Syntactic restructuring as an effect of prediction during simultaneous interpreting from Turkish into English

ENA HODZIK
Boğaziçi University, Istanbul, Turkey
ena.hodzik@boun.edu.tr

SEMRA ÖZDEMIR
Boğaziçi University, Istanbul, Turkey
semra.ozdemir@boun.edu.tr

NESRIN CONKER
Boğaziçi University, Istanbul, Turkey
nesrin.conker@boun.edu.tr

ORHAN BILGIN
Lancaster University, Lancaster, UK
o.bilgin@lancaster.ac.uk

RÉSUMÉ
Cette recherche examine les effets de la contrainte contextuelle et de la probabilité transitionnelle sur la latence d'interprétation et la restructuration syntaxique pendant l'interprétation simultanée de phrases turques avec verbe en position finale vers l'anglais (verbe en seconde position) par des interprètes – étudiants et professionnels - du turc (A) vers l'anglais (B). Nous concluons que la contrainte contextuelle, mais pas la probabilité transitionnelle, conduit à une baisse de la latence d'interprétation sur la phrase avec verbe en position finale, et aussi à un degré plus élevé de restructuration syntaxique entre la langue source et la langue cible de la part des interprètes professionnels et étudiants. De plus, nous n'avons pas observé de différences entre les deux groupes dans l'utilisation des contraintes contextuelles comme signal de prédictions. Ces résultats indiquent que les interprètes, quel que soit leur expérience, usent les signaux contextuels pour restructurer l'ordre des mots entre la source et la cible. Cela suggère d'examiner la latence d'interprétation et la restructuration syntaxique en conjonction avec des indicateurs de prédictions pendant l'interprétation simultanée de langues avec des structures asymétriques, comme le turc et l'anglais.

MOTS-CLÉS
interprétation simultanée, prédiction, contrainte contextuelle, latence, restructuration syntaxique, expertise

RESUMEN
Este estudio investigó los efectos de la restricción contextual y la probabilidad de transición en la latencia de interpretación de verbos y la reestructuración sintáctica durante la interpretación simultánea del verbo final en turco a oraciones en inglés (verbo-medial) por parte de alumnos e intérpretes profesionales de turco (A) - inglés (B). Encontramos que la restricción contextual,

pero no la probabilidad de transición, conduce tanto a una menor demora en la interpretación del verbo al final de la oración como a un mayor grado de reestructuración sintáctica entre la entrada del idioma de origen y la producción en la lengua meta tanto en los estudiantes como en los traductores profesionales. Además, no se observaron diferencias entre los grupos en el uso de la restricción contextual como clave para la predicción. Los presentes resultados sugieren que, independientemente de su experiencia, los intérpretes utilizan claves contextuales para reestructurar el orden de las palabras entre la fuente de entrada y la lengua meta. Esto proporciona un argumento para examinar la latencia de interpretación y la reestructuración sintáctica en conjunto como indicadores de predicción durante la interpretación simultánea entre idiomas con estructuras asimétricas, como el turco y el inglés.

PALABRAS CLAVE
interpretación simultánea, predicción, restricción contextual, latencia, reestructuración sintáctica, experiencia.

ABSTRACT
This study investigated effects of contextual constraint and transitional probability on verb interpreting latency and syntactic restructuring during simultaneous interpreting from Turkish verb-final into English (verb-medial) sentences by trainee and professional Turkish (A) – English (B) interpreters. We found that contextual constraint, but not transitional probability, leads to both a decrease in interpreting latency on the sentence-final verb and a higher degree of syntactic restructuring between the source language input and target language output in both trainee and professional interpreters. Moreover, no between-group differences were observed in the use of contextual constraint as a cue for prediction. The present findings suggest that irrespective of experience, interpreters use contextual cues to restructure the word order between the source input and target output, which provides an argument for examining interpreting latency and syntactic restructuring in conjunction, as indicators of prediction during simultaneous interpreting between languages with asymmetrical structures, such as Turkish and English.

KEYWORDS
simultaneous interpreting, prediction, contextual constraint, latency, syntactic restructuring, expertise

)

1. Introduction

Prediction is considered an integral part of language comprehension. A number of psycholinguistic studies have now demonstrated that context information can be used to predict features of likely upcoming words at phonological (DeLong, Urbach, *et al*. 2005), semantic/conceptual (Federmeier and Kutas 1999, 2001), as well as morphosyntactic level (Van Berkum 2004; Wicha, Moreno, *et al*. 2004). Van Berkum, Brown, *et al*. (2005) showed that predictions are generated based on the wider context even when these contradict the immediately preceding one. Such findings have led to the conclusion that language is processed incrementally

or in a piecemeal fashion and this helps us make predictions about what will follow in unfolding language.

As a way of coping with the multiplicity and simultaneity of efforts involved in simultaneous conference interpreting (SI), interpreters often create expectations about words or phrases that will follow in the unfolding speech, and sometimes even produce these in the target language output before they become available in the source language input (Chernov 2004; Gile 2009). This is referred to as anticipation in the interpreting studies literature and during SI between languages with asymmetrical sentence structure, such as German, where the verb is often placed in sentence-final position in complex sentences, and English, where the verb is obligatorily placed in second position in the sentence, anticipation can be a crucial strategy of relieving cognitive load (Amos and Pickering 2020).

Given the strategic dimension of anticipation during SI, researchers have asked whether there are any expertise related advantages for anticipation in interpreters. More (exact) anticipations have been observed in professional than in trainee interpreters (Jörg 1997; Author citation forthcoming; Riccardi 1996, although see findings to the contrary in Chmiel 2021). While most studies on anticipation in SI look at language pairs like English and German, which belong to the same language family and therefore do not differ so much in terms of sentence structure, the current study employed two typologically very different languages, Turkish and English, as its source and target languages respectively. Examples 1-3 below help illustrate this difference. Unlike German, where verbs can either be placed in second (<u>schützt</u> or *protects* in the main/independent clause in (2)) or in clause-final position (<u>nachdenkt</u> or *thinks* in the adverbial/dependent clause in (2)), Turkish normally places verbs in final position[1] irrespective of clause type (see **düşündüğü** or *thinks* and **koruyor** or *protects* in (3)).

1) Because it is concerned about the country's future, the new administration protects democracy.

2) Die neue Regierung schützt die Demokratie, weil sie über die Zukunft des Landes nachdenkt.
[The new administration protects the democracy because she about the future of the country thinks]

3) Yeni yönetim ülkenin geleceğini düşündüğü için demokrasiyi koruyor.
[New administration of the country future he/she thinks because democracy protects]

Moreover, while all three languages allow for the order of the two clauses (main and adverbial) to be switched, centrally embedded structures, where the adverbial clause is placed between the subject and object of the main clause (3), are more common in Turkish than in German, where extraposition is often used instead (2), and they are uncommon in English. This structural flexibility of Turkish (Kornfilt 2000), paired with a sentence-final verb, can impose high cognitive demands when interpreting into a syntactically more rigid verb-medial language like English. Thus, SI from Turkish into English pre-supposes a degree of syntactic restructuring (i.e., rearranging of sentence constituents) between the source language input and the target language output, which can be facilitated by predicting the sentence-final verb.

The aim of this study was to investigate the effects of contextual constraint and TP on the prediction of the sentence-final verb during SI from Turkish into English in professional and trainee Turkish (A) - English (B)[2] interpreters. To measure prediction, we recorded the interpreting latency between the onset of the sentence-final verb in the Turkish input and the onset of its translation in the English output. Given the asymmetry in sentence structure between Turkish and English, we also examined the degree of restructuring between the source language input and target language output. Moreover, we wanted to see whether there would be any

expertise related differences in prediction of the sentence-final verb during SI from Turkish into English. The current study focused on *prediction*, as the general ability to create expectations about words (in this study, the sentence-final verb) in unfolding language. The term *anticipation* will be used to refer to specific instances, if any, of producing the predicted word in the target language output before this word becomes available in the source language input, as per the interpreting studies literature.

1.1. What causes prediction during SI?

Two types of anticipation have been identified in the interpreting studies literature which are known as extralinguistic and linguistic anticipation (Lederer 1981). The former is said to primarily rely on general background or situational knowledge, which is of particular importance during simultaneous conference interpreting given the specific context in which the task is being carried out. So, information about the conference topic, speakers, location or the background knowledge of the interpreter is used top-down to anticipate words, ideas or messages (Gile 1992, 2009; Van Besien 1999) on sentence level. Chmiel (2021) found shorter word translation latency on a sentence-final word when this was preceded by a high constraint (i.e., more predictable) context than a neutral or low constraint (i.e., less predictable) context both in professional and trainee interpreters.

Linguistic anticipation is assumed to rely more on language specific probabilistic information, or the likelihood of words occurring together in a given language (Gile 2009). In an early study of this topic, Wilss (1978, p. 348) noted the example of the German word Namens (*On behalf of*), often introducing the standard expression of thanks Namens … darf ich … danken (*On behalf of … I would like to thank …*): hearing Namens thus enables the interpreter to anticipate danken, based on the statistical likelihood of the two words co-occurring in German. Setton (1999, 2006) views frequently co-occurring words or fixed expressions as connecting devices at a discourse level. Along with extralinguistic cues like background knowledge of the topic, they are used incrementally to draw inferences and anticipate what will follow in the unfolding speech.

Even though early interpreting studies assumed a role for prediction, in particular in the context of SI (Gerver, Longley, *et al.* 1984; Moser-Mercer 2000; Setton 1999), few of them were empirical (Jörg 1997; Riccardi 1996; Seeber 2001). They found instances of verb production in the target output before it becomes available in the source input in SI from German into English (Jörg 1997; Kurz and Färber 2003), from Japanese into English (Gile 1992), and from German into Italian (Riccardi 1996).

While interpreters do sometimes produce the anticipated word in the target output before it becomes available in the source input (i.e., the definition of anticipation in the interpreting studies literature), they cannot always afford to do this. Sometimes they postpone production until their hypothesis is confirmed to avoid anticipatory errors. However, this does not mean that they are not creating expectations or pre-activating features on different levels of language processing. It could simply mean that their predictions are not always overt.

In the more recent predictive processing literature, prediction is viewed less as strategic or all-or-nothing and more as implicit and probabilistic in nature (Huettig 2015). Some researchers have posited a distinction between prediction as a result of higher-order processing of contextual constraint and prediction relying on lower-order processing of transitional probabilities between syllables and words (McDonald and Shillcock 2003a, 2003b; Frisson, Rayner, *et al.* 2005).

Transitional probability (TP) is the statistical likelihood with which syllables/words appear together in language which is a feature of statistical learning (McDonald and Shillcock 2003a, 2003b). The ability to extract statistical regularities is thought to be linked to an individual's prediction skills (Saffran, Newport, *et al*. 1996; Thompson and Newport 2007). TP effects have also been found on prediction during reading (McDonald and Shillcock 2003a, 2003b). For instance, collocations like *accept defeat*, which have a high statistical likelihood of appearing together, i.e., high TP, were read faster than non-collocates such as *accept losses*, which have a low TP. However, when context was increased such effects seemed to disappear (Frisson, Rayner, *et al*. 2005).

Author citation (2017) used a latency measurement technique to investigate prediction of the sentence-final verb during SI from German into English based on contextual constraint and TP. A significant decrease in interpreting latency as a result of a constraining or more predictable context and high TP was interpreted as prediction. While an effect of contextual constraint on interpreting latency was found, TP did not affect interpreting latency. The findings were the same for a group of participants with prior experience in interpreting and a group of bilinguals with no experience in interpreting. They suggest that during SI higher order information about the context as a whole affects interpreting latency, while phrase-level probabilistic information does not. This is not surprising given that the primary concern of interpreters is to transfer the message from the source into the target language. When those languages have asymmetrical sentence structures, the word order has to be rearranged from the source into the target language structure. This in turn may result in lower-level probabilistic effects literally being lost in translation. A TP effect on interpreting latency was obtained in a follow-up study (Author citation 2019), where all verb-final German sentences used in Author citation (2017) were made significantly shorter and converted into verb-medial structures to match those of the target language (English). Thus, TP seemed to only affect interpreting latency when the source and target sentence structures were symmetrical (e.g., both verb-medial).

The above studies (Author citation 2017; Author citation 2019) employed a latency measurement technique for prediction, recording the interpreting latency on a single word, i.e., between the sentence-final verb in the source language input and its translation/version in the target language output. However, when interpreting between languages with asymmetrical syntactic structures, such as Turkish and English, latency can vary greatly. For example, interpreters may decide to wait or stall production (Bevilacqua 2009), resulting in an increase in overall latency, which could then be compensated by an intentional decrease in latency to keep up with the rate of speech delivery or avoid structural interference from the source into the target language (Gernsbacher and Shlesinger 1997). Crucially, prediction can be part of such compensatory strategies. As a way of circumventing the cognitive load imposed by waiting or stalling production, interpreters could use prediction to restructure the input. Syntactic restructuring between the source and the target sentences could be the result of anticipation or production of the predicted verb in the target output before this becomes available in the source input or it could be used to stall the production of the verb until its prediction is confirmed by the source language input. This phenomenon has been referred to as structural prediction in the interpreting studies literature (see Seeber 2001; Ven Besien 1999). Therefore, in addition to measuring the latency on the verb in the source input and target output, the present study also examined the degree of syntactic restructuring that takes place during SI between Turkish and English, as syntactically asymmetrical languages.

It is also well worth pointing out that the results obtained by Author citation (2017) were based on a small mixed group of trainee (N=7) and professional (N=4) interpreters and a group of bilinguals with no prior experience in interpreting, while Author citation (2019) only involved bilinguals with no prior interpreting experience. Thus, these studies do not control for or address potential expertise related differences in prediction.

1.2. Expertise related advantages for prediction

In the context of interpreting studies, expertise includes more general experience with the interpreter's working languages, but also her specific experience acquired in the professional setting of simultaneous conference interpreting, which is the type of conference interpreting that most studies on prediction and anticipation focus on. The latter more specific experience is evident in the interpreter's professional profile, including her membership in professional conference interpreting organizations. Professional interpreters have demonstrated behavioural advantages in semantic processing and working memory capacity when compared with other groups, such as trainee interpreters and untrained bilinguals (for a review of these findings see García, Muñoz, *et al*. 2020). Based on such findings, García (2014) claimed that the observed behavioural advantages in professional interpreters are associated with their experience in SI.

Comparisons have been made between professional interpreters and other groups with respect to the rate of anticipations and ratio of exact versus general anticipations and based on directionality or whether the participants are interpreting from or into their native language. While there have been few expertise-based differences in the overall number of anticipations, more instances of exact anticipations have been observed in professional interpreters than trainee interpreters in their final stage of interpreter training in SI from German into Italian (Riccardi 1996) and from German into English (Jörg 1997, and more recently replicated in German-French SI by Pöchhacker and Stögerer 2021), which suggests that professionals might be making more specific predictions than students. Alternatively, professionals could be quicker than students at retrieving specific terms, phrases, and expressions in the target language due to the stronger connections in their brains between specific words or phrases in the source and target languages as a result of experience (Paradis 1994).

Interestingly, the above studies also found more instances of anticipation in interpreters whose A language or L1 was German than those whose L1 was English, Italian or French. By the same token, Chmiel (2021) found more anticipation during SI into the B language (i.e. inverse interpreting) than during SI into the A language (i.e. direct interpreting), although no expertise-based advantages were observed in this study. This suggests that predictions are more common when interpreting from than into the interpreter's native language, thus inverse interpreting was employed in the present study.

The more recent findings on prediction in interpreters/during SI are conflicting. For example, Author citation (forthcoming) found a prediction effect (more looks towards a plausible agent in the VWP upon hearing the accusative than the nominative Turkish case marker), but no such effect in student interpreters in a listening task. However, Chmiel found no differences in prediction between professional and trainee interpreters, as revealed by verb translation latency measurements in an offline sentence processing task. Amos, Seeber, *et al*. (2022) found prediction of an upcoming semantically related discourse referent (relative to an unrelated one) in the VWP during SI by professional French-English interpreters and translators, and no differences between the two groups in the number and time course of the predictions. This led

the authors to conclude that prediction occurs during SI irrespective of expertise and training. Additionally, Liu, Hintz, *et al*. (2022) observed anticipatory eye movements to semantically related upcoming target words in their L1 source language during both consecutive and simultaneous interpreting of sentences in bilinguals with no prior experience in interpreting.

While more recent findings seem to be contradictory, there is still reason to believe that there could be an expertise related advantage for prediction in interpreters (Jörg 1997; Author citation forthcoming; Pöchhacker and Stögerer 2021; Riccardi 1996).

1.3. Present study

This study examined whether contextual constraint and/or TP would cause prediction of the sentence-final verb during SI from Turkish into English and whether there would be any expertise related differences in the cues used to predict the sentence-final verb during SI from Turkish into English.

First, we measured the interpreting latency or the time lag between the onset of the sentence-final verb in the Turkish input and the onset of its translation in the English output. This technique is based on a latency measurement method first employed to investigate semantic effects in speech shadowing (Marslen-Wilson 1973). Second, given the asymmetry in structure between the source and target languages employed in our SI task (Turkish and English, respectively), we also examined the degree of syntactic restructuring between the source language input and target language output. Importantly, we aimed to find out whether contextual constraint and/or TP would affect interpreting latency on the sentence final verb as well as the degree of syntactic restructuring between the source language input and target language output.

To this end, we analysed the produced target language structures to determine the degree of restructuring between the source language input and target language output. This analysis (described in Methods) revealed that our target language structures can be divided into verb-second structures, where the verb was produced in second position in the English sentence, following the subject, and all the rest or non-verb second structures, where the verb was produced later in the target sentence, following an adjunct (i.e., an adverbial clause) and the subject. We then looked at the effects of contextual constraint and TP on the use of verb-second target language structures only, as the types of sentence structures exhibiting a higher degree of restructuring between the source input and target output relative to the rest of our observed target language structures.

In line with previous findings on German-English SI obtained with the same experimental design (Author citation 2017), we expected an overall effect of contextual constraint on the prediction of the sentence-final verb. In other words, we expected shorter verb interpreting latency and more verb-second structures in constraining than in neutral contexts. We did not expect an effect of TP on either.

Based on previous findings of expertise-related advantages for prediction (Jörg 1997; Author citation forthcoming; Riccardi 1996), we expected a stronger prediction effect in professional than in trainee interpreters, where professionals would exploit the contextual constraint cue for prediction to a greater extent than trainees, resulting in a greater difference in interpreting latency and verb-second target sentence structures in constraining than in neutral contexts for professional interpreters than for trainees.

2. Methods

2.1. Participants

Two groups of native Turkish speakers with different levels of interpreting experience were recruited for the SI task. The first group consisted of 36 interpreting trainees, who were either senior year undergraduates at the translation and interpreting studies departments of Boğaziçi, Yeditepe, Okan, Bilkent and Hacettepe universities (N=34) or MA students enrolled in the European Master of Conference Interpreting Program at Boğaziçi University (N=2). The entirety of these universities has screening tests in their interpreting programs, and all trainees had passed a screening test, either for the fourth year as undergraduate students or an entrance exam for MA students. Thus, they possessed the necessary language and interpreting skills to qualify as prospective conference interpreters. However, four of the undergraduate trainees had to be excluded due to excessive omission and lag, resulting in a group of 32 trainee interpreter participants (30 undergraduate trainees and 2 MA students). The second group consisted of 33 professional Turkish (A) - English (B) interpreters, all of whom were contacted through the Conference Interpreters' Association of Turkey (TKTD). As per the membership requirements of the TKTD, all had completed at least 150 days of conference interpreting. Thus, they had much greater experience than the trainee group. The age of the trainee interpreters varied between 22 and 26 years (M = 22.7; SD = 0.9) and 69 % were female. The age of the professional interpreters varied between 28 and 56 years (M = 42.4; SD = 7.6) and 82% were female.

2.2. Materials

A total of 100 noun-verb pairs were extracted from the trTenTen12 corpus made available by Sketch Engine (Jakubíček, Kilgarriff, *et al*. 2013), half of these had high TP (N=50) and the rest were their low TP counterparts. Between high and low TP pairs, the noun varied while the verb (i.e., the target word) was maintained the same. This was done to prevent potential confounds created by word frequency and length. This was an improvement from the experimental design in Author citation (2017), where the noun was maintained the same while the verb (i.e., the target word) varied. The noun frequency was obtained in its case marked form. Either accusative or nominative case marked nouns were used in the pairs as these two cases are the most frequently used ones with direct objects in Turkish. All verbs were used in their active form and no light verbs were used, to avoid the noun being the sole meaning carrier in the pair.

An online norming study (Frey 2018) was conducted with 107 Turkish L1 speakers with an advanced level of English. The aim of this study was to remove noun-verb pairs with inconsistent English translations (with a translation consistency threshold of 70%) and resulted in reducing the number of noun-verb pairs to 48 (24 high TP, 24 low TP). TP was calculated by dividing the co-occurrence frequency of the noun-verb pair by the overall frequency of the noun (McDonald and Shillcock 2003a, 2003b; Perruchet and Peereman 2004). Table 1 shows the mean co-occurrence and TP information across high and low TP pairs. A paired samples t-test revealed a significant difference between mean TP values of high and low TP pairs, $p < .001$.

TABLE 1

Mean co-occurrence and TP values across noun-verb pairs

Noun-Verb Pair	Mean noun frequency	Mean co-occurrence frequency	Mean TP (co-occurrence frequency / noun frequency)	t-test mean comparison
High TP e.g., **doğayı koru-** (*to protect the environment*)	86.889	72.378	.833	$p < .001$
Low TP e.g., **demokrasiyi koru-** (*to protect the democracy*)	158.464	5.883	.037	

Additionally, to replicate the experimental design of Frisson, Rayner, *et al*. (2005), each noun-verb pair was inserted in a constraining and neutral context, resulting in a 2x2 design: i) constraining context, high TP (CH); constraining context, low TP (CL); neutral context, high TP (NH); neutral context, low TP (NL). Each sentence consisted of exactly 8 words, and all items followed an SAOV (Subject-Adjunct-Object-Verb) order, where the adjunct constituted a centrally embedded adverbial clause, like in example (3) above. A sample experimental item in each of the four conditions is provided in Table 2.

TABLE 2

Sample experimental item in four conditions

Experimental condition	Example in Turkish (with English gloss and translation)
CH: Constraining context, high TP	Yeni yönetim ülkenin geleceğini düşündüğü için **doğayı koruyor**. [New administration of the country future think because the nature protects] Translation: The new administration **protects the environment** because it is concerned about the future of the country.
CL: Constraining context, low TP	Yeni yönetim ülkenin geleceğini düşündüğü için **demokrasiyi koruyor.** [New administration of the country future think because the democracy protects] Translation: The new administration **protects democracy** because it is concerned about the future of the country.
NH: Neutral context, high TP	Yeni yönetim genel durumdan anlaşıldığına göre **doğayı koruyor.** [New administration from the general situation understood as the nature protects] Translation: As (can be) understood from the general situation, the new administration **protects the environment**.
NL: Neutral context, low TP	Yeni yönetim genel durumdan anlaşıldığına göre **demokrasiyi koruyor**. [New administration from the general situation understood as the democracy protects] Translation: As (can be) understood from the general situation, the new administration **protects democracy**.

Experimental conditions: constraining context, high TP (CH); constraining context, low TP (CL); neutral context, high TP (NH); neutral context, low TP (NL).

An online gating task, which is a version of a cloze task (Van Petten, Coulson, *et al*. 1999), was conducted with 66 native speakers of Turkish to test the reliability, i.e. predictability, of the items. In each trial, participants were asked to guess the sentence-final verb. After every guess, one letter of the missing verb appeared, and the number of correct responses at each stage of gating was counted. We looked at the effects of contextual constraint and TP on i) first correct guesses (correct guesses with no letters of the missing word revealed) and ii) gating score, which represented the total number of letters that needed to be revealed to make a correct guess across items per condition (which the participants saw 4 times). For example, if a participant needed 1 letter twice and 2 letters twice per condition, the gating score for that condition would be (1x2) + (2x2) = 6. A liner mixed effects model with subjects as the random effect and context (neutral vs. constraining), TP (high vs. low), and their interaction terms as the fixed effects revealed effects of both contextual constraint (estimate = -0.97, p = 0.000) and TP (estimate = -1.80, p = 0.000) on first correct guesses of the verb (before any letters were revealed). In other words, there were significantly more first correct guesses in constraining contexts and high TP than in neutral contexts and low TP. The mixed effects model also revealed an effect of contextual constraint (estimate = 1.73, p = 0.007) and TP (estimate = 4.84, p = 0.000) on gating score. In other words, the number of letters needed to correctly guess the verb was significantly lower in constraining contexts and high TP than in neutral contexts and low TP. None of the interaction terms were significantly associated with first correct guesses or number of letters needed to correctly identify the verb. Consequently, the results of the gating task confirmed the reliability of the experimental items created for the purpose of the current investigation.

Forty-eight filler sentences were also extracted from the trTenTen12 corpus. These varied 6-12 words in length and could employ a non-active (i.e., causative or passive) verb form (4).

4) Dün gece Trump için Havaalanı'nda yoğun güvenlik önlemleri alındı.
[Yesterday night Trump for at the airport busy security measures were taken]

Translation: Last night strict security measures were taken at the airport for Trump.

The twenty-four target sentences were divided into 4 lists and the 48 fillers were inserted and interspersed throughout the lists, so that each participant received one of the four lists and one version of each item. All (target and fillers) were recorded in audio version with a native speaker of Turkish for the purpose of the SI experiment.

2.3. Procedure

Before the onset of the pandemic, the SI experiment was administered in a physical setting. Participants were seated across a computer and asked to sign an informed consent form. Afterward, they were asked to put on headphones and instructed to interpret sentences from Turkish into English as quickly and accurately as they could, without waiting for the sentence to end. Following three practice trials, participant responses were automatically recorded by the software. The sentences were presented with OpenSesame (Mathôt, Schreij, *et al*. 2012), an open-source experiment builder, which was launched on the computer in front of them. Five-second breaks had been inserted between sentences and two breaks of 30 seconds each had been inserted a third and two thirds of the way in the experiment.

After the COVID-19 outbreak, the experiment was modified so that it could be administered remotely. Experimental and filler items were randomized and concatenated in R

version 3.6 (R Core Team 2021), maintaining the duration of the experiment and break length exactly the same. The resulting tracks were uploaded into either Audacity or GarageBand, two software programs that allow for simultaneous listening and recording. Participants were provided detailed guidelines for installing one of the two programmes, depending on the processing system of their personal computer, and extracting their responses, which were recorded offline. Moreover, they were provided guidance through Zoom before the start of the experiment.

2.4. Data analysis

We had to remove 220 data points (out of which, 68 professional and 152 trainee data points) due to omissions of the target word in the interpreted output, which still amounted to 1,340 data points being included in our data analyses. The exclusion of data due to omissions did not prevent us from obtaining statistically significant results (see Results). Two interpreters that work in the Turkish-English pair were asked to go over the responses. As the aim of the current study was not to look at translation accuracy, translations of the target word that were deemed acceptable in a conference setting and that matched the responses obtained in the norming task (see Materials) were used in our data analysis.

Next, the data were annotated for latency and word order. Here, latency refers to the time between the onset of the Turkish verb produced in the experimental item and the onset of English verb produced by the participant. To measure this, four master audio files were created (one for each list created to fit the Latin Square design), and the onset of the verb in each item was marked. Then, the recordings of each participant were parsed and reordered in R to align with the ordering of the master lists. The onsets of the verbs in the translation were tagged, and the latency was recorded. No instances of negative latency, i.e., production of the sentence-final verb in the output before it became available in the input, were recorded in our data.

Moreover, the order of constituents in each of the responses was recorded. Corresponding to the annotation of the target sentences in Turkish, the four constituents used to annotate the produced English sentences were subject (S), verb (V), object (O), and adjunct (A). The most frequent word order patterns recorded in our professional interpreter data were SAVO (49% of all produced target language sentences), followed by SVOA (27%), and ASVO (16%). The rest (8%) were incomplete structures, where constituents other than the verb (i.e., target word) were omitted, such as SVO. Our trainee data also revealed SAVO patterns as the most frequently employed ones (52%), followed by SVOA (24%) and ASVO (6%). Incomplete structures accounted for 18% of all target language structures produced by trainee interpreters. Only SVOA structures, where the verb was produced in second position in the sentence (earlier relative to the other two most common structures), were of interest in further investigations of prediction. Thus, only these were included in our statistical analyses. However, the ratio of SAVO and ASVO structures is considered in the general discussion of our findings.

We applied a linear-mixed effects model with the *lmer* function and *bobyqa* optimizer in the lme4 software package (Bates, Mächler, *et al*. 2015) for R version 3.6 (R Core Team 2021). The random effects were subject and item and the fixed effects were group (with professional interpreters coded as 0.5 and trainee interpreters as -0.5), context (with constraining context coded as 0.5 and neutral context as -0.5), and TP (with high TP coded as 0.5 and low TP as -0.5). We also analysed the interaction between the fixed effects. Our continuous outcome variable was latency. We consider that the difference between conditions becomes significant when the t-

value has absolute values exceeding -2 or 2 (Baayen, Davidson, *et al*. 2008). Our binary outcome variable was verb-second structure. The latter was computed by assigning 1 to verb-second (i.e., SVOA) structures and 0 to all the rest. In this analysis, statistical significance was determined based on *z* and p-values.

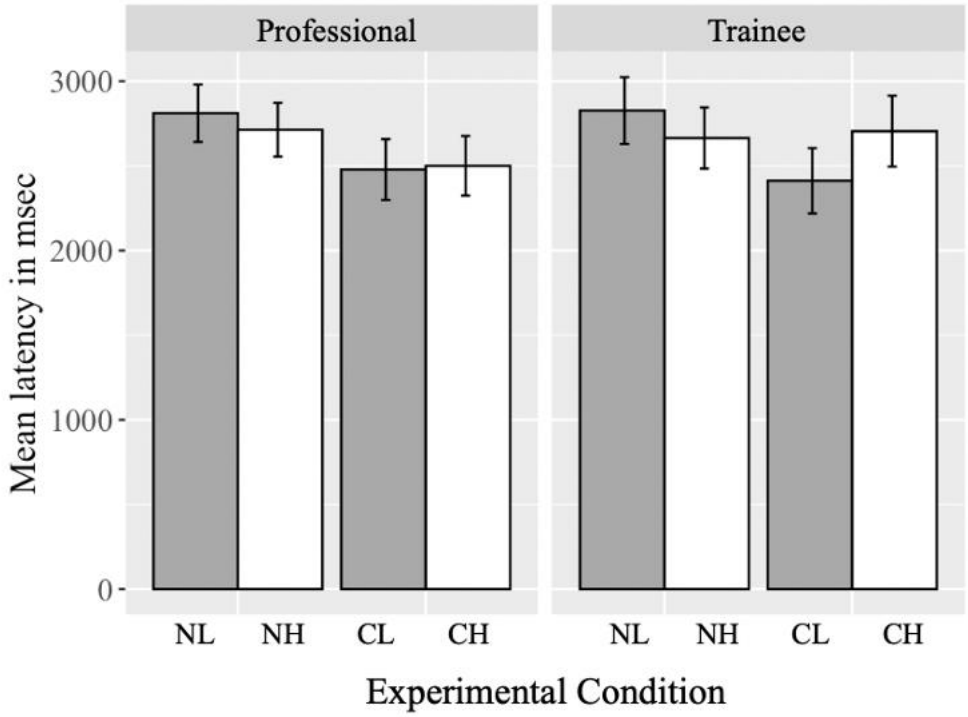
3. Results

3.1. Latency analysis

Figure 1 shows the mean latency per condition in professional and trainee interpreters.

FIGURE 1

Mean latency per experimental condition in professional and trainee interpreters



Experimental conditions: constraining context, high TP (CH); constraining context, low TP (CL); neutral context, high TP (NH); neutral context, low TP (NL)

A linear-mixed effects model with the fixed effects of group, context, and TP, and their interaction revealed no effect of group on latency, (estimate = -0.006, *SE* = 0.056, *t* = -0.107). However, a main effect of context on latency was observed (estimate = -0.120, *SE* = 0.047, *t* = -2.540). There was no effect of TP on latency (estimate = 0.005, *SE* = 0.036, *t* = 0.188). Moreover, no interaction was observed between group and context (estimate = -0.060, *SE* = 0.062, *t* = -0.973) or group and TP (estimate = -0.076, *SE* = 0.053, *t* = -1.429).

A significant positive interaction was found between context and TP (estimate = 0.117, *SE* = 0.054, *t* = 2.183), indicating that in a constraining context there is a larger difference in latency between high and low TP items than in a neutral context, which can also be observed in Figure 1.

Finally, there was no interaction between group, context, and TP (estimate = -0.120, *SE* = 0.107, *t* = -1.123).

We also conducted separate analyses per group and found an effect of context, but no effect of TP and no interaction between context and TP in professionals. By contrast, the effect of context only approached significance in the trainees while no effect of TP was observed in this group. However, a significant interaction was found between context and TP. The results are summarised in Table 3.

TABLE 3

Per-group effects on latency

Group	Effect	Estimate	*SE*	*t*
Professional	Intercept	7.761	0.040	195.836
	Context	-0.150	0.059	-2.507
	TP	-0.033	0.035	-0.928
	Context:TP	0.054	0.070	0.763
Trainee	Intercept	7.767	0.046	168.516
	Context	-0.089	0.047	-1.855
	TP	0.041	0.041	1.011
	Context:TP	0.180	0.082	2.195

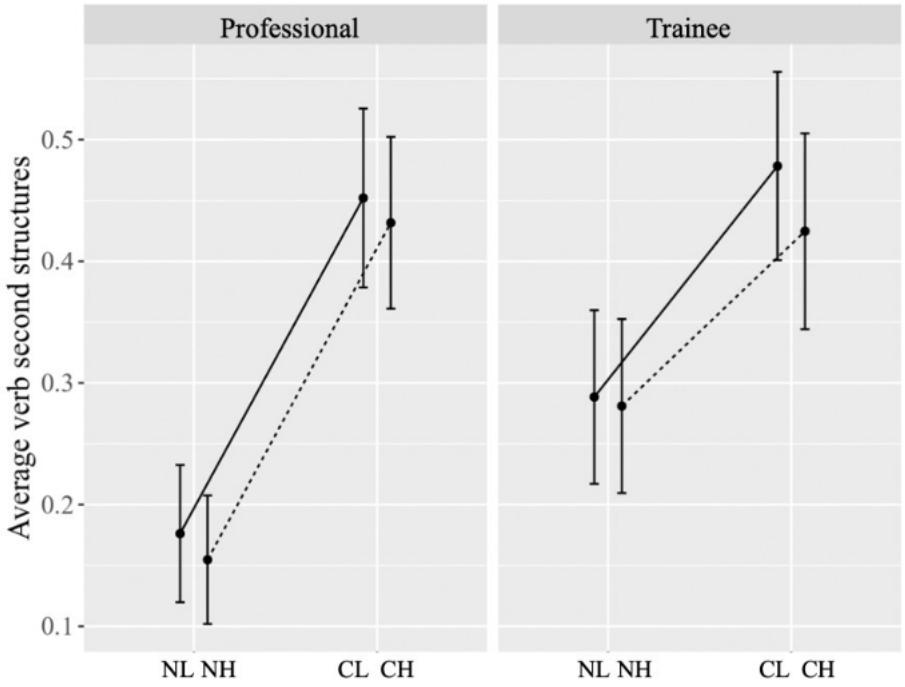
Estimated values, standard error (SE) and t-values for latency per intercept, context, TP, and the interaction between context and TP in professional and trainee interpreters. We consider that the effect becomes significant when the t-value has absolute values exceeding -2 or 2 (Baayen, Davidson, et al. 2008).

3.2. Verb-second structures

Figure 2 shows the mean number of verb-second structures per experimental condition in professional and trainee interpreters.

FIGURE 2

Mean verb-second structures per experimental condition in professional and trainee interpreters



Experimental conditions: constraining context, high TP (CH); constraining context, low TP (CL); neutral context, high TP (NH); neutral context, low TP (NL)

A linear-mixed effects model with the fixed effects of group, context, and TP, and their interaction revealed no effect of group on word order (estimate = -0.529, *SE* = 0.404, *z* = -1.309, *p* = .190). However, a main effect of context on latency was found (estimate = 1.411, *SE* = 0.320, *z* = 4.401, *p* < .001). There was no effect of TP on latency (estimate = -0.091, *SE* = 0.149, *z* = -0.611, *p* = .541). The interaction between group and context approached significance (estimate = 0.643, *SE* = 0.339, *z* = 1.895, *p* = .058), but there was no interaction between group and TP (estimate = -0.078, *SE* = 0.297, *z* = -0.264, *p* = .792). Moreover, no interaction was found between context and TP (estimate = -0.014, *SE* = 0.300, *z* = -0.047, *p* = .963) or between group, context, and TP (estimate = 0.415, *SE* = 0.596, *z* = 0.696, *p* = .486).

We also conducted separate analyses of verb-second structures per group and found an effect of context, but no effect of TP and no interaction between context and TP in professionals. The same pattern of results was observed for trainees. The results are summarised in Table 4.

TABLE 4

Per-group effects on verb-second structures

Group	Effect	Estimate	*SE*	*z*	*p*
Professional	Intercept	-1.267	0.291	-4.361	< .001
	Context	1.752	0.413	4.241	< .001
	TP	-0.140	0.213	-0.658	.51
	Context:TP	0.147	0.427	0.345	.73

Trainee	Intercept	-0.790	0.354	-2.233	< .05
	Context	1.093	0.323	3.387	< .001
	TP	-0.057	0.216	-0.266	.79
	Context:TP	-0.254	0.434	-0.585	.56

Estimated values, standard error (SE), z-values and probability levels for verb-second structures per intercept, context, TP, and the interaction between context and TP, in professional and trainee interpreters. Significance level is determined based on p values.

4. Discussion and conclusions

This study investigated prediction of the sentence-final verb during SI from Turkish into English in a group of professional and trainee Turkish (A) - English (B) interpreters. First, we examined what types of cues lead to prediction of the sentence-final verb during SI from Turkish into English, as measured by interpreting latency on the verb and the use of verb-second structures in the target language output. Second, we tried to find out whether a group of professional interpreters would show a stronger prediction effect, i.e., shorter latency and more verb-second structures as a result of contextual constraint, than a group of trainee interpreters. Our overall analysis (combining the professional and trainee data) of latency revealed an effect of context on latency but no effects of group or TP. An interaction was also observed between context and TP. Group did not interact with either of the remaining two variables. Similarly, the analysis of target sentence structures revealed no effect of group or TP but a main effect of context on verb-second structures. The interaction between group and context only approached significance and there was no interaction between context and TP or group and TP.

A closer inspection of the latency data within each group revealed an effect of context on latency in the professional group, while within the trainee group the effect of context only approached statistical significance. In addition, an interaction between context and TP was only observed in the trainee group but not in professionals. Despite these differences in the per-group latency analyses, the fact that *group* did not interact with any of the other interaction terms in the overall data analysis reveals that there was no statistically significant difference in latency between the two groups of participants. Moreover, when it comes to the use of verb-second target sentence structures, per group analyses revealed the same result pattern in both groups: an effect of context but no effect of TP or interaction between context and TP.

An important finding of this study is that verb-second structures were more common upon hearing a constraining context than a neutral one, which also led to shorter latency on the verb in both trainee and professional interpreters. Given that the sentence subject did not differ between constraining and neutral conditions, the level of contextual constraint was mainly manipulated via the adjunct (i.e., the adverbial clause preceding the noun-verb TP pair). Upon hearing a constraining adjunct, participants were quicker to produce the verb in the target output than after hearing a neutral adjunct. In order to produce an SVOA target structure (*e.g., The new administration protects democracy because it is concerned about the country's future*), participants had to store all pre-verbal information in their working memory and only retrieve and produce this in the output after encountering the verb in the input. That they were waiting to hear the verb first, before producing its translation, is confirmed by the fact that we did not observe any instances of negative latency on the verb, i.e., production of the verb in the target output before this became available in the source input, in our data. This finding is not surprising given that our study employed isolated sentences on different topics, rather than continuous speech as is the case in actual simultaneous conference interpreting.

Possibly, participants had made a prediction on the verb and were waiting for this to be confirmed by the information being revealed in the input before producing the predicted word in the output, regardless of the load that waiting may impose on their working memory. It makes sense that participants would maintain constraining, rather than neutral, information in their memory. In the case of a neutral adjunct, no expectation on the verb would have been created, so they may have opted for other structures in this condition, such as SAVO (49% of all produced target sentences in professionals and as many as 52% in trainees) or ASVO (16% in professionals and 6% in trainees), allowing them to 'buy some time' before producing a translation of the verb. SAVO structures are characterized by a lower overall EVS (ear-voice-span) than other structures (e.g., ASVO and SVOA in the current study), which could be maintained for the purpose of circumventing cognitive load imposed by waiting, storing, and retrieving information from memory. Such demands would have been higher than usual in the present study due to the use of isolated sentences.

Source-like structures like SAVO could be the result of *interpretese*, a target language structure tainted by source language forms (Shlesinger 2008), which can occur as a result of structural interference from the source into the target language (Chmiel, Janikowski, *et al*. 2020). The high frequency of such structures observed in professional interpreters in the current study is surprising given that structural interference has mainly been observed in non-expert groups (e.g., trainee interpreters in Chmiel, Janikowski, *et al*. 2020). Structural interference is deemed more common for language pairs with dissimilar syntactic structures (Gernsbacher and Shlesinger 1997), which suggests that the use of source-like SAVO structures in the target language may be an effect of syntactic asymmetry. To avoid structural interference, interpreters manipulate the EVS or overall interpreting latency, resulting in other types of target sentence structures which exhibit a higher degree of syntactic restructuring between the source input and target output, such as SVOA or ASVO, at least in the case of a constraining context. In line with this, Bevilacqua (2009) found a longer EVS (waiting or stalling before production) as well as more reformulation when interpreting between syntactically less symmetrical (German-Italian) structures than between more symmetrical (Dutch-Italian) ones.

Thus, we may speculate that our participants i) heard the constraining adjunct, which helped them generate an expectation about the upcoming verb, and ii) after hearing sufficient information to identify the verb (similarly to a gating task) and confirm their expectation, iii) produced the translation of the verb in the output. The cognitive load imposed by waiting for production in the case of SVOA or verb-second structures may have been decreased by prediction. According to the model of prediction in interpreting proposed by Amos and Pickering (2020), interpreters build a covert predicted representation in the source language as a way of circumventing the cognitive load imposed by the asymmetry of the source and target language structures. This then serves as input for the planning of speech in the target language, where the representation is overtly produced. It is the covert source language representation that is believed to decrease cognitive load as this allows for the planning of the target language utterance. Overt production of the prediction in the target language is not always possible, although it is advantageous as it can further decrease the cognitive load imposed by the asymmetry in sentence structure. Even though prediction itself imposes demands on cognitive resources, these are not as great as in the no-prediction case (Amos and Pickering 2020), i.e., the neutral condition in the current study. In this condition, interpreters tend to resort to other strategies, such as maintaining lower overall interpreting latency (or EVS) as a way of decreasing cognitive demands. The present findings are in line with Author citation (2017), who observed an effect of contextual

constraint but no effect of TP on latency during SI between asymmetrical German-English sentence structures. Additionally, prediction does not *necessarily* result in restructuring, as attested by the high ratio of source-like SAVO patterns, but it *can* be considered to drive structural changes. The fact that there was no TP effect on latency suggests that this may have been overridden by the syntactic restructuring between the source and target languages. Other structural changes notwithstanding, the order of the constituents comprising the TP pair had to be rearranged from object followed by verb (i.e., verb-medial) in the source language into verb followed by object (i.e., verb-final) in the target language. TP effects would also need to be examined during Turkish-English SI involving symmetrical verb-medial structures (see Author citation 2019), although such structures are far less common in Turkish than verb-final ones (Özge, Küntay, *et al*. 2019).

When it comes to the question of expertise related differences in prediction, our statistical data analyses revealed no differences between professional and trainee interpreters when it comes to the effect of contextual constraint on latency or verb-second structures, contrary to our expectations. Nonetheless, numerical differences were observed between the two groups and in what follows we will attempt to provide some speculative accounts of these. For example, the interaction between context and TP observed within the trainee group (but not within professionals) could be related to the mean latency patterns across conditions seen in Figure 1. Unexpectedly, the mean latency was virtually the same between the CH (constraining context, high TP) and CL (constraining context, low TP) conditions for the professionals and even higher in the CH than in the CL condition in trainees. On the other hand, changes in latency followed the expected direction in the neutral conditions (lower in NH than in NL) in both groups.

According to the predictive processing literature, during incremental sentence processing a constraining context gradually reduces the possible completions of a sentence as it unfolds, without excluding less possible semantically related completions (Kutas and Hillyard 1984; Van Petten and Kutas 1990). In line with this, predictive processing studies (Federmeier and Kutas 1999; Frisson, Harvey, *et al*. 2017) have found no difference in immediate (but only in late) responses between semantically predictable and unpredictable but semantically related words in constraining contexts, indicating that the expectations we form are not specific but include semantic neighbours. Given that the low TP nouns in our study were semantically related to the context, even if they did not form collocates with the verb, there would not have been any cost in processing and integrating them within the wider sentence context relative to high TP nouns. This is what the professional interpreter data seem to show, i.e., the mean latency between the CH and CL conditions is not different in this group (see Figure 1), which could also explain the lack of TP effect on latency.

Nonetheless, it is still unclear why trainees showed *higher* mean latency in the CH than the CL condition. The only difference between the two conditions (CH and CL) was in the noun (i.e., object) preceding the sentence-final verb. A possible explanation is that the retrieval of the high TP target language equivalents took more time than the retrieval of low TP target language equivalents. This could be due to factors that the current study did not control for, including the level concreteness as well as the cognateness status of the noun forming the TP pair. Cognates have been found to facilitate translation production in both professional and trainee interpreters as well as in bilinguals with no experience in interpreting (Christoffels, de Groot, *et al*. 2006; Lijewska and Chmiel 2015).

The current findings on latency in professional and trainee interpreters are in line with Chmiel (2021), who found no between-group differences in context-based anticipations between

professional and trainee interpreters, as revealed by measures of word translation latency in an offline visual sentence processing task. Chmiel refers to similar findings in a word translation task conducted with professional and advanced trainee interpreters by García, Ibáñez, *et al*. (2014), who claimed that the strength of the lexical connections between the source and target languages reaches ceiling level before the onset of professional experience.

A potential limitation of the current study is the use of a latency measure to investigate effects of low-level information, such as statistical probabilities indexed by TP, on prediction. Such effects may be observable with more fine-grained prediction measurement methods like eye tracking (see McDonald and Shillcock 2003b) or electroencephalography (EEG), although it is worth pointing out that TP effects on latency were found in Author citation (2017), who applied the same experimental design in a shadowing task, involving within-language repetition of speech.

A further limitation constitutes the use of isolated sentences for the purpose of an SI task, which normally involves speeches. In post-experimental feedback, professional interpreters expressed difficulty in switching from one context to another with every incoming sentence, deeming this highly unusual for an SI task. The use of isolated sentences may have also led to the unusually high degree of *interpretese*, lowering the degree of syntactic restructuring relative to an actual SI situation. Variation in syntactic structure would be expected to be higher when interpreting more authentic materials, such as speeches. As a further step in this research, an SI task could be carried out with more authentic materials, although it may be challenging to manipulate contextual constraint with such materials.

At the same time, the fact that contextual constraint effects on latency were observed in isolated sentences, which has now been found for multiple language pairs and participant groups with different levels of interpreting experience (during German-English SI in bilinguals and a mixed group of professional and trainee interpreters in Author citation (2017) and during Turkish-English SI in professional and trainee interpreters in the current study), suggests that interpreters with varying levels of experience in interpreting engage in prediction even when they have very little context at their disposal. This limited sentence context relates to their background or world knowledge, which is stored in their long-term memory. This information is used top-down to create expectations on what will follow during incremental language processing. In the present study, a constraining context also led to a higher degree of restructuring between the source input and target output, which suggests that interpreters restructure the word order between the source language input and target language output as an effect of prediction. The current findings provide a strong argument for examining both interpreting latency and syntactic restructuring in conjunction in future investigations of prediction during SI between syntactically asymmetrical languages.

ACKNOWLEDGEMENTS

This study was part of a research project supported by the Boğaziçi University Research Fund Grant Number 14481. We thank all the trainee and professional interpreters who took part in this research. We also thank Prof. Ebru Diriker for her invaluable feedback on this manuscript. A big thank you to Bastien Revel and María José González for helping us with the French and Spanish versions of the abstract.

NOTES

1. Verb-medial sentence structures do exist in Turkish, but they are far less common than verb-final ones (Özge, Küntay, *et al*. 2019).
2. The A language is the interpreter's L1 or the language she works into from all her other working languages, while the interpreter's B language is one she is fluent in, but is not her L1, which she works into from one or several of her other working languages (International Association of Conference Interpreters, AIIC).

REFERENCES

AMOS, Rhona and PICKERING, Martin (2019): A theory of prediction in simultaneous interpreting. *Bilingualism: Language and Cognition.* 23(4):706-715.

AMOS, Rhona, SEEBER, Kilian and PICKERING, Martin (2022): Prediction during simultaneous interpreting: Evidence from the visual-world paradigm. *Cognition.* 220:104987.

Author citation (2017)

Author citation (2019)

Author citation (forthcoming)

BAAYEN, Harald, DAVIDSON, Douglas and BATES, Douglas (2008): Mixed-effects modeling with crossed random effects for subjects and items. *Journal of Memory and Language*. 59(4): 390-412.

BATES, Douglas, MÄCHLER, Martin, BOLKER, Ben and WALKER, Steve (2015): Fitting linear mixed-effects models using lme4. *Journal of Statistical Software.* 67(1):1-48.

BEVILACQUA, Lorenzo (2009): The position of the verb in Germanic languages and simultaneous interpretation. *The Interpreters' Newsletter.* 14:1-31.

CHERNOV, Ghelly (2004): *Inference and anticipation in simultaneous interpreting: A probability-prediction model.* Amsterdam: John Benjamins Publishing Company.

CHMIEL, Agnieszka (2021): Effects of simultaneous interpreting experience and training on anticipation, as measured by word-translation latencies. *Interpreting.* 23(1):18-44.

CHMIEL, Agnieszka, JANIKOWSKI, Przemysław and CIESLEWICZ, Anna (2020): The eye or the ear? Source language interference in sight translation and simultaneous interpreting. *Interpreting.* 22(2):187-210.

CHRISTOFFELS, Ingrid, DE GROOT, Anette and KROLL, Judith (2006): Memory and language skills in simultaneous interpreters: The role of expertise and language proficiency. *Journal of Memory and Language*. 54:324-45.

DELONG, Katherine, URBACH, Thomas and KUTAS, Marta (2005): Probabilistic word pre-activation during language comprehension inferred from electrical brain activity. *Nature Neuroscience*. 8(8):1117-1121.

FEDERMEIER, Kara and KUTAS, Marta (1999): A rose by any other name: Long-term memory structure and sentence processing. *Journal of memory and Language*. 41(4):469-495.

FEDERMEIER, Kara and KUTAS, Marta (2001): Meaning and modality: Influences of context, semantic memory organization, and perceptual predictability on picture processing. *Journal of Experimental Psychology: Learning, Memory, and Cognition.* 27(1):202-224.

FREY, Bruce (2018): Norming. *In*: Bruce, FREY, ed. *The SAGE Encyclopedia of Educational Research, Measurement, and Evaluation*. Thousand Oaks, California: SAGE.

FRISSON, Steven, RAYNER, Keith, and PICKERING, Martin (2005): Effects of contextual predictability and transitional probability on eye movements during reading. J*ournal of Experimental Psychology: Learning, Memory, and Cognition.* 31(5):862-77.

FRISSON, Steven, HARVEY, David, and STAUB, Adrian (2017): No prediction error cost in reading: Evidence from eye movements. *Journal of Memory and Language*. 95:200-214.

GARCÍA, Adolfo (2014): The interpreter advantage hypothesis: preliminary data patterns and empirically motivated questions. *Translation and Interpreting Studies. The Journal of the American Translation and Interpreting Studies Association.* 9(2):219-238.

GARCÍA, Adolfo, IBÁÑEZ, Agustin, HUEPE, David, HOUCK, Alexander, MAËVA, Michon, LEZAMA, Carlos, CHADHA, Sumeer, RIVERA-REI, Álvaro (2014): Word reading and translation in bilinguals: The impact of formal and informal translation expertise. *Frontiers in Psychology*. 5(1302).

GARCÍA, Adolfo, MUÑOZ, Edinson, and KOGAN, Boris (2020): Taxing the bilingual mind: Effects of simultaneous interpreting experience on verbal and executive mechanisms. *Bilingualism: Language and Cognition.* 23(4):729-39.

GERNSBACHER, Morton Ann and SHLESINGER, Miriam (1997): The proposed role of supression in sumultaneous interpretation. *Interpreting.* 2(1/2):119-140.

GERVER, David, LONGLEY, Patricia, LONG, John and LAMBERT, Sylvie (1984): Selecting trainee conference interpreters: A preliminary study. *Journal of Occupational Psychology*. 57(1):17-31.
GILE, Daniel (1992): Predictable sentence endings in Japanese and conference interpretation. *The Interpreters' Newsletter*. 1 (special issue):12-23.
GILE, Daniel (2009): *Basic concepts and models for interpreter and translator training*. Amsterdam: John Benjamins Publishing.
HUETTIG, Falk (2015): Four central questions about prediction in language processing. *Brain Research.* 1626(11): 118-35.
INTERNATIONAL ASSOCIATION OF CONFERENCE INTERPRETERS (n.d.). The AIIC A-B-C. Retrieved from https://aiic.org/site/world/about/profession/abc
JAKUBÍČEK, Miloš, KILGARRIFF, Adam, VOJTECH, Kovář, RYCHLÝ, Pavel, SUCHOMEL, Vít (2013): The Tenten corpus family. *Paper presented at the 7th International Corpus Linguistics Conference in CL, Lancaster*.
JÖRG, Udo (1997): Bridging the gap: Verb anticipation in German-English simultaneous interpreting. *In:* Mary SNELL-HORNBY, Zuzana JETTMAROVA and Klaus KAINDL, eds. *Translation as Intercultural Communication: Selected Papers from the EST Congress, Prague 1995*. Amsterdam: John Benjamins Publishing, 217-228.
KORNFILT, Jaklin (2000): Some syntactic and morphological properties of relative clauses in Turkish. *In:* Artemis ALEXIADOU, ed. *The Syntax of Relative Clauses*. Amsterdam: John Benjamins Publishing, 121-159.
KURZ, Ingrid, FÄRBER, Birgit (2003): Anticipation in German-English simultaneous interpreting. *FORUM. Revue internationale d'interprétation et de traduction / International Journal of Interpretation and Translation*. 1(2):123-50.
KUTAS, Marta, HILLYARD, Steven (1984): Brain potentials during reading reflect word expectancy and semantic association. *Nature.* 307(5947):161-63.
LEDERER, Marianne (1981): *La Traduction Simultanée: Expérience Et Théorie.* Lettres Modernes Minard.
LIJEWSKA, Agnieszka, CHMIEL, Agnieszka (2015): Cognate facilitation in sentence context – translation production by interpreting trainees and non-interpreting trilinguals. *International Journal of Multilingualism.* 12(3):358-75.
LIU, Yinguang, HINTZ, Florian, LIANG, Junying and HUETTIG, Falk (2022): Prediction in challenging situation: Most bilinguals can predict upcoming semantically relates words in their L1 source language when interpreting. *Bilingualism: Language and Cognition*. 1-15.
MARSLEN-WILSON, William (1973): Linguistic structure and speech shadowing at very short latencies. *Nature*. 244(5417):522-523.
MATHÔT, Sebastiaan, SCHREIJ, Daniel SCHREIJ, Daniel and THEEUWES, Jan (2012): Opensesame: An open-source, graphical experiment builder for the social sciences. *Behavior Research Methods*. 44(2):314-24.
MCDONALD, Scott and SHILLCOCK, Richard (2003a): Eye movements reveal the on-line computation of lexical probabilities during reading. *Psychological Science*. 14(6):648-52.
MCDONALD, Scott and SHILLCOCK, Richard (2003b): Low-level predictive inference in reading: The influence of transitional probabilities on eye movements. *Vision Research.* 43(16):1735-51.
MOSER-MERCER, Barbara (2000): Simultaneous interpreting: Cognitive potential and limitations. *Interpreting.* 5(2): 83-94.
ÖZGE, Duygu, KÜNTAY, Aylin and SNEDECKER, Jesse (2019): Why wait for the verb? Turkish speaking children use case markers for incremental language comprehension. *Cognition.* 183: 152-180.
PARADIS, Michel (1994): Toward a neurolinguistic theory of simultaneous translation: The framework. *International journal of psycholinguistics.* 10(3):319-35.
PERRUCHET, Pierre and PEEREMAN, Ronald (2004): The exploitation of distributional information in syllable processing. *Journal of Neurolinguistics.* 17:97-119.
PÖCHHACKER, Franz and STÖGERER, Monica (2021): Fifty years of research on anticipation in simultaneous interpreting. In Kilian Seeber, ed. *100 years of conference interpreting: a legacy*. Newcastle upon Tyne: Cambridge Scholars Publishing, 26-41.
R CORE TEAM (2021): A language and environment for statistical computing. *R Foundation for Statistical computing*, Vienna: Austria. Available online at: https://www.R-project.org/
RICCARDI, Alessandra (1996): Language-specific strategies in simultaneous interpreting. *In:* Cay DOLLERUP and Vibeke APPEL, eds. *Teaching Translation and Interpreting 3*. Amsterdam: John Benjamins Publishing, 213-222.
SAFFRAN, Jenny, NEWPORT, Elissa, and ASLIN, Richard (1996): Word segmentation: The role of distributional cues. *Journal of memory and language.* 35(4):606-21.

SEEBER, Kilian (2001): Intonation and anticipation in simultaneous interpreting. *Cahiers de Linguistique Française.* 23:61-97.

SETTON, Robin (1999): *Simultaneous Interpretation: A Cognitive-Pragmatic Analysis.* John Benjamins, 1999.

SETTON, Robin (2006): Context in simultaneous interpretation. *Journal of Pragmatics*. 38(3):374-89.

SHLESINGER, Miriam (2008): Towards a definition of interpretese: An intermodal, corpus-based study. *In*: Gyde HANSEN, Andrew CHESTERMAN and Heidrun GERZYMISCH-ARBOGAST, eds. *Efforts and models in interpreting and translation research: A tribute to Daniel Gile.* Amsterdam: John Benjamins Publishing, 237-253.

THOMPSON, Susan and NEWPORT, Elissa (2007): Statistical learning of syntax: The role of transitional probability. *Language Learning and Development.* 3(1):1-42.

VAN BERKUM, Jos (2004): Sentence comprehension in a wider discourse: Can we use ERPs to keep track of things? *In*: Manuel CARREIRAS and Charles CLIFTON, JR, eds. *The on-line study of sentence comprehension: Eyetracking, ERPs and beyond*. New York: Psychology Press, 229-270.

VAN BERKUM, Jos, BROWN, Colin, ZWITSERLOOD, Pienie, KOOIJMAN, Valesca and HAGOORT, Peter (2005): Anticipating upcoming words in discourse: Evidence from ERPs and reading times. *Journal of Experimental Psychology: Learning, Memory, and Cognition*. 31(3): 443-467.

VAN BESIEN, Fred (1999): Anticipation in simultaneous interpretation. *Meta: Translators' Journal.* 44(2): 250-59.

VAN PETTEN, Cyma, COULSON, Seana, RUBIN, Susan, E, PLANTE, Elena and PARKS, MARJORIE (1999): Time course of word identification and semantic integration in spoken language. *Journal of Experimental Psychology: Learning, Memory, and Cognition.* 25(2):394-417.

VAN PETTEN, Cyma and KUTAS, Marta (1990): Interactions between sentence context and word frequency in event-related brain potentials. *Memory & Cognition.* 18(4):380-93.

WICHA, Nicole, MORENO, Eva and KUTAS, Marta (2004): Anticipating words and their gender: An event-related brain potential study of semantic integration, gender expectancy, and gender agreement in Spanish sentence reading. *Journal of Cognitive Neuroscience* 16(7):1272-1288.

WILSS, Wolfram (1978): Syntactic anticipation in German-English simultaneous interpreting. *In:* David GERVER, H. Wallace SINAIKO, eds. *Language Interpretation and Communication*. Boston, MA, US: Springer, 343-352.