Al-Noor Journal for Humanities, December (2024); 2 (4):
DOI: https://doi.org/10.69513/jnfh.v2.n4.en6 (134-167)
IRAQI Academic Scientific Journals

ISSN: 3005-5091
AL-NOOR JOURNAL FOR HUMANITIES
Available online at : http://www.jnfh.alnoor.edu.iq
JNFH Al-Noor Journal for Humanities

Exploring the Cognitive Dimensions in Interpreting and AI

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Received: 2024/10/2 Accepted: 2024/11/18

Published: 2024/12/21

Abstract:

Anticipation is a fundamental cognitive process in interpreting that enables interpreters to predict upcoming speech segments and facilitate the transfer of meaning between languages. This abstract explores the cognitive aspects of anticipation in interpreting and examines how artificial intelligence (AI) can enhance this process.

Drawing on research from cognitive psychology and interpreting studies, the abstract discusses the cognitive mechanisms involved in anticipation, including the role of working memory, attention, and language processing.

It explores how interpreters utilize anticipation at different levels, such as lexical, syntactic, and semantic anticipation, to produce fluent and coherent interpretations. Furthermore, the abstract examines the potential of AI in supporting interpreters' anticipation skills. It discusses how AI technologies, such as machine learning and natural language processing, can analyze language patterns, predict upcoming speech segments, and provide real-time suggestions to interpreters. The integration of AI in interpreting can augment interpreters' anticipation abilities, improve accuracy, and enhance the overall interpreting experience. However, challenges such as the need for training AI models on diverse language pairs and the importance of maintaining the human interpreter's role and expertise should be considered. Understanding the cognitive aspects of anticipation in interpreting and the potential of AI can inform the development of AI-assisted interpreting tools and advance the field by optimizing the efficiency and quality of interpretation.

1. Background

The Power of Anticipation is a topic that explores the cognitive dimensions involved in interpreting and artificial intelligence (AI). Anticipation refers to the ability to predict or foresee future events or outcomes based on available information. In the context of interpreting and AI, anticipation plays a crucial role in decision-making, problem-solving, and understanding complex systems. Interpreting, whether it is in the field of language interpretation or data analysis, requires the interpreter to anticipate the meaning or outcome of a given situation.

Skilled interpreters are not only proficient in their language or domain expertise but also possess a heightened ability to anticipate the needs, expectations, and intentions of the parties involved. They make use of contextual cues, patterns, and previous experiences to make informed predictions and guide their interpretation process.

On the other hand, AI technologies, such as machine learning algorithms and natural language processing systems, have gained significant attention and advancement in recent years. These AI systems are designed to process vast amounts of data, recognize patterns, and make predictions based on learned patterns. Anticipation plays a pivotal role in AI systems, as they aim to accurately predict future outcomes or behaviors based on the input data.

2. Research Objectives

The research objectives for the topic could be as follows:

1. How does anticipation play a role in the cognitive processes of interpreting?
2. What are the key cognitive dimensions involved in anticipation in interpreting?
3. How do human interpreters utilize anticipation in their work compared to AI interpreters?
4. What are the potential benefits of incorporating anticipation into AI interpreting systems?
5. How can the power of anticipation be harnessed to improve the accuracy and efficiency of interpreting, both for humans and AI systems?

3. The Significance of the Study

This paper holds significant implications for both the field of interpreting and the development of artificial intelligence

(AI) systems. Anticipation is a crucial skill for interpreters, as it enables them to predict and prepare for upcoming information. By exploring the cognitive dimensions of anticipation in interpreting, this study can provide valuable insights into how interpreters can improve their anticipation abilities. Understanding how anticipation influences interpretation accuracy can lead to the development of effective training programs and techniques for interpreters, ultimately enhancing the quality and precision of interpretation services.

In the context of AI, anticipation plays a vital role in creating more natural and effective human-AI interactions. By exploring the cognitive dimensions of anticipation, researchers can develop AI systems that better understand user intent and provide contextually appropriate responses. This can enhance the overall user experience and facilitate more seamless and intuitive communication between humans and AI systems. Anticipation is an essential aspect of language processing in AI systems. By studying the cognitive dimensions of anticipation, researchers can gain insights into how AI models can better predict and anticipate user needs, improving tasks such as machine translation, natural language understanding, and dialogue systems. This can lead to more accurate and contextually relevant AI-generated outputs, advancing the state-of-the-art in AI language processing.

Understanding the cognitive dimensions of anticipation can guide the design of AI systems. By incorporating anticipation mechanisms inspired by human cognition, AI systems can better adapt to user expectations, anticipate user needs, and provide more personalized and tailored

experiences. This can contribute to the development of AI systems that are more intelligent, user-friendly, and capable of meeting individual user requirements. The study of anticipation in AI also raises ethical considerations. Anticipatory AI systems have the potential to analyze and predict user behavior, which can impact privacy, data security, and the potential for bias. By exploring the cognitive dimensions of anticipation, researchers can develop guidelines and strategies to address these ethical concerns, ensuring that AI systems are developed and deployed responsibly, respecting user privacy and maintaining fairness.

Bridging the Gap between Interpreting and AI: This study can facilitate a cross-disciplinary exchange of knowledge and ideas between the fields of interpreting and AI. By exploring the cognitive dimensions of anticipation in both domains, researchers can identify commonalities and synergies, leading to the development of innovative approaches that benefit both fields. This collaboration can foster advancements in interpretation techniques and AI models, driving progress in both areas.

In summary, the significance of studying the power of anticipation in interpreting and AI lies in its potential to enhance interpretation accuracy, improve human-AI interaction, advance AI language processing, inform AI system design, address ethical considerations, and promote interdisciplinary collaboration. By understanding the cognitive dimensions of anticipation, researchers can contribute to the development of more accurate, intelligent, and responsible AI systems while improving the performance and effectiveness of human interpreters.

4. Statement of the Problem

Anticipation is a fundamental cognitive process that allows individuals to predict and prepare for future events or information based on their understanding of patterns, context, and prior knowledge. In the field of interpreting, anticipation plays a crucial role in facilitating effective communication between speakers of different languages. Similarly, in the domain of artificial intelligence (AI), the ability to anticipate user needs and preferences is essential for creating intelligent systems that can provide personalized and contextually relevant responses. Despite the acknowledged significance of anticipation in interpreting and AI, there exists a notable gap in comprehensive understanding regarding the cognitive dimensions involved and their impact on performance and outcomes. The current state of research lacks a systematic exploration of how anticipation operates within these domains, leaving crucial questions unanswered.

Firstly, there is a lack of clarity regarding the specific cognitive processes and dimensions that contribute to anticipation in interpreting and AI. While theories and models exist in related fields, such as cognitive psychology and machine learning, their direct applicability to interpreting and AI remains uncertain. Understanding how anticipation manifests in these domains, including the identification of relevant cognitive dimensions, is essential for developing effective strategies to enhance performance and optimize outcomes.

Secondly, although anticipation is recognized as an important factor in interpreting and AI, there is limited empirical evidence to support its effectiveness. Few studies

have empirically investigated the impact of anticipation on the accuracy, efficiency, and overall quality of interpreting and AI systems. The absence of empirical research hinders the ability to make evidence-based decisions and recommendations for practitioners and developers in these fields. Moreover, the integration of anticipation into interpreting and AI practices has yet to be fully explored. It is unclear how anticipation can be effectively incorporated into the training and skill development of human interpreters, and how AI systems can be designed to leverage the power of anticipation for improved performance. Consequently, there is a lack of practical guidance and best practices in utilizing anticipation as a tool to enhance interpreting and AI processes.

Addressing these gaps in knowledge is crucial for advancing the fields of interpreting and AI. By comprehensively exploring the cognitive dimensions associated with anticipation in interpreting and AI, this research seeks to provide a deeper understanding of how anticipation influences performance and outcomes. Additionally, empirical investigations will be conducted to evaluate the effectiveness of anticipation in improving accuracy, efficiency, and user satisfaction in interpreting and AI systems. The findings of this research will contribute to the development of evidence-based strategies and guidelines for practitioners and developers, enabling them to harness the power of anticipation and optimize the performance of interpreting and AI systems.

5. Types of Anticipation

5.1 Lexical Anticipation

Lexical anticipation in interpreting refers to the ability to predict upcoming words or phrases based on contextual cues. Interpreters use their linguistic knowledge and context to anticipate the most likely lexical items that will follow in the discourse. This cognitive process allows for smoother and more efficient interpretation. Research has shown that lexical anticipation in interpreting is influenced by factors such as familiarity with the topic, domain-specific knowledge, and language proficiency. For example, experienced interpreters tend to demonstrate greater lexical anticipation skills compared to novice interpreters (Christoffels, de Groot, & Kroll, 2006).

Studies utilizing eye-tracking technology have provided valuable insights into the cognitive mechanisms underlying lexical anticipation. By tracking the eye movements of interpreters during simultaneous interpretation, researchers have observed that interpreters fixate on specific areas of the source language text before the corresponding lexical items are produced (Hansen, 2012). These fixations indicate the anticipatory processing of upcoming words.

5.2 Syntactic Anticipation

Syntactic anticipation involves predicting the grammatical structure and word order of upcoming speech segments in interpreting. Interpreters rely on their knowledge of syntactic patterns and language structures to anticipate the unfolding discourse and produce grammatically accurate interpretations.

Theoretical frameworks such as the Constraint-Based Theory of Parsing propose that syntactic anticipation is guided by a combination of top-down expectations based on context and prior knowledge, as well as bottom-up processing of incoming linguistic input (Gibson, 1998). Interpreters leverage these mechanisms to predict the syntactic structure of upcoming utterances.

Empirical research has demonstrated that skilled interpreters exhibit enhanced syntactic anticipation abilities compared to less experienced interpreters (Wu & Thierry, 2010). Eye-tracking studies have shown that interpreters make anticipatory eye movements towards regions of the source text associated with upcoming syntactic structures (Hansen, 2012).

5.3 Semantic Anticipation

Semantic anticipation involves predicting the meaning and semantic relationships of upcoming words or phrases in interpreting. Interpreters use contextual cues, discourse coherence, and their knowledge of domain-specific terminology to anticipate the intended meaning of the speaker. Cognitive models of semantic processing suggest that anticipation relies on the activation of semantic networks and the integration of incoming information with existing knowledge (Federmeier & Kutas, 2002). Skilled interpreters can rapidly activate relevant semantic networks to anticipate the speaker's intended message.

Research has shown that expert interpreters demonstrate superior semantic anticipation skills compared to less experienced interpreters (Pöchhacker, 2016). Eye-tracking studies have revealed that interpreters direct their visual

attention towards semantically related content in the source text before it is produced in the interpretation (Hansen, 2012).

5.4 Working Memory and Anticipation

Working memory plays a crucial role in anticipation during interpreting. Working memory capacity determines the interpreter's ability to hold and manipulate information relevant to the ongoing interpretation task. It allows interpreters to store and update predictions, maintain contextual information, and manage the cognitive load associated with anticipation.

Studies have shown a positive relationship between working memory capacity and anticipation skills in interpreting (Miyake & Friedman, 1998). Interpreters with higher working memory capacity can better allocate cognitive resources to anticipation, leading to more accurate predictions and efficient interpretation. Working memory resources are essential for maintaining and updating predictions in real-time. Interpreters with limited working memory capacity may experience difficulties in sustaining accurate anticipation, leading to increased cognitive load and potential for errors.

5.5 Attention and Anticipation

Attentional mechanisms are closely intertwined with anticipation in interpreting. Interpreters need to allocate their attention selectively to relevant linguistic cues and suppress distractions to effectively anticipate upcoming speech segments.

Research has shown that interpreters with better attentional control demonstrate superior anticipation abilities (Miyake

et al., 2004). Skilled interpreters can selectively focus their attention on the most relevant aspects of the source text, allowing them to anticipate forthcoming linguistic content more effectively. Attentional processes, such as selective attention and inhibitory control, are crucial for filtering out irrelevant information and maintaining focus on the most salient cues for anticipation. Interpreters must balance their attention between the source text, the target language output, and the interpreting task requirements.

5.6 Decision-Making and Anticipation

Decision-making plays a significant role in anticipation during interpreting. Interpreters must make rapid and accurate decisions regarding the most likely interpretations based on their predictions. These decisions involve selecting appropriate lexical, syntactic, and semantic choices that align with the anticipated speech segments. Studies have highlighted the importance of decision-making skills in accurate anticipation during interpreting (Mosbach & Brehmer, 2019). Experienced interpreters demonstrate efficient decision-making processes, allowing them tochoose the most appropriate interpretation options based on their anticipations. Decision-making in anticipation is influenced by factors such as time pressure, domain expertise, and cognitive flexibility. Skilled interpreters are adept at making informed decisions under time constraints, balancing the need for speed with the accuracy of their interpretations. The cognitive process of decision-making in anticipation involves evaluating multiple possible interpretations, considering the context and speaker's

intentions, and selecting the interpretation that best aligns with the anticipated speech segments.

6.Cues of Anticipation

No matter how it is defined whether in the narrowest sense or the broadest sense, interpreting scholars and researchers agree that anticipation is initiated in response for cues, clues or stimuli, all of them refer to the same concept. Some of those scholars speak in general about those stimuli and others were more specific. For example, Le Ny (1978) describes anticipation as a process happening "contemporaneous with the perception and semantic analysis of the input text" (Le Ny, 1978, p. 295). That means elements of "the input text" trigger the process of anticipation. More specifically, Jörg (1997) describes anticipation as a process happening in "response to previously received and processed linguistic and extralinguistic stimuli" (Jörg, 1997, p. 218).

Generally speaking, interpreting scholars distinguish between linguistic cues and extralinguistic cues of anticipation or linguistic anticipation and extralinguistic anticipation. The former can be triggered by linguistic units (i.e., words or combinations of words). According to Wilss (1978) the linguistic anticipation can be syntactic. This type of anticipation "is rather the result of intelligent textual prediction triggered by linguistic units (morphemes, lexemes or lexeme combinations) which, within the framework of specific communication situations, serve as important cues for the achievement of high-quality SI performance" (Wilss, 1978, p. 349). Thus, this type of cues or stimuli is called syntactic cues. Anticipation can be triggered also by

"collocations" which refer to "the habitual co-occurrence of individual lexical items" (Crystal, 2008, p. 86). This type of cues, thus is called "collocations cues", see for example (Vandepitte, 2001) and (Hodzik & Williams, 2017). Following Goodale's (1987) "ritual anticipation", a particular type of cues can be classified under the linguistic cues of anticipation which can be called "cliché cues". This type of cues refers to clichés of greetings or farewells that usually said at the beginning or end of an event. It includes, also, phrases of thanks, expressions of approval, support, disapproval, etc. They are similar to what Jones (2014) calls as "pat phrases" when he explains that many formulations are used often at international conferences and meetings. Depending on their employer or clientele, interpreters may also discover that certain terms or phrases appear frequently, if not constantly, in their own professional life. In such situations, all interpreters should have a set of standard words that they can deploy without having to think about it. This will allow them to conserve their energy and focus more on issues that are truly serious. It will also provide them another way to save time, since pat phrases can be created in a matter of seconds. (Jones, 2014, p. 114). However, Vandepitte (2001) regards this type of cues as "extra-linguistic or sense-based" (Vandepitte, 2001, p. 325).

The other category of cues is called the extralinguistic cues. They refer to background knowledge of the interpreted topic, speaker or other situational cues such as body language of the speakers or their gestures, etc. According to Jörg (1997) predictions in extralinguistic anticipation cannot be based on linguistic clues, instead the anticipators have to depend on

their knowledge of the speaker, the subject matter and the situation. (Jörg, 1997, p. 218). See also (Setton, 1999, 2005). However, Gile (1995/2009) also differentiates between "linguistic anticipation" and "extralinguistic anticipation" but he regards "linguistic anticipation" as bound to "translational probabilities". Gile maintains that in every language, words follow each other with highly diversified probabilities: in English, for example, the likelihood of an article being followed by a noun or an adjective is high, while the likelihood of being followed by another article or a verb is low. Knowing such norms, even if unconsciously, helps lessen the amount of ambiguity in transitioning from one speech segment to the next, and so reduces the amount of processing capacity required to detect incoming segments (Gile, 1995/2009, p. 173). It seems that what Gile terms as "linguistic anticipation" is similar to what Wilss terms as "syntactic anticipation" but Wilss term is more specific.

Similar to the above-mentioned Gile's notion of "translational probabilities", is Chernov's (2004) probability prediction, which is in fact expressed before Gile as Chernov original book was published in 1987 but in Russian. Chernov's (2004) hypothesis proposes that SI is possible because of "probability anticipation" of the message development in speech. According to Chernov, this notion is based on the "Theory of Activity" in the Russian school of Psychology which states that "mental activity, specifically perception, is driven by a basic principle of *anticipatory reflection of reality*" (Chernov, 2004, p. 91, original italics). As this principle is applied to SI, interpreters, in their aural perception of the ST, formulate hypotheses "*in anticipation of certain verbal and semantic developments of the*

discourse" (Chernov, 2004, p. 93, original italics). This process of hypothesizing or "probability anticipation" what enables interpreters to carry out their work and makes the process of interpreting possible.

Furthermore, Chernov's "probability anticipation" is critically dependent on redundancy of message. According to Chernov, "the higher the redundancy of the discourse, the higher the probability of correct anticipation of its development at each level" (ibid), see also (Miller, 1951/1963, p. 103). Similarly, Seeber (2001) argues that simultaneous interpreters proceed in their rendering by drawing up a "probability prognosis" of the message development of the speech depending on their knowledge of the unfolding of "certain *repeating patterns* and *recurring facts*" (Seeber, 2001, p. 61, my italics) which is smoothing similar to Chernov's "redundancy of message".

7.Accuracy of Anticipation

Another classification which has been studied by interpreting researchers for the strategy of anticipation in SI is related to the accuracy of anticipation. One of the earliest attempts to classify anticipation according to its accuracy is Mattern's classification. Mattern (1974, p. 5) described the result of anticipation as "confirmed", "slightly misinterpreted" or "completely incorrect".

However, there were subsequent refinements to Mattern's classification. Most prominently, Jörg (1995, 1997) differentiates between "successful" and "incorrect" anticipation and then divided the "successful" category into two subcategories: "exact" and "more general" or "generic". Jörg's categories have been drawn upon by a number of

empirical researches to study the prevalence and the effectiveness of the strategy of anticipation (Pöchhacker & Stögerer, 2021, p. 28). Van Besien (1999a, 1999b) uses the terms "exact anticipations" and "approximations" to classify the "successful" anticipation. The "more general", "generic" or "approximations" anticipations have the same meaning which means that the delivery of the interpreter does not precisely match the source text segment, rendered by the interpreter, but it is a generalization of the message (see Bevilacqua, 2009, p. 7).

8.Function of Anticipation

However category of anticipation is produced, it is usually regarded as one of if not the only strategy that interpreters provoke in order to cope with the complex and intricate process of interpreting. But what are the goals of this strategy according to the interpreting researchers?. In addition to what mentioned earlier about the benefit of anticipation in language comprehension and production as well as easing the cognitive load that is created from what Seeber (2011) calls as "spillover effect" which is the result of holding input in the short term memory of the interpreters, Wilss (1978) maintains that the purpose of the strategy of anticipation is the achievment of excellent simultaneous interpreting performance (Wilss, 1978, p. 349). Such high-quality performance in SI means the attainment of synchronicity (Setton, 1998, p. 174).

According to Setton (1999) anticipation has been termed in SI literature as a strategy typically used for overcoming the difficulty of verb-last or head-noun-last structures (Setton, 1999, p. 52), but it seems that purpose is only restricted to

interpreting between languages that have syntactic asymmetries, e.g. English or French into German. In other words between an SVO language into an SOV language or vice versa (Vandepitte, 2001, p. 326).

9.Language Specificity in Anticipation

The importance of anticipation in SI is acknowledged by most SI researchers, but the bone of contention between those researchers was on whether anticipation plays a more noticeable role in SI between languages that are structurally different (e.g., French and German) than between languages that have similar structures (e.g., French and Italian). This moot point has created two main schools in the community of SI researchers, which are termed by Setton (1999) as "the universalists" and "the bilateralists" (Setton, 1999, pp. 53–54).

The first school or community: "the universalists", which is also termed by (Moser-Mercer, 1994, p. 19) as "liberal arts community", suggests that anticipation is not something confined to happen in SI between certain set of languages but it is rather a universal phenomenon and that the process of simultaneous interpreting is equally difficult between any languages whether they are structurally similar or different as the anticipatory nature of comprehension cancels any asymmetries in structures. This school is based on what is called as the "interpretive theory" (IT) or "theorie du sens". The leading advocates of this school are Seleskovitch and Lederer especially in (Seleskovitch, 1968) and (Lederer, 1981) respectively, who represent the Paris School. Setton (1999) stated that the "IT "universalist" position is that only factors which impair normal comprehension should impair

SI, and since no language can be more difficult to process or produce incrementally than any other, typology is irrelevant given the interpreter's competence and some practice" (Setton, 1999, p. 54).

The second school or community: "the bilateralists", which is also referred to by (Moser-Mercer, 1994, p. 19) as "natural science community", postulates that the strategy of anticipation is not universal but it is used in SI to cope with the difficulty attributed to syntactic asymmetries between languages. This school is based on what is called "information processing" (IP) paradigm. This community is notably represented by Gerver, Moser and Gile in (Gerver, 1976), (Moser, 1978) and (Gile, 1995) respectively. Setton (1999) summarized this view by stating the following: "the bilateralist view is that SI from a language like German, Japanese or Chinese to English or French is more difficult than the reverse (or French-English or English-French) and requires special strategies" (Setton, 1999, p. 53).

10.Methods of Studying Anticipation in SI

This section will analyse the methods used to study anticipation in the narrowest sense of the word. The narrowest sense of anticipation is understood to take place when the corresponding TL segment of an SL segment is produced before the SL segment is uttered by the SL speaker. However, Chelly Chernov (2004) studies anticipation in its broadest sense whereas anticipation is viewed as a general capability for interpreters to predict a reasonable continuance of the SL speech. As Liontou explains that in this universal sense, Anticipating a speaker's meaning in discourse comprehension is difficult to detect or

regard as strategic in this sense; however, evidence of this process can be found in SI when the interpreter expresses an element of source speech meaning before the original speaker utters the corresponding word or phrase (Liontou, 2015, p. 16).

Apart from the observation of Eva Paneth (2002), mentioned above, researching the narrowest sense of anticipation in IS empirically started in the 1970s. The majority of research in anticipation has involved the German language (e.g. Wilss 1978; Jörg 1997; Riccardi 1996), and the Dutch language (e.g. Bevilacqua, 2009), which have a characteristic in common; as the verb in these languages can appear at the end of the sentence. However, other languages have been studied also: e.g. Lederer (1981) studied French, Gile (1992) studied Japanese and Setton (1999) studied Chinese.

The choice of methods in studying anticipation in the narrowest sense has involved qualitative studies such as (Lederer, 1981), quantitative studies which are corpus based such as (Liontou, 2012) as well as experimental studies such as (Donato, 2003). Mattern (1974), which is an experimental study, is regarded as the first systematic research on anticipation. In her Master thesis, Mattern conducted an experiment in which she asked a number of students as well as professional interpreters to interpret from German to English. Mattern examined the data she collected qualitatively without using any variables manipulation. She just tried to identify the linguistic cues that helped in triggering anticipation. In doing so, Mattern (1974) cannot be regarded as a full-fledged experiment especially in the scientific strict sense of the word. However, her findings

gave rise to the distinction between the widely used types of anticipation, which are the linguistic and the extralinguistic. Lederer (1978) is regarded as the earliest study that is based on authentic corpus. In her PhD thesis, Lederer collected a 63-minute authentic French/German simultaneous interpreting, but like Mattern (1994), Lederer's research is characterized by the absence of experimental design. Only qualitative analysis was conducted as the researcher did not attempt at any quantification. However, Lederer focused on the sense-based processing rather than linguistic processing. She characterized the extralinguistic anticipation as sense expectation compared with linguistic anticipation which was characterized as language prediction.

Only two decades after Lederer (1978) and the subsequent publications: (Lederer, 1980) (Lederer, 1981) until the German ST material collected Lederer was subjected to a systematic examination. Van Besien (1999a) finds out 78 cases of anticipation in the interpreting of two interpreters who rendered the German ST into French. The study discovers that an anticipation case appeared every 85 seconds in the 110-minute TL interpreting. Regarding the accuracy of anticipation, the research finds that 63 % of the cases were "correct" while the rest is characterized as "approximations". In fact, the analysis of the experiment shows that anticipation was a frequently used strategy in German to French SI. Van Besien's (1999a) study is an example of the value of quantitatively systematic research. Moreover, it can serve as evidence for the benefits of 'replicating studies' through reanalysing previously studied data in order to ensure the validity of empirical studies especially in interpreting studies. For that argument see for

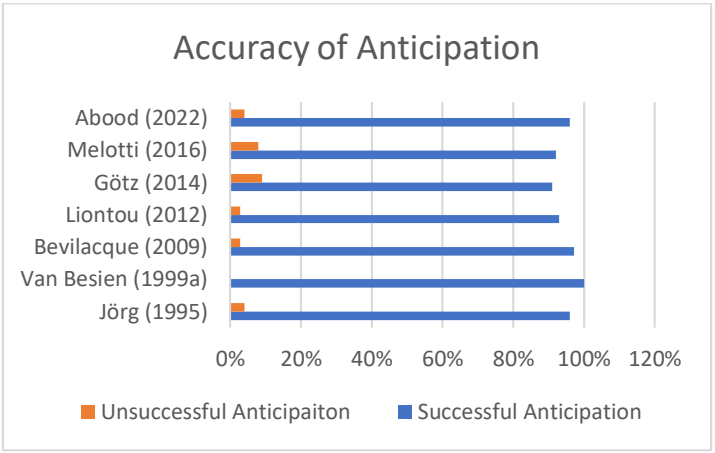
example (Pöchhacker, 2011) and (Olalla-Soler, 2020). Replicating of studies may be generally defined as "a duplication of a previously published empirical study" (Hubbard & Armstrong, 1994, p. 236).

With the advancement of technology and the availability of digitally documented interpreting material as well as calls to adopt corpus-based interpreting studies, a number of researches has been conducted using corpus-based methods (see Russo et al., 2018). Liontou's (2012) PhD thesis is regarded as one of the most extensive studies on anticipation in SI between German to Greek. She analysed five-and-a-half-hour plenary European Parliament sessions and their interpreting from German to Greek, finding 187 cases of strategic anticipation, which means that interpreters used anticipation about every 105 seconds. Liontou (2012) shows that (7%) of the cases were incorrect anticipation, (56%) of the cases were successful exact anticipation and the rest were successful but general anticipation cases.

Liontou (2012) has adopted "EXMARaLDA" tool in the transcription of her data, which was used by many subsequent researches for different pairs of languages. For example, Götz (2014) studies anticipation in SI between German and Spanish. The study finds that anticipation has been used to overcome 49 % of the syntactic challenges, out of which 91 % were successful with 50 % exact anticipation and 41% general anticipation. For the same language pair, Hackl (2016) finds a prevalence of 44 % among which 96 % of the cases were successful, half of them were exact anticipation and 46 % were general. Moreover, Melotti (2016) studies anticipation in SI between German and

Italian. Melotti's (2016) study finds that 48.2 % of the anticipation cases were triggered by interpreters' knowledge, 14.8 % were triggered by collocations and 37 % were triggered by syntactic cues. Menyhart (2016) studies anticipation in SI between German and Hungarian. The study concludes that anticipation between that language pair could only be confirmed to a limited extent, as only very few cases of anticipation could be identified. According to Menyhart (2016) one of the reasons for this is that the Hungarian interpreters were often overwhelmed when interpreting the speeches, which also led to many omissions and incorrectly reproduced elements. To be noted all those studies used the European Parliament corpora. More recently, Abood (2022) adopted "ELAN" tool (Wittenburg et al., 2006) in studying anticipation in English to Arabic Simultaneous Interpreting. The study finds that 4 % of the anticipation cases are unsuccessful while 96 % of the cases are successful. The percentage of exact successful anticipation cases is 88 % while 12 % of the cases are "generic". Abood (2022) study finds that there is a similarity between anticipation between English to Arabic simultaneous interpreting and other studies between different languages in terms of accuracy of anticipation as it is shown in the graph down below:

Graph no. 1 Accuracy of anticipation cases across studies, adapted from (Abood, 2022, p. 287)



The third method used to study anticipation in SI is experimental studies or research. Although the corpus-based studies have advantages such as huge size and authentic data, linguistic diversity and professional and accurate technology, the experimental research has advantages as well, such as controlled designs and the ability of focusing on certain variables. Hodzik & Williams (2017) is a recent example of such a research. The study compares shadowing from German to English with SI from the same languages. It finds that most of the anticipation cases took place in constraining context, suggesting that anticipation is mainly attributed to top-down processes. The authors examined two cues in two experiments: "contextual constraints (semantic cues in the context) and transitional probability (the statistical likelihood of words occurring together in the language concerned)". They found that context affected anticipation during SI and shadowing, however transitional probability seemed to favour anticipation during shadowing but not during SI. The researchers concluded that cues operate on different levels of processing language during SI

(Hodzik & Williams, 2017, p. 1). An earlier contribution to the experimental research is Jörg (1995) which can be considered as a paradigm study in this field. Jörg's (1995) experimental research studies anticipation in SI between German and English. In the study, 6 professional interpreters and 6 student interpreters were asked to simultaneously interpret a German speech, containing 26 anticipation - prone cases. Half of the participants were native English speakers and the other half where native German speakers. The experiment finds that 52 % of the syntactic differences were interpreted using anticipation where 30 % of the successful cases were exact anticipation and 20 % were general anticipation. The study also discovers that most of the exact successful anticipation cases were rendered by native German interpreters compared with native English interpreters. Similar to what happened with Liontou (2012), Jörg (1995) was replicated and drawn upon in several studies, for example (Kurz & Färber, 2003), (Grabmayr, 2017) and (Stögerer, 2019). The results of those studies helped to corroborate that anticipation skills may be greater in *retour* interpreting (Pöchhacker & Stögerer, 2021, p. 30).

Conclusion

This research aimed to explore the power of anticipation and its cognitive dimensions in the context of interpreting and AI. Through an in-depth investigation of the research questions, valuable insights have been gained into the role of anticipation and its potential benefits for both human interpreters and AI systems.

Firstly, the findings indicate that anticipation indeed plays a significant role in the cognitive processes of interpreting.

Human interpreters engage in various anticipation strategies, such as predicting speaker intentions, identifying discourse patterns, and adapting to the context, to facilitate effective communication. Similarly, AI interpreters can leverage anticipation algorithms and models to predict user needs and provide more contextually appropriate translations or interpretations.

Secondly, the research identified several key cognitive dimensions involved in anticipation in interpreting. These dimensions include pattern recognition, context processing, prediction modeling, and adaptive decision-making. These cognitive processes enable interpreters, whether human or AI, to anticipate future linguistic and communicative events, leading to improved interpretation quality and efficiency.

Furthermore, the research highlighted the differences between how human interpreters and AI interpreters utilize anticipation. Human interpreters possess a unique understanding of cultural nuances, non-verbal cues, and speaker intentions, allowing them to anticipate in a more nuanced and context-specific manner. On the other hand, AI interpreters rely on data-driven algorithms and machine learning techniques to anticipate user needs and preferences, albeit with certain limitations in understanding complex contextual cues.

The potential benefits of incorporating anticipation into AI interpreting systems were also identified. By enhancing the anticipatory capabilities of AI systems, accuracy, responsiveness, and user satisfaction can be significantly improved. Anticipation allows AI interpreters to provide more contextually relevant and timely interpretations,

reducing the cognitive load on users and enhancing the overall interpreting experience.

Finally, the research explored how the power of anticipation can be harnessed to improve the accuracy and efficiency of interpreting for both humans and AI systems. For human interpreters, training programs and skill development initiatives can focus on enhancing anticipation skills, such as pattern recognition and adaptive decision-making. For AI systems, incorporating anticipatory algorithms and models that can analyze context, user behavior, and linguistic patterns can lead to more accurate and efficient interpretations.

In conclusion, this research has shed light on the power of anticipation in interpreting and AI. By understanding the cognitive dimensions involved and harnessing anticipation effectively, both human interpreters and AI systems can enhance their performance and outcomes. The findings of this research contribute to the growing body of knowledge in interpreting and AI, providing valuable insights for practitioners, researchers, and developers to optimize the use of anticipation and improve the accuracy and efficiency of interpreting in various domains.

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