

Cognitive and Neurolinguistic Aspects of Interpreting

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Abstract: *Over the past decade, a large and growing body of literature has explored the cognitive and neural foundations of interpreting processes. The article explores the relevance of cognitive and neurolinguistic approaches to the process of both simultaneous and consecutive interpreting.*

The main objective is to reveal the interpreter's status, his/her mental and linguistic operations as cognitive units in the approaches under review. Firstly, we discuss how both interpreting modes have been understood and defined by various researchers. Secondly, we present the overview of diverse research works on cognitive and neurolinguistic scientific approaches to interpretation, trying to understand and explain the operating of interpreters' minds. Finally, we focus on the issues of bilingualism and its impact on language comprehension and its production.

It has been revealed that interpreting contributes significantly to improving cognitive and neural functions of the brain. Interpreters have always been a key figure in facilitating and bridging communication across cultures and languages. They can input, retain, retrieve, and output data but are limited in processing capacity at any given time. Quite recently, scholars in both interpreting and neurolinguistics have attempted to provide insight into the organization of bilingual speakers' minds. In interpreting and translation tasks, it has been complemented by research works into language control in a bilingual language mode, with both language systems being simultaneously activated.

Taken together, the cognitive and neurolinguistic studies reviewed in the paper support strong recommendations to regard an interpreter as a conceptual mediator relying on both his/her decision-making and probability thinking mechanisms.

Keywords: *interpreting; cognition; simultaneous and consecutive interpreting; mental and linguistic operations; bilingualism; language comprehension and production.*

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Introduction

Interpreting, as an extreme form of bilingualism (Babcock, 2015; Chmiel, 2021) and as a special type of linguistic activity, is of interdisciplinary character, having intricate connections with other fields of linguistics. Such an increasingly interdisciplinary perspective on its study opens new promising opportunities for scholars in the field.

From a psycholinguistic point of view, interpreting is recognized as being a linguocultural phenomenon and psychic and cognitive activity (Demetska, 2019, p. 71). Consistent with this view, interpreters usually face many challenges, acting not as merely receivers of the message but being rather actively involved in appropriating it and reformulating it (Krémer & Quijano, 2018, p. 80). Furthermore, they are regarded as tools that provide interdisciplinary communication (Erton, 2020, p. 1914). Notwithstanding the crucial role of an interpreter in the process of thought transmitting from input language into the output, there is a sizeable body of research findings on what one might call the phenomenon of interpreting as such.

The past two decades have produced a wealth of studies linked up with the diversity of conceptual approaches. The latter contribute much to our current understanding of how the brain subserves both bilingual interaction and interpreting processes. First, social and relational aspects are concerned with the cross-cultural dimension of mediated communication (Pochhacker, 2004; Zasiëkin, 2018). Relevance theory is a cognitive approach of communication, integrating both linguistic and pragmatic insights and providing definite conceptual tools and techniques proven appropriate in understanding the interpreting processes from inside.

Related to conceptual knowledge and its organization in the brain, the second commonly studied area of interpretation is cognitive. Several studies have found that conceptual knowledge is organized as a network of mutually interconnected nodes, the activation of which represents the retrieval of information (Gillies, 2019; Guo, 2016; Ning et al., 2020; Rojo Lopez, 2015). Language is a key element in transferring information, a specific mental entity that is prone to constant development. Cognitive processes taking place in the mind are undoubtedly very significant in language control as a mental capacity. Finally, a few studies have examined the interpreting process from a neuroscience perspective concerned with the issue of what brain areas and neural networks are implicated in complex cognitive processes (Lin et al., 2018; Nerubasska et al., 2020; Nerubasska & Maksymchuk, 2020; Onishchuk et al., 2020; Pisa, et al., 2021; Setton & Dawrant, 2016).

Notwithstanding diverse approaches used by the scholars, their research is designed to contribute primarily to our understanding of the phenomenon of interpreting. Firstly, the relevance of the research is conditioned by the scholars' growing interest in determining the role of lingual, cognitive, and neural operations in the process of simultaneous and consecutive interpreting. Secondly, debate continues about the status of the interpreter. Thirdly, the neurobiological basis of interpreting as a form of bilingualism is poorly understood.

This paper *aims* to remedy these problems by analyzing the literature on interpreting conceptions available in the field of neurolinguistics, cognitive linguistics, and interpreting studies. Having gained some inspiration from previous studies on cognitive and neurolinguistic aspects of interpretation, we decided to incorporate some theoretical findings of relevant researchers into the paper.

There are several important areas where this study contributes. Examination of the literature emphasizing such relevant issues provides perspectives that strengthen the existing knowledge of neurolinguistic and other characteristics of the interpreting process. Second, the literature on translation offers new significant views on the nature of language transfer and communication characteristics between speakers of different languages.

Interpreting and its cognitive root

Language can influence cognition in a lot of different ways. The latter lies behind language, going far beyond it, and can be referred to as cognitive backstage (Eftekhari, 2019, p. 1) rather than a scientific notation.

Cognitive problems arising in interpreting process are for the most part conditioned by certain socio-cultural and historical experience shared by representatives of the target language culture. This wealth of experience is manifested in various forms: mental and emotional images, socio-cultural stereotypes and norms, discursive communication strategies, etc. In this respect, translation and interpreting, in particular, appear to be the primary aspects of cross-cultural communication.

Cognitive abilities play a crucial role in these processes since humans are “cognitive niche builders, extending the mind into space to think more efficiently” (Queiroz & Atã, 2019, p. 20). Furthermore, they can extend cognition through nonbiological devices, merging our cognitive activities with the operation of cognitive artifacts and creating an external and distributed cognitive system (Queiroz & Atã, 2019, p. 19). In the individual's mind, social environment, everyday and spiritual life of community, and

standards of human conduct are reflected in certain cognitive structures, realized in linguistic forms. El-Zawawy (2019, p. 50) holds the view that the integration of the semantic, syntactic, and pragmatic (and cultural) aspects does not operate in the void but is geared towards exploring the cognitive demands and processes of interpreting.

In 2016, Setton and Dawrant pointed to three basic steps of the interpreting process: understanding, speaking, and mediating (p. 159). While acting as a mediator, an interpreter can face some barriers, which prevent efficient communication and information transfer. The scholars claim that linguistic barriers occur while using the concepts of deverbilization and transcoding and exploring the traps of language transfer, especially interference. Cognitive barriers can be easily overcome if the interpreter projects the cognitive environment of the parties to the exchange. The interpreter's role in the process is undeniably profound as he/she should instill the ethos of impartiality and step into the speaker's shoes. The evidence from the studies suggests that only by employing the linguistic analysis and entailing extralingual factors in the message production can the interpreter realize the potential communicative intent of the source language speaker in the target text.

Recent developments in the field of cognitive sciences have paved “the way for a better understanding of critical and creative thinking, problem solving, strategy developing, perceiving, learning and memory processing” (Erton, 2020, pp. 1912-1913) and led to a renewed interest in the issues of the interpreter’s role in the process of interpreting. One major theoretical issue that has dominated the field for many years concerns how interpreters function in their role. Regarding both modes of interpreting, the interpreter is believed to be a bilingual communicator who facilitates the transmission of the verbal message. Consistent with this view, throughout this paper, we suggest that interpreting is not just a cognitive process requiring constructing output in the target language based on input provided by the source-language speaker but a communicative act mediated by an interpreter.

It turns out that performance problems and communicative ‘breakdowns’ may arise not only in simultaneous but in consecutive mode. The former is a “highly complex verbal task” (Lin et al., 2018, p. 1), requiring various actions to be completed simultaneously with definite intellectual capacities. It presents a unique type of multitasking, encompassing speech comprehension and production, a switch of attention, self-correction, and many other concurrent activities. There is an unambiguous relationship between both modes of interpreting as they presuppose multitasking. However, consecutive interpreting is distinguished

from simultaneous from the perspective of cognitive science in that a time lag separates speech comprehension and its production.

Interpreting studies conducted so far are mainly product-oriented. Overall, they highlight the need for focusing on the product without an in-depth analysis of the interpreting process. The issue has grown in importance in light of recent works on cognitive processing in translation and interpreting. A longitudinal study of simultaneous interpreting by Chernov (2004) arouses fierce controversy in this area of concern. A reasonable approach to tackle this issue could be to penetrate deeply into the interpreting process, disclosing its essential phases, components, and interpreter's capacities.

Although differences of opinion still exist, there appears to be some agreement that interpreting refers to a cognitively demanding activity entailing both memory and production efforts (Liang et al., 2019; Russel & Takeda, 2015; Seeber, 2015). Multitasking is usually understood as an ability or skill necessary to accomplish definite complex tasks at once.

The evidence consistent with this hypothesis can be clearly seen in the Gile's groundbreaking work of 1995. He puts forward the *Effort Model of interpreting*, outlining the activities that interpreters must make (*efforts*). More broadly, the model is centered on the notion of processing capacity, requirements, and limitations. As noted by the scholar (Gile, 1995, p. 161), the use of 'mental energy' is only available in limited supply. It takes up almost all of it. The efforts an interpreter is challenged with are the following (Figure 1).

Figure 1 is a refined and yet confined state of the interpreting process in the cognitive perspective. The arrows indicate the links between the phases, revealing an unambiguous relationship between the phases of interpreting since each implies an effort. The interpreter's role in this process is undoubtedly profound, as he/she should therefore be able to find a balance among them in terms of energy and avoid cognitive 'overload'.

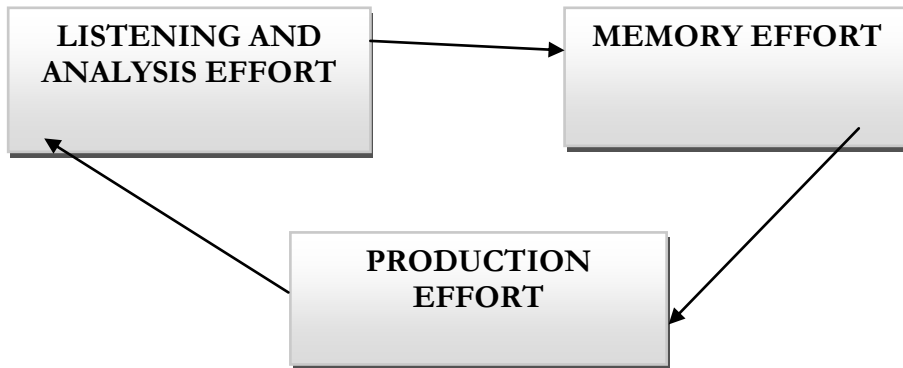


Figure 1. *Daniel Gile's Effort Model for Interpreting (1995)*

Each phase in the sequence involves definite operations undertaken while interpreting, complex thought processes, and impressive cognitive abilities. The Listening and Analysis Effort starts with the identification of the sound form of the source language message and involves the final decision as to the content of the output. Effort The Memory Effort is viewed as a specific mechanism for storing and retrieving information before its further processing. The Production Effort stands for the output phase of interpretation and has distinctive features depending on the mode of interpreting. In simultaneous interpreting, it ranges from the operations connected with the mental representation of the source message to its active reproduction in the target language. In consecutive mode, there are two types of production distinguished by different characteristics in each phase. Phase 1 presupposes listening and analysis, production of notes, short-term memory operations, and coordination of these tasks, whereas during phase 2 an interpreter is engaged in note-reading, remembering, and production. In this regard, coordination skills are of primary importance for people with interpreting experience and expertise since interpreting is “highly complex and requires the performance and coordination of multiple, simultaneous tasks” (Strobach et al., 2015, pp. 1-2). According to Gile (1995), while rendering the speech into the target language, the interpreter will have to coordinate and distribute his/her mental resources between the interpretation components to achieve the intended purpose. Concisely, Gile’s coordination component can be regarded as similar in function to the language control mechanism.

Many scholars believe that memory as a particular cognitive function in complex mental and linguistic activity is activated in consecutive interpreting. Its role in interpreting should not be underestimated. The last decade has witnessed enormous growth in typologies of memory put forward by cognitive scientists. However, a great deal of work remains to be done in determining what those types are and how they are engaged in the interpreting process.

Setton and Dawrant (2016) have attempted to draw fine distinctions between immediate, short-term, and long-term memory. The function of the immediate (echoic) memory lies in retaining sounds or images for just a few seconds without mental processing of the information. Short-term memory or 'working memory' refers to "the active core of our mental activity, a busy workshop of flexible but limited capacity in which we process what we are currently seeing, hearing, and experiencing against our existing knowledge, assumptions and past experiences" (Setton & Dawrant, 2016, p. 206). A well-trained interpreter's memory can retain considerable volumes of information, retrieving it while deciphering the message in the target language. The researchers maintain that long-term memory may last from a few minutes to several decades. It is further subdivided into semantic (retaining explicit knowledge organized in schemas), procedural (capturing unconscious sequences and procedures) and episodic (memory for life experiences, events, and situations). Thus far, the studies presented evidence that an interpreter decodes a message and renders it by integrating the communicative acts and cognitive entities, drawing on various memories.

Taking notes at a short "ear-pen span" (Chen, 2017, p. 11) in the form of shorthand signs and symbols representing ideas is also an important goal of consecutive interpretation. Notes taken in consecutive interpreting are "a representation of the skeleton structure of the speech" (Gillies, 2017, p. 9). To all those identifying, retrieving, and analyzing the primary parts of the sentence, the understanding of logical links between them has become indispensable for interpreters. As Gillies points out: "once you've recognized, noted and split the ideas on the page, you will see that although they give you the most important information from the speech, without information about the relationship between the ideas, the ideas don't make enough sense alone" (Gillies, 2019, p. 103). Thus, these links are meaningful associations between entities and concepts expressed in verbal form. Their variety and properties play a significant role in human comprehension and reasoning.

From a cognitive psychological perspective, interpreting is a systematic information processing that requires cognitive resources and

mappings, undergoing accurate mental processing. What is not yet clear is the impact of systemic thinking on speech deciphering. Preliminary work on this issue was undertaken by Rebrii and Rebrii (2018). The scholars draw our attention to the point that systemic thinking lets an interpreter go beyond what seems to be isolated and independent experiences and reveal the structures lying in the core (Rebrii & Rebrii, 2018, p. 183). Furthermore, organizing the message information into the concurrent chunks does play a significant role in the hearer's perception of speech since it "reflects the speaker's sensitivity to the hearer's state of knowledge in the process of communication" (Baker, 2018, p. 160). Thus, the accurate delivery of the original message is directly related to the interpreter's cognitive ability and degree of comprehension. Furthermore, the encyclopedic and specific knowledge they have acquired in advance contributes to conveying the rich subtlety of mental models that both individuals and cultures bring to bear on the communication process.

To better understand the mechanisms of the interpreting process and its outcome, the scholars attempted to analyze it as an artistically creative process (Eftekhari, 2019, p. 1; Rebrii, & Rebrii, 2018, p. 182; Zasiakin, 2018, p. 72). One of the pivotal for interpretation studies revolves around the interpreter's questions anticipation and intuition (Gile, 1995; Hubscher-Davidson, 2015; Palova & Kiktova, 2019; Setton & Dawrant, 2016). The role of these strategies is significant.

Cognitive anticipatory activities are an inseparable part of the reception process. They involve word prediction, probabilities related to phonological, grammatical, stylistic rules, and sense expectations. Depending on differences concerned with the production of anticipation, different types of anticipation have been distinguished. Gile (1995) classified anticipation into two broad types: 1) linguistic, based on the prediction of source discourse from knowledge of collocations, function words, connectives; 2) extralingual, based on external knowledge, varying according to situational and personal factors (Gile, 1995, pp. 176-178). These two types of anticipation activate drastically different operations in the human mind. Regardless of any anticipation type, it is usually seen as the strategy an interpreter can deploy in the complex interpreting process before his/her mental generation of assumptions that the speaker has not yet actualized.

Interpreting takes its root in psycho-cultural interaction, being a biological entity geared by cognition. Undoubtedly, cognitive processes and operations are indispensable elements of both interpreting modes. As an artful and highly demanding communicative act, the latter requires proficient linguistic competence, tremendous effort, mental power, effective listening

and memory skills, and anticipatory strategies. Improper activation of these elements results in the disruption of communication flow, distortion of the original message, and language barriers in bilingual or multilingual environments. More information on bilingualism would help us establish a greater degree of accuracy on this matter since “without evidence from bilinguals we could only ever have (less than) half of the story” (Pisa et al., 2021, p. 1). Furthermore, it can shed light on bilingualism and cognitive ability issues, linguistic competence in bilingual settings.

Interpreting as a specific case of bilingual activity

A striking feature of contemporary translation and interpreting theory is that one of the significant types of verbal communication is the information exchange between speakers of different languages. Thus, bilingualism is becoming a necessary interpreting skill in the modern globalized world, where international and cultural contacts are strengthening. The term has broad semantics and is generally understood to mean using two languages in the communication process or information transfer. However, this definition is centered mainly on linguistic competence, overlooking relevant cognitive, socio-cultural, and neurobiological factors engaged in bilinguals' performance.

Bilingual competence is a significant aspect of the interpreting process and is heavily involved in producing output in the target language from the input in the source language. Interlingual and cross-cultural communication cannot be effectively realized without a mediator. However, he/she should re-interpret those communication needs due to the context in which he/she is in without any diversion of the original intent. The causes of failure in rendering the message into the target language are innumerable, ranging from misunderstandings of the original to insufficient mastery of the receptor language. The most significant scientific attention seems to be given to matters concerning the management and control of the two languages representing two different linguistic codes.

Recent trends in interpreting have led to a proliferation of studies that focus on such complicated issues as the functionality of bilingual memory, attention and discourse processing, language comprehension and its production, lexical and conceptual representations in a bilingual's mind. However, notwithstanding a number of serious research works on how concurrently command and control two languages that have appeared recently (Grosjean, 2008; Mishra, 2018; Schwieter & Ferreira, 2018), there

still is ample room for further insight into the problem, providing for deeper penetration into its vast expanse.

Interpreters should comprehend the source language while producing the output in the target one, maintaining both languages active. This ability to multitask distinguishes interpreters from monolinguals and bilinguals. The latter are frequently engaged in various interpreting-related activities and often switch from one language to another, outperforming monolinguals in executive control. The other differences between monolinguals and bilinguals involve the interaction of the two linguistic systems: their simultaneous activation and the need to select one at a time, the effort involved in operating two lexicons and grammars instead of one.

Undoubtedly, at the heart of the description of bilingualism is language processing in the human brain. The bilingual's language modes in language production and language perception constitute a significant area of interest within the field. Neurological research on interpreting conducted so far has attempted to map task-specific activation patterns. While a variety of definitions of the term 'language mode' has been suggested, this paper will make use of the definition suggested by Grosjean (2008), who saw it as "the state of activation of the bilingual's languages and language processing mechanisms at a given point in time" (p. 39). Surveys such as that conducted by the researcher have shown that ranging from a monolingual mode to a bilingual, the base language, i.e., the primary language being produced or perceived at a particular point in time, is the most active. In contrast, the second language is activated to lesser degrees.

It must be noted that language is tightly tied with cognition, and the linguistic phenomena are analyzed regarding their status in a human mind within human culture. The study of bilingual cognition can benefit neurolinguistic research into various issues. The latter are related to language and cognitive processes, cognitive control in interpreting, the linguistic shaping of human thought, cross-linguistic differences in conceptualizing events, and metalinguistic awareness in bilinguals.

Conclusion

Returning to the hypothesis posed at the beginning of this study, it is now possible to state that the interpreting process is an essential task for cognitive and neural systems. Researchers in cognitive psychology, neurolinguistics, and interpreting studies hold the view that different modes of interpreting should include various processing procedures, mechanisms and efforts. Both simultaneous and consecutive interpreting pose severe and daunting challenges for an interpreter in transferring from one language to

another, changing his/her role from a mere receiver of the message to an active participant of the cross-cultural communicative act. Although both interpreting modes require substantial efforts to be made and overload of working memory, the reviewed literature has shown that simultaneous and consecutive interpreting involve different degrees of cognitive capacity.

Today's understanding of interpreting process and the interpreter's role in it far exceeds in complexity compared to practices in the past. The current study found that an interpreter faces significant difficulties, including the simultaneity of listening, retaining, comprehending the input and producing the output, and concurrent and proficient activation of two languages at once. These require the constant use of linguistic and cognitive mechanisms, coordinating various brain systems involved in handling these multiple tasks. Cognitive and neurolinguistic perspective on interpreting entails an interdisciplinary approach since it acknowledges that language processing and production must be considered regarding communicative, psychological, and neural constraints.

Despite its exploratory nature, this study offers some insight into interpreting as bilingual processing. It is portrayed as a cognitive process activating both psychological and neural mechanisms whose integration provides for the successful resolution of problem situations in interpretation. The current findings add to a growing body of literature on the well-founded interpreting conceptions, enhancing our understanding of interpreting as a means of cross-cultural communication and exploring the brain operations activated in the process of interpreting. This research has thrown up many questions and proved that interpreting is an intriguing one that could be usefully explored in further research.

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