temper easily?
Martin idejqu l-konflitt?	Does Martin hate conflict?
L-istatwa irħisa?	Is the statue cheap?
Amelia tara it-tajjeb fin-nies?	Does Amelia always see the best in people?
Anthea tħobb ir-realiżmu?	Is Anthea realistic?
Janet kellha risposti tajbin?	Does Janet have good answers?

Anthea għanda nuqqas ta manjieri?	Is Anthea ill-mannered?
Clive se isir avukat?	Is Clive going to become a lawyer?
Jessica tħobb toffri x-xorb?	Does Jessica like to offer drinks?
Aldo ma użax banketta?	Did Aldo use a stool?
James iħobb il-qari?	Does James like to read?
Martina marret party?	Did Martina go to a party?
Ħadd ma jibża mit-tigra?	Is no one afraid of the tiger?
Dennis inħobb il-kumpanija?	Does Dennis like company?
Marija xtrat Porsche?	Did Marija buy a Porsche?
Il-gwardarobba ċara?	Is the wardrobe light colored?
Il-bieb magħmul mill-aluminju?	Is the door made of aluminum?
Claire tilgħab il-basketball?	Does Claire play basketball?
Alexei jagħmel l-istorbju?	Is Alexei loud?
It-torta ħażina?	Is the pie bad?
Ħafna tfal se jgħaddu?	Are many children going to pass?
It-tifel għandu sitt snin?	Is the child six years old?
Martin għandu għoxrin sena?	Is Martin twenty years old?

Appendix H

List of semantic anomalies and semantically correct sentences used in experiment 3.

Semantically Correct

Sentence	Translation
Martin siefer sa l-Italja, qabad *ajruplan* u f'sagħtejn wasal.	Martin travelled to Italy, he got on a *plane* and arrived in two hours.
Il-kamra kienet ilha magħluqa, daħħalt l-*arja* billi ftaħt it-tieqa.	The room had been closed for a very long time, I opened the window to let some *air* in.
Insejt il-ħwejjeġ barra, sibthom ma l-*art* ħabba ir-riħ.	I forgot the clothes outside, I found them on the *floor* due to the wind.
Wara it-titjira, stennejt il-*bagalja* qabel qbadt it-taxi.	After the flight, I wanted for my *luggage* before getting a taxi.
Stephanie tħobb il-crafts, milux irranġat *banketta* u ġabitha qisa ġdida.	Stephanie likes crafts, a while ago she fixed a *stool* and made it look brand new.
Christopher iħobb l-sports, jilgħab *basketball* u football ma team.	Christopher likes sports, he plays *basketball* and football with a team.
Mark wasal ix-xogħol, fetaħ il-*bieb* għax kien l-ewwel wieħed.	Mark arrived at work, he opened the *door* and found out he was there first.
Ħriġt niekol ma sħabi s-Sibt, servewna *b'ikel* u xorb mill-aħjar.	I went out to eat with my friends on Saturday, we were served some very good *food* and drinks.
Is-Sibt nagħmel il-faċendi, nibda bil-*ħwejjeġ* u l-art.	On Saturday I do the chores, I start with the *laundry* followed by washing the floor.

Qatt ma irbaħt il-lotterija, ninsa nixtri *biljett* kull ġimgħa.	I've never won the lottery, I forget to buy a *ticket* every week.
Jenny kitbet ittra, waħħlet il-*bolla* u bagħtita.	Jenny wrote a letter, she stuck a *stamp* and sent it.
Mort inlesti l-ittri, waħħalt il-*bolol* u wara impustajthom.	I got the mail ready, bought some *stamps* and posted them.
Filgħodu dejjem nieħu kolazzjon, ġeneralment *ċereali* u ftit ħalib.	Every morning I have breakfast, usually *cereal* and some milk.
Is-Sibt nagħmel il-muffins, nibda b'taċ-*ċikkulata* u nispiċċa b'tal-lumi.	On Saturday I make muffins, I start by making *chocolate* ones and end by making lemon ones.
Kulljum noħroġ il-kelb għal nofs siegħa, inlibbsu iċ-*ċinġa* ħalli ma jaħrabx.	Every day I take the dog out for half an hour, I always put on his *harness*, so he doesn't run away.
Wara l-ikla, nerfa iż-żejjed fil-*kontenitur* għal l-għada.	After dinner, I put away the leftovers in a *container* for the day after.
Anthea iddekorat id-dar, xtrat il-*cushions* u l-purtieri.	Anthea decorated her home, she bought new *cushions* and curtains.
Mark wasal id-dar, xegħel id-*dawl* u beda jsajjar.	Mark arrived at home, he turned on the *light* and started cooking.
James iħobb kull ħaġa tal-baħar, speċjalment id-*dgħajjes* u l-jetskis.	James likes everything to do with the sea, especially *boats* and jetskis.
James jisma ir-radju, iħobb id-*diski* u t-taħditiet.	James listens to the radio, he likes the *songs* and debates.
Filgħaxija immur sal-bar, nieħu *flixkun* birra u ngħid kelma.	In the evening I go to the bar, I have a *bottle* of beer and a chat.

Tlift il-baskett, kont tfajt l-*flus* u iċ-ċwievet fih.	I lost my bag, I had my *money* and keys in it.
It-tisjir dam tlett siegħat, il-*forn* naqra batut.	The cooking took three hours, the *oven* is not so good.
Ftaħt ħanut, nitfa xi xorb fil-*friġġ* bil-lest għan-nies.	I have a grocery shop, every day I put drinks in the *fridge* for the customers.
Sarah tħobb l-insetti, l-*friefet* il-favoriti tagħha.	Sarah likes insects, her favorites are *butterflies*.
Is-Sibt mort sa restorant ġdid, waqqajt il-*furketta* u mal-ewwel bidluwa.	On Saturday we went to a new restaurant, I dropped my *fork* and immediately was given a new one.
Minn dejjem xtaqt għasfur, se inġib *gaġġa* dalwaqt.	I've always wanted a pet bird, I'm going to buy a *cage* soon.
Filgħaxija inħoss il-bard, nilbes *ġakketta* biex noħroġ.	In the evening I feel cold, I wear a *jacket* to go out.
Kristian kulljum iqum bil-ġuħ, jiekol *gallettina* u xi ftit frott.	Kristian always wakes up hungry, he eats a *biscuit* and some fruit.
Andre jħobb isajjar l-ħelu, jaħmi l-*għaġina* favorita tiegħu hu stess.	Andre loves to bake sweets, he makes the *pastry* himself.
Noel ikabbar l-ħaxix, imur l-*għalqa* kulljum biex jieħu ħsiebhom.	Noel grows vegetables, he goes to check his *fields* every day.
Xahrejn ilu xtrajt gaġġa kbira ħafna, l-*għasafar* dejjem għoġbuni.	Two months ago, I bought a very big cage, I've always liked *birds*.
Filgħodu inqum kmieni, imur *ġirja* qabel ix-xogħol.	Every morning I wake up early, I go for a *run* before work.
Sefora tħobb il-fjuri, tieħu ħsieb il-*ġnien* bil-galbu.	Sefora likes flowers, she takes care of her *garden* very well.

Clara ila taqbeż mindu kienet zgħira, il-*ħabel* taf tużaħ sew.	Clara has been jumping ever since she was a child, she's very good with a *skipping rope*.
Inħobb it-tlielaq ta' l-għasafar, inrabbi il-*ħamiem* tat-tiġrija ukoll.	I like bird races, I even breed racing *pigeons*.
Stephanie tħobb il-pjanti, tuża *ħamrija* flok kompost.	Stephanie loves plants, she prefers using *soil* rather than compost.
Nhar ta Sibt immur sas-supermarkit nixtri l-ikel, *ħaxix* u frott nixtri mis-suq.	Every Saturday I go to the supermarket to buy groceries, then I buy fresh fruit and *vegetables* from the market.
Il-bieraħ ħassejt il-bard fil-post, xegħelt il-*heater* biex insaħħan .	Yesterday I felt cold, I turned on the *heater* to feel warmer.
James iħobb isajjar, speċjalment il-*ħelu* u t-torti.	James likes to cook, especially *sweets* and cakes.
Martin mar jistad, qabad *ħuta* daqsiex.	Martin went fishing, he caught a very big *fish*.
Ftaħt ħanut tal-moda, nimportaw il-*ħwejjeġ* minn Milan.	I opened a clothes shop, I import *clothes* from Milan.
Mario jħobb il-films, imur ħafna iċ-*ċinema* fil-weekend.	Mario loves films, he goes a lot to the *cinema* in the weekend.
Waqajt it-taraġ, ksirt *idejja* u mort l-sptar.	I feel down the stairs, broke my *arm* and went to the hospital.
Mort il-bank, iddepożitajt il-*flus* u wara ħallast il-kontijiet.	I went to the bank, I deposited the *money* and after paid my bills.
Sefora xtrat dar ġdida, waqqgħet il-*ħajt* u kabbret il-kċina.	Sefora bought a new house, she tore down a *wall* and made the kitchen larger.

Martina tħobb il-makeup, fuq xufftejha tagħmel il-*lipstick* favorit tagħha.	Martina loves makeup, on her lips she always uses her favorite *lipstick*.
Jeremy irid isir pedjatra, jistudja il-*mediċina* bil-qalb.	Jeremy wants to become a pediatrician, he loves studying *medicine*.
Stephanie pjanista eċċellenti, tħobb il-*mużika* klassika.	Stephanie is an excellent pianist, she loves classical *music*.
Clara ila idoqq mindu kienet żgħira, taf il-*pjanu* u l-vjolin.	Clara has been playing ever since she was a young child, she's learnt both the *piano* and violin.
Jenny qatgħet il-kartonċin, użat l-*imqass* il-kbir.	Jenny cut up the cardboard, she used a large pair of *scissors*.
Mort noqgħod f'dar ġdida, għadni nikteb l-*indirizz* ħażin.	I went to live in a new house, I still write my *address* wrong.
Andrea bena librerija, għamilha mill-*injam* li sab mormija.	Andrea built a library, he made it out of *wood* that he found discarded.
Alexia tmur ħafna l-baħar, tippreferi ir-*ramel* mill-blat.	Alexia goes to the beach a lot, she prefers *sandy* beaches to rocky ones.
Mort sat-teatru is-Sibt, bikkietni ir-*reċta* u għoġbitni ħafna.	I went to the theater, I liked the *play* it made me cry.
Ħriġt niżfen ma sħabi s-Sibt, poġġejt fuq is-*siġġu* meta għajjejt.	I went out dancing with my friends on Saturday, I sat on a *chair* when I got tired.
Kristian kulljum iqum kmieni, jagħmel *kafè* biex jiġi f'tiegħu.	Kristian wakes up early every day, he makes a *coffee* so he's more alert.
Il-basket tal-ħwejjeġ tiegħi mimli, l-*kalzetti* iridu jinħaslu.	My laundry basket is full, the *socks* need to be washed.

Robert jieħu ir-ritratti, juża l-*kamera* li xtara milux.	Robert takes photos, he uses a *camera* he bought recently.
Clare taħdem fi stamperija, tordna l-*karti* kull ġimgħa.	Clare works in the printshop, she orders *paper* every week.
Andrea mela il-librerija, il-*kotba* jikkollezjonhom.	Andrea filled his library, he collects *books*.
Qabel norqod biex nirrilassa, naqra *ktieb* u nieħu te'.	Before going to sleep, in order to relax I read a *book* and have a tea.
Is-sħana kienet qawwija wisq, xegħelt l-*air conditioner* fl-uffiċċju.	It was too hot, I turned on the *air conditioner* in the office,
Andrew iħobb isiefer, imur allavolja l-*ajruplan* idardru.	Andrew loves to travel, he goes even though the *airplane* makes him sick.
Nobgħod it-tindif tad-dar, speċjalment l-*art* tieħu wisq ħin	I hate cleaning the house, especially the *floor* which takes too long.
Andrew jħobb isiefer, jixtri l-*biljett* fuq l-internet.	Andrew loves to travel, he buys his *tickets* on the internet.
John għażel is-suġġetti tas-sekondarja, ħa l-*bioloġija* u l-kimika.	John chose his secondary school subjects, he chose *biology* and chemistry.
Filgħaxija nħares lejn l-stilel, meta l-*lejl* ikun ċar.	In the evening I look at the stars, when the *sky* is clear enough.
Irbaħt il-lotterija, ġbart il-*flus* ġimagħtejn wara.	I won the lottery, I received my *money* two weeks later.
Stephanie tilbes tal-moda, tippreferi l- *ilbiesi* mill-qliezet.	Stephanie is very trendy, she prefers *dresses* to trousers.

Il-laqgħa damet tlett siegħat, tkellem l-*imgħallem* għal siegħa sħiħa.	The meeting took three hours, the *boss* spoke for a whole hour.
Il-librerija tiegħi mimlija, *kotba* żejda qed inżommhom f'kaxxa għalissa.	My library is full, I'm keeping my extra *books* in a box.
Andrea jħobb jilgħab fuq il-PlayStation, Resident Evil hija l-*logħba* favorita tiegħu.	Andrea loves to play on his PlayStation, Resident Evil is his favourite *game*.
Id-dar għandna ħafna fjuri, l-*pjanta* favorita tiegħi hija l-warda.	At home we have many flowers, my favourite *plant* is the rose.
Sarah tħobb l-annimali, l-*qtates* il-favoriti tagħha.	Sarah loves animals, *cats* are her favorite.
Kristina marret timxi, libset l-*islippers* u telqet il-barra.	Kristina went for a walk, she put on her *slippers* and left.
Qed nitgħallem lingwa ġdida, nitkellem l-*Spanjol* bażiku għalissa.	I'm learning a new language, I only speak basic *Spanish* so far.
Tkellimt f'konferenza fl-Iżlanda, attendiet *udjenza* minn pajjiżi varjati.	I spoke at a conference in Iceland, the *audience* was made up of people from various countries.
Waqqajt it-televixin, kissirt il-*maduma* li ġie fuqha.	I dropped my tv, it broke a *tile* with the fall.
It-tifel beda l-skola, iħobb il-*Matematika* u l-Malti.	My son started school, he loves *Mathematics* and Maltese.
Clare taħdem fi spiżerija, tordna l-*mediċini* kull ġimgħa.	Clare works in a pharmacy, she orders *medicine* every week.
Milux bdejt xogħol ġdid, l-imgħallem sejjaħ *meeting* u laqqani mal-kollegi.	I started a new job not too long ago, the boss called a *meeting* and introduced me to all my colleagues.

It-tifel beda l-iskola, joqgħod fuq *mejda* vera skomda.	My son started school, his *desk* and chair are very uncomfortable.
Mark jikkompeti fit-tlielaq, rebaħ *midalja* tat-tieni post milux.	Mark competes in track and field, he won a *medal* for second place recently.
Anthea ippreparat l-kolazzjon, għamlet il-*milkshake* u l-pancakes.	Anthea prepared breakfast, she made pancakes and *milkshake*.
Kulljum noħroġ il-kelb għal nofs siegħa, imorru *mixja* fil-viċinanzi.	Every day I take the dog out, we go for a *walk* nearby.
Gary jieħu gost jaqra, speċjalment *novelli* u fantaxjenza.	Gary loves to read, especially *novels* and science fiction.
Milux għalaqt snini, għamilt *party* u ikla biex niċċelebra.	It was my birthday recently, I had a *party* and a dinner to celebrate.
John huwa kittieb, iħobb jikteb fil-*pitazz* qabel ma juża l-computer.	John is a writer, he likes writing on a *journal* before using the computer.
Filgħodu dejjem inbexxex, l-*pjanti* ikunu nixfin.	Every day I water my *plants*, they are always dry.
Noel iħobb ipitter xeni tan-nies, imur l-*pjazza* biex isib l-ispirazzjoni.	Noel likes to paint scenes with people in them, he goes to the *square* to find inspiration.
Il-mużika toġgħobni ħafna, speċjalment *pop* u Jazz.	I love music, especially *pop* and jazz.
Martina xtrat dar antika, qed tirranġa l-*post* kulljum wara ix-xogħol.	Martina bought an old *house*, she's fixing it up every day after work.
Inħobb nara it-televixin, inseġwi *programmi* li ikunu interessanti ħafna.	I like to watch TV, I watch *programs* that are very interesting.

Jeremy qed jirranġa id-dar, dendel *purtiera* mill-isbaħ il-bieraħ.	Jeremy is fixing up his house, he hung up some really nice *curtains* yesterday.
Minn dejjem xtaqt l-annimali, se inġib *qattus* dalwaqt.	I always wanted pets, I'm getting a *cat* soon.
Christopher iħobb l-festa, speċjalment l-*qbiż* waqt il-marċ.	Christopher likes the village feast, especially *jumping* behind the marching band
Mario jħobb jipprova ikel ġdid, jiekol *f'ristorant* ġdid kull weekend.	Mario likes to try new food, he eats at a new *restaurant* every weekend.
Martina tieħu banjijiet twal, tinħasel bis-*sapuna* favorita tagħha, riħa ta frawli.	Martina like to take long baths, she uses her favorite *soap* which smells like strawberries.
Robert inaddaf wara l-ikel, juża s-*sarvetta* biex inaddaf il-bank.	Robert clears up after dinner, he uses a *cloth* to clean the kitchen top.
Anthea hija kok, fir-restorant għanda tletin *siġġu* u imwejjed għal magħhom.	Anthea is a cook, at her restaurant she has 30 *chairs* and tables for them.
Qed nitgħallem l-astrofiżika, l-*spazju* dejjem interessani.	I'm learning astrophysics, *space* has always interested me.
It-teknoloġija togħġobni ħafna, speċjalment l-*ispeakers* u televixins.	Technology fascinates me, especially *speakers* and televisions.
James jaqqgħad il-pitturi, iħobb l-*stampi* astratti u klassiċi.	James collects paintings, he likes abstract and classic *paintings*.
Ingħaqadt ma l-għaqda astronomika, l-*stilel* jaffaxxinawni.	I'm now a member of the astronomical society, the *stars* fascinate me.
Anthea hija għalliema, fil-klassi għanda tletin *student* tal-primarja.	Anthea is a teacher, she has thirty *pupils* in her primary school class.

Xahrejn ilu bdejt naħdem ġo skola, ngħallem l-*studenti* ix-xjenza.	Two months ago I started to work in a school, I teach the *students* science.
Wara x-xogħol nintefa naqra, is-*sufan* l-ġdid li xtrajt vera komdu.	After work I lie down to read, my new *sofa* is very comfortable.
Għamilt ikla romantika, ix-xemgħat xegħlthom bis-*sulfarina* biex insebbaħ l-atmosfera.	I made a romantic meal, I lit the candles with a *matchstick* to create more atmosphere.
Kristina ħarġet sal-casino, libset it-*takkuna* u telqet il-barra.	Kristina went to the casino, she wore *high heels* and left.
Martina titlaq mid-dar kmieni filgħodu, taqbad *tal-linja* u tmur l-università.	Martina leaves home early in the morning, she catches the *bus* to university.
Alexia tmur ħafna bir-rota, tippreferi issuq fuq it-*tarmac* milli l-kampanja.	Alexia uses her bike a lot, she prefers to ride on *tarmac* rather than in the countryside.
Gary jieħu gost jixrob, speċjalment *tazzi* mimlijin whisky.	Gary likes to drink, especially *glasses* full of whisky.
Nixtieq insir attriċi, inħobb it-*teatru* u l-films.	I'd like to become an actress, I love *theater* and films.
Nhar ta Sibt immur sas-supermarkit, nuża it-*trolley* għax inkun mgħobbija .	Every Saturday I go to the supermarket, I use a *trolley* because I buy many things.
Filgħaxija immur il-gym, nagħmel ftit *weights* u cardio.	In the evening I go to the gym, I do some *weights* and cardio.
Il-bieraħ mort party, xrobt *whisky* u vera kien tajjeb.	Yesterday I went to a party, I drank *whisky* and it was very good.
Filgħodu inqum kmieni, nara ix-*xemx* tiela qabel ix-xogħol.	In the morning I wake up early, I like to see the *sun* rising before going to work.

Il-bieraħ mort il-lezzjoni tal-ballet, iż-*żfin* qed jitqal f'dan il-livell.	Yesterday I went to ballet lessons, the *dance* classes are getting harder.
Mark jirranġa l-fjuri, jorbot l-bukketti *b'żigarella* meta jlesti.	Mark makes flower arrangements, he ties up the bouquets with a *ribbon*.

Semantically Incorrect

Sentence	Translation
Martin mar jistad, qabad *ajruplan* daqsiex.	Martin went fishing, he caught a huge *plane*.
Is-sħana kienet qawwija wisq, xegħelt *l-arja* fl-uffiċċju.	The heat was too much, I turned on the *air* in the office.
Id-dar għandna ħafna fjuri, *l-art* favorita tiegħi hija l-warda.	We have a lot of flowers at home, my favorite *floor* is the rose.
Wara l-ikla, nerfa iż-żejjed *fil-bagalja* għal l-għada.	After eating, I put away the leftovers in my *luggage* for the next day.
Stephanie pjanista eċċellenti, tħobb *il-banketta* klassika.	Stephanie is an excellent pianist, she like the classical *stool*.
Christopher iħobb l-festa, speċjalment l-*basketball* waqt il-marċ.	Christopher likes the village feast, especially the *basketball* during the ‘marċ’.
Mark wasal id-dar, xegħel *il-bieb* u beda jsajjar.	Mark arrived at home, he turned on the *door* and started cooking.
Ħriġt niżfen ma sħabi s-Sibt, poġġejt fuq *l-ikel* meta għajjejt.	I went out to dance with my friends on Saturday, I sat down on the *food* when I got tired.
Is-Sibt nagħmel il-muffins, nibda *bil-ħwejjeġ* u nispiċċa b'tal-lumi.	On Saturday I make muffins, I start with the *laundry* and finish with the lemons.

Irbaħt il-lotterija, ġbart *il-biljett* ġimagħtejn wara.	I won the lottery, I picked up the *ticket* a two weeks later.
Jenny qatgħet il-kartonċin, użat *il-bolla* l-kbira.	Jenny cut up the cardboard, she used the big *stamp*.
Mort il-bank, iddepozitajt *il-bolol* u wara ħallast il-kontijiet.	I went to the bank, deposited the *stamps* and then paid the bills.
Filgħodu dejjem inbexxex, *iċ-ċereali* ikunu nixfin.	Every morning I water, the *cereal* is usually dry.
Is-Sibt nagħmel il-faċendi, nibda *biċ-ċikkulata* u l-art.	On Saturday I do the chores, I start with *chocolate* and washing the floor.
Kulljum noħroġ il-kelb għal nofs siegħa, imorru *iċ-ċinga* fil-viċinanzi.	Every day I take the dog out for half an hour, we go *harness* close by.
Wara it-titjira, stennejt *il-kontenitur* qabel qbadt it-taxi.	After the flight, I waited for the *container* before getting a taxi.
Anthea ippreparat l-kolazzjon, għamlet il-*cushions* u l-pancakes.	Anthea prepared breakfast, she made *cushions* and pancakes.
Mark wasal ix-xogħol, fetaħ *id-dawl* għax kien l-ewwel wieħed.	Mark arrived at work, he opened the *light* since he was first.
James iħobb isajjar, speċjalment *id-dgħajjes* u t-torti.	James likes cooking, especially *boats* and cakes.
James jaqqgħad il-pitturi, iħobb *id-diski* astratti u klassiċi.	James collects paintings, he likes the abstract and classical *songs*.
Filgħaxija immur il-gym, nagħmel ftit il-flixkun u cardio.	In the evening I go to the gym, I do some *bottle* and cardio.

Qatt ma irbaħt il-lotterija, ninsa nixtri *flus* kull ġimgħa.	I never win the lottery, I forget to buy *money* every week.
Il-laqgħa damgħet tlett siegħat, tkellem *il-forn* għal siegħa sħiħa.	The meeting took three hours, the *oven* spoke for a whole hour.
Ftaħt ħanut tal-moda, ninporta *il-fridge* minn Milan.	I opened a clothes shop, I import the *fridge* from Milan.
Sarah tħobb l-annimali, *l-friefet* il-favoriti tagħha.	Sarah likes animals, her favorites are *butterflies*.
Mort sat-teatru is-Sibt, bikkietni *il-furketta* u għogħġbitni ħafna.	On Saturday I went to the theater, I enjoyed the *fork* as it made me cry.
Minn dejjem xtaqt it-tfal, se inġib *gaġġa* dalwaqt.	I've always wanted kids, I'm going to get a *cage* soon.
Filgħaxija nħares lejn l-stilel, meta *l-ġakketta* ikun ċar.	In the evening I look at the stars, when the *jacket* is clear.
Kristian kulljum iqum kmieni, jagħmel *ġallettina* biex jiġi f'tiegħu.	Kristian always wakes up early, he makes a *biscuit* to become more alert.
Andrea jħobb jilgħab fuq il-Playstation, Resident Evil hija *l-għaġina* favorita tiegħu.	Andre loves to play on the Playstation, Resident Evil is his favourite *pastry*.
Noel iħobb ipitter xeni tan-nies, imur *l-għalqa* biex isib l-ispirazzjoni.	Noel likes to paint scenes with people in them, he goes to his *field* every day for inspiration.
Xahrejn ilu bdejt naħdem ġo skola, ngħallem l-*għasafar* ix-xjenza.	Two months ago, I started working in a school, I teach the *birds* science.
Filgħodu inqum kmieni, nara *il-ġirja* tiela qabel ix-xogħol.	Every morning I wake up early, I see the *race* going up before work.

Sefora xtrat dar ġdida, waqqgħet *il-ġnien* u kabbret il-kċina.	Sefora bought a new car, she took down the *garden* and enlarged the kitchen.
Clara ila idoqq mindu kienet żgħira, taf *il-ħabel* u l-vjolin.	Clara has been playing ever since she was a child, she can play the *rope* and the violin.
Tkellimt f'konferenza fl-Iżlanda, attendiet *ħamiem* minn pajjiżi varjati.	I spoke at a conference in Iceland, a lot of foreign *pigeons* attended.
Stephanie tilbes tal-moda, tippreferi *l-ħamrija* mill-qliezet.	Stephanie is very trendy, she prefers *soil* to trousers.
Nhar ta Sibt immur sas-supermarkit, nuża il-*ħaxix* għax inkun mgħobbija .	Every Saturday I go to the supermarket, I use the *vegetables* to carry my things.
Għamilt ikla romatika, ix-xemgħat xegħlthom *bil-heater* biex insebba- l-atmosfera .	I cooked a romantic meal, I turned on the candles using the *heater* to create an atmosphere.
James iħobb kull ħaġa tal-baħar, speċjalment l-*ħelu* u l-jetskis.	James likes everything to do with the sea, especially *sweets* and jetskis.
Martin siefer sa l-Italja, qabad *ħuta* u f'sagħtejn wasal.	Martin flew to Italy, he caught a *fish* and was there in two hours.
Ftaħt ħanut, nitfa xi xorb *fil-ħwejjeġ* bil-lest għan-nies.	I opened a grocery shop, I put some *drinks* in the clothes for the customers.
Mario jħobb jipprova ikel ġdid, jiekol f'*ċinema* ġdid kull weekend.	Mario loves trying out new food, he eats at a new *cinema* in the weekend.
Waqqajt rixa, kissiritli *idejja* u mort l-isptar.	I dropped a feather, it broke my *arm* I went to the hospital.
Mort inlesti l-ittri, waħħalt *il-flus* u wara impustajthom.	I finished the letters, I stuck the *money* on them and posted them.

Sefora tħobb il-fjuri, tieħu ħsieb *il-ħajt* bil-galbu.	Sefora likes flowers, she takes care of the *wall* very well.
Martina tieħu banjijiet twal, tinħasel bil-*lipstick* favorita tagħha, riħa ta frawli.	Martina loves taking long baths, she washes with her favourite *lipstick*, which smells of strawberries.
Jeremy qed jirranġa id-dar, dendel l-*mediċina* mill-isbaħ il-bieraħ.	Jeremy is fixing his house he hung some lovely *medicine*.
Stephanie tħobb il-crafts, milgħux irranġat l-*mużika* u ġabita qisa ġdida.	Stephanie loves crafts, she recently fixed the *music* and made it look brand new.
Clara ila taqbeż mindu kienet żgħira, il-*pjanu* taf tużaħ sew.	Clara has been jumping ever since she was a young child, she's knows how to play the *piano* very well.
Jenny kitbet ittra, waħħlet *l-imqass* u bagħtitu.	Jenny wrote a letter, she stuck the *scissors* and posted it.
Nobgħod it-tindif tad-dar, speċjalment l-*indirizz* tieħu wisq ħin	I hate doing the chores, especially the *address* it takes too much time.
Andrea mela il-librerija, *l-injam* jikkollezjonhom.	Andrea filled his library, he collects *wood*.
Alexia tmur ħafna bir-rota, tippreferi issuq fuq *is-sħab* milli l-kampanja.	Alexia likes riding her bike, she prefers riding on *clouds* rather than the countryside.
Is-Sibt mort sa restorant ġdid, waqqajt *ir-reċta* u mal-ewwel bidluwieli.	On Saturday I went to a new restaurant, I dropped the *play* and they immediately changed it for me.
Ħriġt niekol ma sħabi s-Sibt, servewna is-*siġġu* u xorb mill-aħjar.	I went out to eat with my friends on Saturday, we were served the *chair* and drinks which were very good.

Kristian kulljum iqum bil-ġuħ, jiekol *kafè* u xi ftit frott.	Kristian wakes up hungry every day, he eats a *coffee* so he's more alert.
Il-librerija tiegħi mimlija, il-*kalzetti* żejda qed inżommhom f'kaxxa għalissa.	My library is full, I keep the extra *socks* in boxes for now.
Robert jnaddaf wara l-ikel, juża il-*kamera* biex inaddaf il-bank.	Robert cleans up after dinner, he uses a *camera* to clean the kitchen top.
Clare taħdem fi spiżerija, tordna l-*karti* kull gimgħa.	Clare works in a pharmacy, she orders *paper* every week.
Il-basket tal-ħwejjeġ tiegħi mimli, l-*kotba* żejda iridu jinħaslu.	My laundry basket is full, the *books* need to be washed.
Nixtieq insir attriċi, inħobb *il-ktieb* u l-films.	I'd like to become an actress, I like *books* and film.
Il-kamra kienet ilha magħluqa, daħħalt l-*air conditioner* billi ftaħt it-tieqa.	The room was closed for too long, I brought in the *air conditioner* by opening the window.
Andrew jħobb isiefer, jixtri l-*ajruplan* fuq l-internet.	Andrew loves to travel, he buys the *airplane* on the internet.
Mort noqgħod f'dar ġdida, għadni nikteb l-*art* ħażin.	I went to live in a new house, I still write the *floor* wrong.
Andrew jħobb isiefer, imur allavolja l-*biljett* idardru.	Andrew loves to travel, he goes even though the *ticket* makes him sick.
John huwa kittieb, iħobb jikteb fil-*bijoloġija* qabel ma juża l-computer	John is a writer, he likes to write using *biology* before typing on a computer.
Filgħaxija inħoss il-bard, nilbes *lejl* biex noħroġ.	In the evening I feel cold, I wear the *night* to go out.

Ingħaqadt ma l-għaqda astronomika, l-*flus* jaffaxxinawni.	I joined the astronomical society, *money* fascinates me.
Stephanie tħobb il-pjanti, tuża *ilbiesi* flok compost.	Stephanie loves plants, she uses *dresses* instead of compost.
It-tisjir dam tlett siegħat, *l-imgħallem* naqra batut.	The cooking took three hours, the *boss* is not so good.
Andre bena dgħajsa, għamilha mill-*kotba* li sab mormija.	Andrea built a boat, he made it out of *books* he found discarded.
Andrea jħobb isajjar l-ħelu, jaħmi *l-logħba* favorita tiegħu hu stess.	Andrea loves to make sweets, he bakes his favorite *game* himself.
Filgħodu dejjem nieħu kolazzjon, ġeneralment *pjanta* u ftit ħalib.	Every morning I have breakfast, usually a *plant* with some milk.
Sarah tħobb l-insetti, *l-qtates* il-favoriti tagħha.	Sarah loves insects, *cats* are her favorite.
Kristina ħarġet sal-casino, libset *l-islippers* u telqet il-barra.	Kristina went to the casino, she put on her *slippers* and left.
Qed nitgħallem l-astrofiżika, *l-Spanjol* dejjem interessani.	I'm learning astrophysics, *Spanish* has always been of interest to me.
Inħobb it-tlielaq ta' l-għasafar, inrabbi l-*udjenza* tat-tiġrija ukoll.	I like bird racing, I breed and raise the *audience* for the race too.
Waqajt it-tarağ, ksirt *maduma* u mort l-sptar.	I fell down the stairs, I broke *a tile* and went to hospital.
It-tifel beda l-skola, joqgħod fuq il-*matematika* vera skomda.	My son started school, he sits on *mathematics* which is very uncomfortable.
Clare taħdem fi stamperija, tordna *l-mediċini* kull ġimgħa.	Clare works in a print shop, she orders *medicine* every week.

Milux għalaqt snini, għamilt *il-meeting* u ikla biex niċċelebra.	It was my birthday not so long ago, I called a *work meeting* and had dinner to celebrate.
It-tifel beda l-skola, iħobb il-*mejda* u l-Malti	My son started school, he likes *desk* and mathematics.
Mark jirranġa l-fjuri, jorbot l-bukketti b'*midalja* meta jlesti.	Mark makes flower arrangements, he ties the bouquet with a *medal* when finished.
Anthea iddekorat id-dar, xtrat il-*milkshake* u l-purtieri.	Anthea decorated her house, she bought *milkshake* and curtains.
Kulljum noħroġ il-kelb għal nofs siegħa, inlibbsu *il-mixja* ħalli ma jaħrabx.	Every day I take the dog out for half an hour, I put on his *walk* so he doesn't run away.
Gary jieħu gost jixrob, speċjalment *in-novelli* mimlijin whisky.	Gary loves to drink, especially *novels* filled with whisky.
Milux bdejt xogħol ġdid, l-imgħallem sejjaħ *party* u laqqani mal-kollegi.	I started a new job recently, the boss called a *party* introduced me to all my colleagues.
John għażel is-suġġetti tas-sekondarja, ħa l-*pitazz* u l-kimika.	John chose his secondary school subjects, he chose *copybook* and chemistry.
Insejt it-tfal barra, sibthom *mal-art* ħabba ir-riħ.	I forgot the children outside, I found them next to the *floor* because of the wind.
Noel ikabbar l-ħaxix, imur *il-pjazza* kulljum biex jieħu ħsiebhom.	Noel grows vegetables, he goes to the *square* every day to take care of them.
It-teknoloġija togħġobni ħafna, speċjalment pop u televixins.	I love technology, especially pop and televisions.
Martina titlaq mid-dar kmieni filgħodu, taqbad il-*post* u tmur l-università.	Martina leaves the house early every day, shecatches the *building* and goes to university.

Wara ix-xogħol norqod naqra, *il-programmi* l-ġdid li xtrajt vera komdu.	After work I like to read, the new *programs* I bought is very comfortable.
Jeremy irid isir pedjatra, jistudja *il-purtiera* bil-qalb.	Jeremy wants to become a pediatrician, he studies the *curtains* eagerly.
Minn dejjem xtaqt għasfur, se inġib *qattus* dalwaqt.	I always wanted a bird, I'm getting a *cat* soon.
Christopher iħobb l-sports, jilgħab *qbiż* u football ma team.	Christopher likes sports, he plays *jumping* and football with a team.
Mario jħobb il-films, imur ħafna *ir-restorant* fil-weekend.	Mario likes films, he goes to the *restaurant* in the weekend.
Martina tħobb il-makeup, fuq xufftejha tagħmel *is-sapuna* favorit tagħha.	Martina likes makeup, on her lips she uses her favourite *soap* which smells like strawberries.
Robert jieħu r-ritratti, juża is-sarvetta li xtara milux.	Robert takes photos, he uses a cloth he bought recently.
Anthea hija għalliema, fil-klassi għanda tletin *siġġu* tal-primarja.	Anthea is a teacher, in her class she has thirty primary *chairs*.
Qed nitgħallem lingwa ġdida, nitkellem *l-spazju* bażiku għalissa.	I'm learning a new language, I speak *space* at the basic level at the moment
Il-mużika togħġobni ħafna, speċjalment *l-ispeaker* u Jazz.	I love music, especially *speakers* and Jazz.
James jisma ir-radju, iħobb *l-stampi* u t-taħditiet.	James listens to the radio, he likes *paintings* and debates.
Tlift il-basket, fih kont tfajt *l-stilel* u iċ-ċwievet fih.	I lost my bad, I had put the *stars* and my keys in it.

Xahrejn ilu xtrajt gaġġa kbira ħafna, *l-studenti* dejjem għoġbuni.	Two months ago I bought a very big cage, I've always liked *students*.
Inħobb nara it-televixin, inseġwi s-sufan li ikunu interessanti ħafna.	I like to watch television, I follow the sofa which is very interesting.
Il-bieraħ ħassejt il-bard fil-post, xegħelt is-*sulfarina* biex insaħħan .	Yesterday I felt very cold, I lit the matchstick to warm the place up.
Kristina marret timxi, libset it-*takkuna* u telqet il-barra.	Kristina went for a walk, she wore *high heels* and left.
Martina xtrat dar antika, qed tirranġa *tal-linja* kulljum wara ix-xogħol.	Martina bought a new house, she's fixing the *bus* after work.
Alexia tmur ħafna l-baħar, tippreferi *it-tarmac* mill-blat.	Alexia likes going to the beach, she prefers *tarmac* rather than rocky beaches.
Gary jieħu gost jaqra, speċjalment *it-tazzi* u fantaxjenza.	Gary likes to read, especially *glasses* full of science fiction.
Qabel norqod biex nirrilassa naqra *teatru* u nieħu te'.	Before sleeping to relax, I read *theater* and have a tea.
Nhar ta Sibt immur sas-supermarkit nixtri l-ikel, it-*trolley* u frott nixtri mis-suq.	Every Saturday I go to the supermarket to buy food, I buy *trolley* and fruit from the market.
Filgħaxija immur sal-bar, nieħu il-*weights* birra u ngħid kelma.	In the evening I go to the bar, I take *weights* beer and have a chat.
Il-bieraħ mort il-lezzjoni tal-ballet, il-*whisky* qed jitqal f'dan il-livell.	Yesterday I went to the ballet lesson, the *whisky* is getting harder at this level.
Filgħodu inqum kmieni, imur ix-*xemx* qabel ix-xogħol.	In the morning I wake up early, I go to the *sun* before going to work.

Il-bieraħ mort party, xrobt i*ż-żfin* u vera kien tajjeb.	Yesterday I went to a party, I drank the dancing and it was really good.
Mark jikkompeti fit-tlielaq, rebaħ *żigarella* tat-tieni post milux.	Mark competes in track and field, he won a string for second place recently.

Appendix I

List of fillers used in experiment 3.

Sentence	Translation
Ħareġ temp sabiħ, sejra mixja max-xatt.	It's nice weather, I'm going for a walk by the beach.
Irċevejt rigal sabiħ ħafna, bqajt sorpriża bih.	I received a very nice gift, I was very surprised.
Illum għamlet ħafna sħana, mort sal-baħar għal ftit siegħat.	It was very hot today, I went to the beach for a few hours.
Jiena inħobb ħafna l-annimali, speċjalment il-qtates, il-klieb u ż-żwiemel.	I love animals, especially cats, dogs and horses.
Bdejt nistudja l-fotografija, nieħu gost nieħu ritratti tax-xenarji.	I've started studying photography, I like taking landscape photography.
Nisma' l-mużika kulljum, tirrilassani u tgħini norqod.	I listen to music every day, it relaxes me and helps me sleep.
Għamilt kejk għal party, taċ-ċikkulata u l-lariġ.	I made a cake for the party, made of chocolate and oranges.
Mort nixtri sal-Belt, kien hemm ħafna nies.	I went shopping in Valletta, there were a lot of people.
Ftaħt il-bieb malli dħalt, kien hemm wisq sħana.	I opened the door when I walked in, it was too hot.
Is-suq mimli bejjiegħa, xtrajt ħafna affarijiet.	The market was full of vendors, I bought a lot of things.
Mort il-fiera tal-kotba, xtrajt 20 ktieb b'kollox.	I went to the book fair, I bought twenty books.

Ktibt ittra lil kunsill għax iż-żibel mhux jinġabar kif suppost.	I wrote a letter to the local council because the garbage is not being picked up as it should be.
Xegħelt ix-xemgħa, għamlet riħa sabiħa.	I lit the candle, it had a pleasant smell.
Naddaft il-gaġġa ta' l-għasfur u poġġejtlu xi ġugarelli ġodda.	I cleaned the bird cage and put in some new toys.
Mort il-post il-ġdid u poġġejt kollox f'postu.	I went to the new house and tidied up everything.
Inxart il-ħwejjeġ imma ħarġet ix-xita.	I hung the clothes to dry but it started raining.
Bdejt immur sal-gym, għax dalwaqt ġej is-sajf.	I started going to the gym since it will be summer soon.
Kmieni filgħodu noħroġ il-kelb għal nofs siegħa mixja.	Early in the morning I take the dog out for a half hour walk.
Mort nixtri suit ġdida, kelli bżonnha għax-xogħol.	I went to buy a new suit, I needed it for work.
Intfajt nara it-televixin, kelli bżonn nirrilassa.	I started watch TV, I needed to relax.
Ħriġt nieħu drink ma sħabi, morna ġo bar ġdid.	I went out to have a drink with my friends, we went to a new bar.
Stiedint lil tal-familja, sajjartilhom ħaruf il-forn.	I invited the family over and cooked lamb for them.
Krejt dgħajsa u mort ma sħabi sa Kemmuna bija.	I rented a boat and went with my friends to Comino.
Begħt il-karozza, xtrajt waħda ġdida minn barra minflokha.	I sold my car, I bought a new one instead.
Fil-ħin liberu inħobb inpitter, il-bieraħ pittirt xena ta' sur.	In my free time I like to paint, yesterday I painted a fortification scene.

Is-Sibt morna sal-Buskett, għamilna picnic u mixja twila.	On Saturday we went to Buskett and had a picnic and a long walk.
Morna skiing l-Italja, wara jumejn kont tgħallimt sew.	I went skiing in Italy, after two days I'd learned quite a lot.
Wasalt tard ix-xogħol, għamlet ħafna xita kmieni filgħodu.	I was late to work, it rained a lot in the morning.
Nixtieq immur vaganza twila, iżda qabel irrid infaddal.	I'd like to go on a long holiday, but I have to save up for it.
Saqqejt il-pjanti, kienet is-sħana u kien qed jinxfu.	I watered the plants, it was hot and they were dying.
Marija xtaqet tkun iktar attiva, bdiet tilgħab il-volleyball ma team.	Marija wanted to be more active, she joined a volleyball team.
Anthea ħadet sehem fil-maratona, lestiet wara erbgħa siegħat.	Anthea competed in a marathon, she finished after four hours.
Krista ħarġet ma l-għarus tagħha, marru jieklu Marsaxlokk.	Krista went out with her boyfriend, they went to eat in Marsaxlokk.
Mark jipproduċi l-mużika, id-diska li ipproduċa l-aħħar rebħet premju.	Mark produces music, the last song he produced won an award.
Anita taħdem ġo uffiċċju, ikollha ħafna karti x'tara.	Anita works in an office, she has a lot of paperwork to do.
Philip jaħdem fuq ir-radju, jagħmel programm dwar il-kultura.	Philip works on the radio, he has a program about cultural events.
Franco mar dawra bir-rota, waqa' u weġġa saqajh.	Franco went on a bike ride, he fell and hurt his legs.

Andrew jikkompeti fl-għawm, l-aħħar darba ġie it-tielet.	Andrew competes in swimming, last time he came in third.
Martina tħit il-ħwejjeġ, ħietet libsa għal party ta ħabibta.	Martina sews clothes, she made a dress for her friend's party.
Clare marret tisboħ xagħra, għamlitu aħmar ċar did-darba.	Clare went to colour her hair, she now has light red hair.
Andrea beda jikteb ktieb ġdid, rumanz ibbażat fi żmien il-Medjuevu.	Andrea started writing a new book, a romance novel based in medieval times.
Francesca tpinġi l-comics, tgħallmet tpinġi meta kienet żgħira.	Francesca draws comics, she learnt to draw when she was a child.
Jeffrey isuq mutur, joqgħod attent ħafna fit-triq ħabba l-karozzi.	Jeffrey drives a motorbike, he's very careful to avoid other cars.
Martin jgħallem fil-primarja, għandu klassi ta għoxrin tifel u tifla.	Martin teaches in a primary school, he has a class of twenty students.
Kevin minn dejjem iħobb ikanta, dis-sena se jieħu sehem fil-festival.	Kevin has always loved to sing, this year he's taking part in a festival.
Jessica tħobb ħafna il-board games, monopoly il-favorita tagħha.	Jessica loves board games, monopoly is her favourite.
Elena bdiet il-kors tal-infermiera, minn dejjem xtaqet taħdem l-sptar.	Elena has started a nursing course, she always wanted to work in a hospital.
Sarah tħobb ħafna l-ġelat, tal-frawli l-favorit tagħha.	Sarah likes ice-cream, strawberry is her favourite.
Elaine ġabet marki tajbin ħafna, ħarġet tiekol mal-familja biex tiċċelebra.	Elaine got very good grades, she went out with her family to celebrate.

Sibt kelb mitluf barra, ċempilt lil sidu u ġie għalih.	I found a dog that was lost, I called his owner and he picked him up.
Ħriġt iż-żibel, dalwaqt kienu se jgħaddu jiġbruh.	I took out the garbage, it was about to be picked up.
Dħalt fil-klassi u bdejt il-lezzjoni, l-istudenti kollha kienu hemm.	I went into the classroom and started the lesson, the students were all presume nt.
Ħriġna sa Marsascala nieklu, ħadna ħuta u frott il-baħar vera tajbin.	We went to eat in Marsaxlokk, we had a fish and seafood which were very good.
Mort sal-Belt biex nintaqa ma Martina, kont ilni xahar ma nara.	I went to Valletta to meet Martina, I hadn't seen her in a month.
Tlaqt niġri kemm niflaħ, bl-eżatt ilħaqta tal-linja.	I ran as fast as I could, I was just in time to catch the bus.
Ġibna qattus ġdid, huwa abjad bil-griż u semmejtu Ġingo.	We got a new cat, he's white and grey and we called him Ġingo.
Fil-klassi kellna diskussjoni, kulħadd kellu jagħti l-opinjoni tiegħu dwar l-ambjent.	We had a discussion in the classroom, everyone had to give their opinion about the environment.
Użajna is-sapun kollu li kellna id-dar, mort nixtri malajr qabel ma waslu l-mistednin.	We used all the soap we had at home, I went to buy some more before the guests arrived.
Wasalt ix-xogħol tard, kien hemm ħafna traffiku għax għalqu it-triq.	I was late to work, there was a lot of traffic because the road was closed.
Għarmajt it-tieqa tal-ħanut, il-Ġimgħa niftħu.	I dressed the shop window, we open on Friday.
Ħbejt ir-rigali tal-Milied, lejliet nintaqaw kollha u nifthuhom.	I hid the Christmas gifts, on Christmas eve we all meet up and open them.

Bdejt nagħmel l-eżerċizzju regolarment, immur il-gym tlett darbiet f'ġimgħa.	I've started exercising regularly, I go to the gym three times a week.
L-għalliema tagħtna test, kellna nikkritikaw xi poeżiji klassiċi.	The teacher gave us a test, we had to critique some classical poetry.
Ilni infittex post ġdid, sibt dar antika u ħelwa ġo Birkirkara.	I've been looking for a new place, I found a nice old house in Birkirkara.
Bagħat ir-rigali bil-posta, qed nittama li jaslu qabel il-Milied.	I sent the presents by post, I'm hoping they arrive before Christmas.
Ħallast il-kontijiet fil-bidu tax-xahar, inkella ninsa inħallashom.	I paid all the bills at the beginning of the month, otherwise I'd forget to pay them.
Xtrajt ħafna ħwejjeġ ġodda, kont ilni ma inbiddel l-affarijiet fil-gwardarobba.	I bought a lot of new clothes, I hadn't changed things in my wardrobe for a while.
Iltqajt mal-ħbieb tiegħi, għamilna tournament tal-video games.	I met my friends, we had a video game tournament.
Ħadt pizza waranofsinhar, kelli ħafna ġuħ.	I had a pizza in the afternoon, I was very hungry.
Anthea poġġiet fil-klassi, l-arti hija il-lezzjoni favorita tagħha.	Anthea sat in the classroom, art is her favorite lesson.
James mar jara l-aħħar film ta' Star Wars, ilu jsegwi is-saga minn mindu kien żgħir.	James went to see the last Star Wars movie, he's been following the saga ever since he was a child.
Marija tħobb tilgħab bil-Lego, jirnexxila tibni affarijiet vera sbieħ.	Marija loves to play with Lego, she manages to build some really nice things.
Martina kriet karozza, tagħha inkisret u kellha bżonn it-tiswija.	Martina rented a car, hers broke down and needed fixing.

Clare apprezzat ħafna ir-rigal, qalgħatu għal gradwazzjoni tagħha.	Clare appreciated the gift very much, she received it for her graduation.
Martin jipprattika l-boxing, jagħmel mill-inqas 8 siegħat fil-ġimgħa trejning.	Martin practices boxing, he spends at least 8 hours a week training.
Kris irċieva l-kont tad-dawl, ħa qata' meta ra kemm ġieħ.	Kris received his phone bill, he was surprised when he saw the amount to be paid.
Kevin mar għand il-hairdresser, kellu bżonn jaqta xagħru.	Kevin went to the hairdresser, he needed a haircut.
Jessica ħadet il-qattus għand il-veterinarju, weġġa saqajh u ma setgħax jimxi fuqha.	Jessica took the cat to the vet, he'd hurt his leg and couldn't walk on it.
Leo ħasel il-karozza, kellha bżonn wara ix-xita tal-ħamrija.	Leo washed the car, it needed a wash after the blood rain.
Matthew tgħidx kemm jgħid, ma jieqafx jitkellem jekk ittiħ iċ-ċans.	Matthew talks a lot, he doesn't stop talking if you don't stop him.
Jake iħobb imur jimxi, kull weekend imur mixja twila x'imkien.	Jake likes to go hiking, every weekend he hikes somewhere.
Sarah marret l-sptar, daħlet biex tara lil nannitha.	Sarah went to hospital, she went to see her grandmother.
Anton jibni id-djar, ilhu f'dax-xogħol mindu kellu 16 il-sena.	Anton builds houses, he's been in this line of work ever since he was 16 years old.
Janice qed tevita li tmur għand id-dentist, id-darsa ilha ġimgħatejn tuġaħa.	Janice is trying to avoid going to the dentist, her molar has been hurting her for two weeks.
Angele inħarqet bix-xemx, damgħet il baħar u m'għamlitx sunblock.	Angele got sunburnt, she stayed at the beach too long without using sunscreen.

Krista marret għand il-hairdresser, għamlet 'up style' għax kellha tieġ.	Krista went to the hairdresser, she had an up-style done because she had a wedding.
Franco mar ma' sħabu l-casino, qatt ma kienu marru qabel.	Franco went with his friends to the casino, they'd never been before.
Jasmine qed tiddeskrivi l-vaganza tagħha, marret il-Marokk milux.	Jasmine described her holiday, she went to Morocco recently.
Anna saret veterinarja, hija tħobb ħafna l-annimali.	Anna is a veterinarian, she loves animals.
Clare tikteb l-stejjer, il-favoriti tagħha huma l-stejjer tat-tfal.	Clare is a writer, her favourite stories are children's tales.
Andrew kera is-sala, se jagħmel birthday party kbir għal għeluq sninu.	Andrew rented a venue, he's going to have a birthday party.
James ħa ħsieb lin-neputijiet tiegħu, kien ilhu ma joqgħod magħhom	James took care of his nephews, he hadn't babysat them for a while.
Marija stenniet lil-pustier, kienet qed tistenna ittra importanti.	Marija waited for the postman, she was waiting for an important letter.
Clive ħareġ għall-elezzjoni, dejjem xtaq ikun kunsillier.	Clive ran for his local council election, he always wanted to be a local councilor.
Anthea tagħmel il-kejkijiet, milux fetħet ħanut.	Anthea bakes cakes, she recently opened her own shop.
Jessica lemħet lil ħabibtha, kienet ila ix-xhur ma tara.	Jessica saw her friend, she hadn't seen her for months.
Saraħ thobb tmur sal-pool, tipprova tmur tlett darbiet fil-ġimgħa.	Sarah loves to go to the pool, she tries to go three times a week.

Andre jistudja fuq l-spazju, ilu mindu kien tifel żgħir jinteressa ruħu f'dawn l-affarijiet.	Andre's studies focus on space, he's been interested in this field ever since he was a child.
Manwel dar lura bil-karozza, kien għadda mit-triq il-ħażina.	Manwel reversed, he had gone through the wrong road.
Krista fetħet il-bieb, kien waslilha l-ikel.	Krista opened her door, her food delivery had arrived.
Inħobb nipprova ikel differenti, speċjalment minn pajjiżi l-bogħod.	I like trying different food, especially from faraway countries.
Darba f'xahar nintaqa ma sħabi l-każin, nilgħabu poker u nieħdu birra.	Once a month I meet my friends at the local pub, we play poker and have a beer.
Bdejt immur ix-xogħol bir-rota, qed nasal iktar malajr milli bil-karozza.	I've started riding my bike to work, I'm getting there quicker than by car.
Għent lin-nanna tnaddaf id-dar, qed tixjieħ u issibha diffiċli issa.	I helped my grandmother clean her house, she's getting old and is finding it difficult now.
Akkwistajt biċċa għamara antika, se nirranġa u nagħmilha bar.	I've acquired an antique furniture item, I'll fix it up and turn it into a bar.
Ikkompetejt fil-maratona, kienet iktar diffiċli milli ħsibt.	I competed in a marathon, it was more difficult that I thought.
Ressaqt l-għamara ġo kamra oħra, irrid niżboħ il-ħitan.	I moved the furniture around in the room, I wanted to paint the walls.
Daħħalt iż-żibel ġewwa, tal ġbir ġa kienu għaddew.	I took the garbage inside, I missed the collection time.
Ħsibt li se nasal tard, iżda tal-linja waslet qabel.	I thought I was going to be late, however the bus was early.

Lestejt l-iskultura, għada se nipprova inbiegħa.	I finished the sculpture, tomorrow I'll try to sell it.
Għamilt sagħtejn nistenna sakemm inqdejt, ikun hemm wisq nies il-bank	I had to wait for two hours before I could be helped, there were too many people at the bank.
Imxejt mix-xogħol sad-dar, waqfitli il-karozza u ma kellix min jiġi għalija.	I walked from work to home, my car stopped and I didn't have anyone to pick me up.
Ġbart lil-sħabi mill-airport, kienu għadhom kif ġew lura minn vaganza.	I picked up my friends from the airport, they'd just gotten back from a holiday.
Ħadt il-qattus għand il-veterinarju, kellhu bżonn l-ewwel tilqima.	I took the cat to the vet, he needed his first vaccination.
Għamilt ġimgħa id-dar fis-sodda, kelli riħ u telgħali d-deni	I spent a whole week in bed, I had the flu and my temperature went up.
Irranġajt is-sodda, iddejjaqni meta ma tkunx f'postha.	I made the bed, I hate it when it's not tidy.
Waddabt il-ħwejjeġ fil-basket tal-ħasil, għandi bżonn nagħmel ħasla.	I threw my clothes in the laundry bin, I need to wash them.
Ikkalmajt lil ħabibti, kien se itijha panic attack.	I calmed down my friend, she was having a panic attack.
Ħarist lejn il-mappa, ridt insib ħanut u intlift.	I looked at the map, I wanted to find a shop but I got lost.
Martina daqet il-kejk, għoġobha iktar milli stenniet.	Martina tasted the cake, she liked it more than she expected.
Krista tħobb teħles mix-xogħol, tara kif taħmel biex tiskarta.	Krista likes to skive, she'll do anything to get rid of her work.

Jessica għamlet kors tal-‘makeup’, dejjem xtaqet issir makeup artist.	Jessica started a makeup course, she always wanted to be a makeup artist.
James kesa il-ħajt, kienet qed tidħollu l-moffa.	James sealed the wall, he had mold growing on it.
Mark fetaħ id-dokument, kellu mitt paġna x'jaqra.	Mark opened the document, he had a hundred pages to read.
Marlon lesta id-diskors, irid jippreżentah għada waqt konferenza.	Marlon finished the speech, he’ll present tomorrow during a conference.
Marija ppruvat il-libsa, xahar ieħor tiżżewweġ.	Marija tried on the dress, next month she gets married.
Sarah ħadet banju u qrat magazine, kellha bżonn tirrilassa.	Sarah took a bath and read a magazine, she needed to relax.
Andre qata' il-ħaxix, se jsajjar soppa il-lejla.	Andre chopped the vegetables, he was making soup.
Krista timmudella l-ħwejjeġ, għandha figura sabiħa ħafna.	Krista models clothes, she has a very nice figure.
Anita xegħelt il-mużika, kellha soundtrack ġdid x'tisma.	Anita turned on the music, she had a new soundtrack to listen to.
Kevin ipprintja il-biljetti, kien sarlu l-ħin għal airport.	Kevin printed the tickets, it was time to go to the airport.
Kim tirkeb u tieħu ħsieb iż-żwiemel, ilha mindu kienet żgħira interessata fihom.	Kim rides and takes care of horses, she’s been interested in them ever since she was a child.
Andrew għandu rispett kbir lejn l-ambjent, dejjem kien japprezza in-natura.	Andrew is very respectful of the environment, he’s always appreciated nature.

Malcolm bagħat cheque lil tal-karita, huwa ġeneruż ħafna.	Malcolm sent a cheque to charity, he's very generous.
Jessica marret tiġbor iċ-ċwievet, għamlet kopja għax beżgħet li se titlifhom.	Jessica picked up her keys, she's made a copy because she was afraid she'd lose them.
Clive ħa lil nanntu sat-tombla, ħadu pjaċir ħafna.	Clive took his grandmother to bingo, they had a very good time.
Miriam ħarset lejn in-noti, kellha eżami daqs sagħtejn oħra.	Miriam reread her notes, she had an exam in two hours.
Sabrina marret tixtri żewġ pastizzi, insiet tieħu lunch magħha.	Sabrina went to buy two cheesecakes, she forgot to take lunch with her.
Frankie mar sal-mużew, togħġbu ħafna l-kultura.	Frankie went to the museum, he likes culture.
Lara sabet iċ-ċurkett, ħasbet li kienet tilfitu l-ġurnata ta qabel.	Lara found her ring, she thought she'd lost it the day before.
Għandi uġigħ ta ras, se norqod naqra forsi jgħaddili.	I've got a headache, I'm going to sleep in an attempt to feel better.
Rajna il-murtali, l-kuluri kienu sbieħ immens.	We watched the fireworks, the colours were beautiful.
Ħadna l-ikel ħdejn il-baħar, għamilna barbeque meta niżlet ix-xemx.	We took the food to the beach, where we had a barbeque when the sun went down.
Ksejt il-kotba bil-plastik, ħalli jdumu iktar tajbin.	I covered the books in plastic, so that they last longer.
Filgħodu nieħu kafè u nara l-aħbarijiet, qabel ma nibda l-ġurnata.	Every day I have a coffee and I watch the news, before I start the day.

Nhar ta' Sibt naħsel il-ħwejjeġ u nonxorhom, il-Ħadd ngħaddijhom.	On Saturday's I wash my clothes, on Sunday I iron them.
Ħadt ħafna ritratti waqt li kont imsiefer, irrid nagħżel liema se inżomm.	I took a lot of photos whilst I was on holiday, I need to choose which ones to keep.
Sibt il-mobile ta xi ħadd, ħadtu l-għassa tal-pulizija.	I found someone's mobile phone, I took it to the police station.
Qtajt il-kejk għall-mistednin, għoġobhom ħafna.	I cut the cake for the guests, they liked it a lot.
Bdejt nitgħallem insajjar, immur għall-lezzjoni darba f'ġimgħa.	I've started to learn to cook, I go to lessons once a week.
Mort nara lil ħabibti, daħlet l-sptar biex tagħmel operazzjoni.	I went to visit my friend, she had to go to hospital.
Tkellimt mal-ġirien filgħodu kmieni, qaluli li kien hemm serqa viċin tagħna.	I spoke to my neighbors earlier today, they told me there was a robbery nearby.
Sibt lukanda għas-safra li jmiss, tidher vera sabiħa u lussuża.	I found a hotel for my next holiday, it looks nice and luxurious.
Erfajt il-ħwejjeġ tax-xitwa u ħriġt tas-sajf, bdiet is-sħana issa.	I put the winter clothes away and took out the summer ones, it's hotter now.
Mort il-festival ta' l-inbid, kien hemm għażla vasta ta' nbejjed.	I went to the wine festival, there was a wide selection of wines.
Rajt il-film l-ġdid ta'l-Avengers, għoġobni ħafna għalkemm kien naqra twil.	I saw the latest Avengers movie, I liked it a lot even though it was a bit too long.
Ħadt ħsieb id-direzzjoni tar-reċta għal-ewwel darba, kienet esperjenza interessanti ħafna.	I took care of the direction of the play for the first time, it was a very interesting experience.
Mort inbiddel il-ħwejjeġ li xtrajt, xtrajthom żgħar wisq għalija.	I went to change the clothes, I bought them too small.

Faddalt biżżejjed biex nixtri karozza ġdida, naħseb se nixtri waħda minn barra.	I saved enough money to buy a new car, I think I'll buy one from abroad.
Fl-Għid għamilt ikla għall-familja kollha, b'kollox sajjart għal 25 persuna.	On Easter day I made lunch for all the family, there were 25 of us in total.
Ħadt il-mobile għat-tiswija, waqali u inkisirlu l-iskrin.	I took my mobile to get fixed, I dropped it and broke the screen.
Mort nara logħba futbol, it team tiegħi rebaħ.	I went to see a football game, my team won.
Bdejt nara programm ġdid fuq it-televixin, dwar ir-restawr tad-djar antiki.	I've started watching a new program on tv, it's about the restoration of old houses.
Ħlist mill-eżamijiet kollha, issa nista nibda l-vaganzi tas-sajf.	I've finished all my exams, now I can start my summer holidays.
Fis-sajf se nitla muntanja, ilni nipprepara mis-sena l-oħra.	During the summer I'm going to climb a mountain, I've been preparing for the last year.
Mort skiing ma sħabi, kienet vaganza attiva ħafna.	I went skiing with my friends, it was a very active holiday.
Bdejt kors ġdid l-università, dejjem xtaqt nitgħallem dwar il-kimika	I started a new course at university, I've always wanted to learn about chemistry.
Irbaħt weekend brejk ġo lukanda 5 star, se immur fis-sajf.	I've won a weekend in a 5-star hotel, I'm going in summer.
Mort dawra tal-mużewijiet waqt il-festa pubblika, tgħallimt ħafna affarijiet ġodda.	I went for a tour of some museums during on a public holiday, I learnt a lot of new things.
Se nibda immur volontarjat, nixtieq ngħin lil min għandu bżonn.	I'm going to start voluntary work, I'd like to help people in need.
Sibt xogħol ġdid, minn nhar it-Tnejn nibda ma' kumpanija ġdida.	I've found a new job, from next Monday I start with the new company.

Żarmajt is-siġra tal-milied, poġġejt kollox fil-garaxx.	I took the decorations down from the tree and put everything in the garage.
Nixtieq nitgħallem insuq mutur, iżda nibża' wisq mit-traffiku.	I'd like to learn to ride a bike, but I'm too afraid of oncoming traffic.
Ilni ġimgħa id-dar, ħassejtni wisq ma niflaħx biex immur ix-xogħol.	I've been at home for a week, I've felt too sick to go to work.
Irrid nixtri rigal lil-ħabibti, ġimgħa oħra għanda għeluq snina.	I want to buy a gift for my friend, next week it's her birthday.
Is-Sibt li għadda mort niżfen ma sħabi, għejjejna imma vera ħadna gost.	Last Saturday I went out dancing with my friends, we were really tired but we had a lot of fun.
Konna ħerġin nimxu, iżda ix-xita ma tridx tieqaf.	We were going out for a walk but the rain won't stop.
Lgħabt logħba karti ma nannuwi, jieħu gost ikollu biex jgħaddi l-ħin.	I played a game of cards with my grandpa, he enjoys having something to pass the time with.
Kelli inwaqqaf il-lezzjonijiet tal-pjanu, mgħandiex ċans bħalissa.	I had to stop piano lessons, I don't have time right now.
Milux irbaħt il-lottu b'Erbgħa numri, xtrajt ħafna affarijiet għad-dar bil-flus li qlajt.	Recently I won the lottery with four numbers, I bought many things for the house with that money.
Martina torganizza l-ħruġ għaż-żagħżagħ, ikollha ħafna min jattendi.	Martina organizes outings for teenagers, a lot of people attend.
Debbie dejjem tieħu sehem fil-maratona tal-volleyball, jogħġobha l-sport.	Debbie always takes part in the volleyball marathon, she loves sport.

Jeremy kellu inċident żgħir, spiċċa l-sptar għal ftit jiem.	Jeremy had a small incident, he ended up in hospital for a few days.
Anita marret lura id-dar, ma felħitx toqgħod barra fis-sħana.	Anita went back home, she couldn't stay out in the heat anymore.
Janice marret tagħmel difrejha, tmur qisu kull tlett ġimgħat.	Janice went to get her nails done, she goes almost every three weeks.
Sabrina ċemplet lill ommha, kienet ilha jumejn ma tkellimha.	Sabrina called her mother, it'd been two days since she'd spoken to her.
James jikkollenzjona l-kotba antiki, milux sab wieħed għandu fuq mitt sena.	James collects old books, recently he found one over a hundred years old.
Alex aċċetta l-kuntratt il-ġdid, minn xahar ieħor se jieħu post id-direttur.	Alex accepted the new contract, from next month he's the new director.
Matthew jilgħab squash, sar tajjeb ħafna mindu beda jittrenja bis-serjetà.	Matthew plays squash, he's become very good at it since he's started training seriously.
Andrea jħobb il-puzzles, il-crosswords huma l-favoriti tiegħu.	Andrea loves puzzles, crosswords are his favorites.
Krista hija parti mill-Girl Guides, ila tmur mindu kienet tifla żgħira.	Krista is a member of the Girl Guides, she's been going ever since she was a child.
Frankie mar jixtri friġġ ġdida, li kellu ma baqgħetx taħdem sew.	Frankie went to buy a new fridge, his old one wasn't working as well.
Anita għamlet red velvet, għoġob lil kulħadd.	Anita made red velvet cake, everyone loved it.
Justine iltaqgħet ma Mark, kienu ilhom biex joħorġu flimkien.	Justine met Mark, they been waiting to go out together for a while.
Grace tagħmel programm fuq it-televixin, ikollha ħafna mistednin interessanti.	Grace hosts a program on TV, she has a lot of guests on it.

Krista ħarġet ma l-għarus tagħha, marru jieklu tas-Sliema.	Krista went out with her boyfriend, they went to eat in Sliema.