

Skrylnyk S. V.,

PhD in Philology, Assoc.Prof.,

Head of the Department of Theory and Practice of Translation from English

Taras Shevchenko National University of Kyiv

<https://orcid.org/0009-0007-0042-2755>

COGNITIVE FLEXIBILITY AND MEMORY TRAINING IN SIMULTANEOUS INTERPRETING CLASSES: CASE STUDY

Summary. This paper investigates the impact of cognitive flexibility and memory training techniques on the quality of simultaneous interpreting with first- and second-year master's students of the Translation Department at Taras Shevchenko National University of Kyiv, particularly emphasizing the English–Ukrainian language pair. Drawing on theoretical frameworks developed by Gile, Moser-Mercer, and other scholars, the study situates cognitive flexibility as a core mental resource that enables interpreters to switch efficiently between listening, comprehension, production, and memory-related processes. Special attention is devoted to language interference, which hinders cognitive flexibility achievement under stress and high cognitive load. Over two semesters, students engaged in a structured training program incorporating cognitive load management, shadowing, paraphrasing, dual-tasking, and memory-enhancement strategies such as chunking and delayed repetition. These methods aimed to strengthen short-term and long-term memory and develop resilience to stress and multitasking demands. The experimental results demonstrated steady progress: cognitive flexibility increased by an average of 5% per month, long-term memory by 2%, and short-term memory by 3%. These improvements reflected greater accuracy, reduced omissions, and reduced information loss during interpreting tasks. The study highlights effective pedagogical strategies for interpreter training and provides evidence that systematic development of cognitive flexibility contributes to enhanced performance in complex bilingual communication. The article also identifies promising directions for further research, including stress management, neural mechanisms of memory encoding, and cross-linguistic validation of the observed trends.

Key words: cognitive flexibility, long-term memory, short-term memory, simultaneous interpreting, language interference.

Introduction. The concept of cognitive flexibility in simultaneous interpreting aligns with research conducted in cognitive science, neurolinguistics, and translation studies. Interpreting involves executing multiple tasks concurrently; Gile's Effort Concept model has, in many instances, elucidated the mental resources that underpin the interpreting process.

Simultaneous interpreting constitutes a language acquisition endeavor, comprising three elements: listening and comprehension, production, and memory, as noted by Gile [1, c. 123]. The availability of cognitive flexibility is a critical aspect of mental resources. For example, an interpreter can switch from one task to another, shifting from listening to a source language to articulating in the target language. Gile observed that as the complexity of the materials to be translated increases, so does the necessity for cognitive effort

in interpreting, given that attention must be persistently redirected among various languages and contexts.

Another researcher, Barbara Moser-Mercer, is achieving remarkable advancements by focusing on cognitive flexibility to enhance the interpreting process. In her 2000 study 'Simultaneous Interpreting', Moser-Mercer examined the cognitive demands and limitations of simultaneous interpreting, particularly emphasizing cognitive flexibility and the management of cognitive workload [2, c. 72]. Her research consistently indicates that interpreters are frequently subjected to fluctuations in the speech stream, necessitating a transition between comprehension and reproduction. Moser-Mercer's findings align with task-switching models from cognitive psychology, such as multi-tasking, positing that individuals perform better in analogous situations when their cognitive flexibility is elevated [2, c. 76].

Another field of research is analyzing variables affecting interpreting performance, namely, cognitive load. Seeber and Kerzel support this statement in their work on cognitive load in simultaneous interpreting [3]. It has been shown that the performer believes the mental capacities for performance also have a downward limit, apart from a plateau, which increases the reaction time on a less accurate strategy. Interestingly, the authors explained this as a problem for task-switching, which was based in cognitive science, and maintained that as mental effort increases, the amount of mental shifting that can be done diminishes. Thus, it becomes hard to manage multiple processes well. The consequences of these findings ought to be considered within simultaneous interpreting settings, in which, apart from the central activity of language processing and output production, multiple streams of activity have to be conducted by an interpreter in a limited period of time.

The findings indicated that excessive stress impairs working memory and decision-making processes, predominantly inhibiting cognitive flexibility. Nevertheless, interpreters with high cognitive flexibility are rare and can operate effectively under stress. Rousseau presents distinct research on the association between stress and cognitive functioning. Notably, the work of Lupien et al. is significant as it demonstrated that stress negatively impacts performance, particularly through cortisol release, which affects cognitive working memory and cognitive flexibility [4, c. 199].

Research Aim. The present study aims to investigate the role of cognitive flexibility and memory training in enhancing the performance of simultaneous interpreting among master's students. It seeks to identify how targeted strategies can mitigate language interference and reduce cognitive load during interpreting. Furthermore, the study aspires to outline effective pedagogical practices that foster the development of interpreters' cognitive resilience and adaptability.

Research Goals

1. To examine the theoretical foundations of cognitive flexibility and its relevance to simultaneous interpreting.
2. To analyze the impact of language interference and stress on interpreters' memory and performance.
3. To implement and evaluate memory-enhancement strategies such as chunking, shadowing, and delayed repetition in interpreter training.
4. To measure the quantitative improvement of students' cognitive flexibility, long-term and short-term memory over two semesters.
5. To propose effective training methodologies that strengthen interpreters' ability to manage cognitive load and perform accurately under pressure.

Theoretical Framework. The cognitive flexibility idea in simultaneous interpreting is based on multiple disciplines. Gile and Moser-Mercer established the foundation of the theory by characterizing interpreting as a cognitively demanding process that necessitates multitasking. Seeber and Kerzel and Russo examined the impact of stress and cognitive load on cognitive flexibility in interpreting tasks. These studies emphasize cognitive flexibility as a fundamental cognitive attribute and a crucial element in executing simultaneous interpreting, a complex and advanced task [1; 2; 3; 5].

Cognitive Flexibility and Linguistic Interference

Two crucial factors influencing cognitive flexibility during situational interpreting are language interference and stress. Language interference is a phenomenon wherein elements of the interpreter's two working languages, including syntax, semantics, or phonology, become entangled, hindering the transition from one language to another. The situation deteriorates when the language is constructed under duress, potentially diminishing cognitive flexibility and impairing proper functioning. Researchers investigating language interference and stress in interpreting, and its impact on mental processes, include Fabbro, Gile, and Köpcke and Nespoulous [3; 6; 7; 9].

Fabbro's work, *The Neurolinguistics of Bilingualism* provides a concise yet thorough analysis of the factors and cognitive processes involved in managing two languages, applicable to bilingual speakers, translators, and similar individuals [1, c. 145]. A. Fabbro's findings indicate that language interference is a persistent issue for bilingual individuals, as both language systems are simultaneously activated rather than functioning independently. The translator's skill is essential in this interference, as he must delicately omit superfluous information from one language that cannot be utilized while formulating the output in the other language. In these circumstances, the handling of superfluous verbal usage parallels that of excessive cognitive load or psychological stress, wherein the improper flow of linguistic content is eliminated, significantly impairing the accuracy and fluency of interpreting.

Daniel Gile offers his 'effort model' to evaluate issues related to cognitive flexibility resulting from interferences. Interpreters delineate simultaneous interpreting as comprising three essential efforts: hearing and comprehension, analysis, speaking, and memory retention. When comprehension issues arise from language interference, interpreters must prioritize mitigating its effects, exerting effort beyond their information processing capacity. Furthermore, managing stress exacerbates the problem by emphasizing the translator's cognitive efforts to reconcile interference suppression with the functional analysis of the source language. Gile describes stress as a depletion

of mental resources that renders cognitive flexibility impossible or severely impaired, along with one of its repercussions [1].

Through their research, Köpcke and Nespoulous elucidate potential cognitive mechanisms underlying linguistic interference in simultaneous interpreting tasks. The study "Working Memory Performance in Experienced and Novice Interpreters" elucidates that more experienced interpreters cultivate superior cognitive interference methods, allowing for the suppression of one language while utilizing another [6, c. 15]. Their findings indicate that stress may inhibit the application of advanced techniques by seasoned translators, as it is established that working memory and executive functions can decline under stress. This decline diminishes the ability to navigate obstacles, as stress amplifies the tasks of the processes that typically govern language processing. The research indicated that interpreters increasingly err in lexical and syntactic selections under stress due to interference from the non-target language.

In her work Barbara Moser-Mercer assessed the relationship among stress, cognitive flexibility, and language interference [2, c. 92]. Moser-Mercer's findings indicate that cognitive flexibility enhances interpreters' efficacy in the target language by enabling rapid adaptation to interference. Nonetheless, her research reveals that stress, which might arise from rapid speech, an abundance of unfamiliar vocabulary, or other highly external factors, constrains a translator's efficacy in managing linguistic interference. Stress may impair a translator's capacity to effectively alternate between languages, resulting in an escalation of "code switches," wherein the translator unintentionally incorporates the source language into the translated text. Besides linguistic interference concerns, cognitive load influences performance related to cognitive flexibility in simultaneous interpreting. The cognitive load enables interpreters to manage language interference successfully; nevertheless, the crucial cognitive component that aids in stress adaptation diminishes, resulting in increased errors and decreased productivity. These findings underscore the necessity of implementing all requisite procedures to manage stress and language interference for efficient interpreting during training and performance. *Stress Reduction Strategies for the Improvement of Cognitive Flexibility*. Improving cognitive flexibility is a crucial aspect of training for any performer, including a simultaneous interpreter. This will enhance their capacity to adapt to rapid linguistic changes, manage information, and handle tasks in highly stressful conditions. Numerous approaches for cultivating cognitive flexibility have been investigated within translation studies, cognitive psychology, and linguistics. These strategies enhance multitasking, problem-solving, and working memory to facilitate practical interpreting.

Daniel Gile proposed the idea of effort, positing that targeted strategies for managing cognitive load are among the most successful methods for improving cognitive flexibility in interpreters. He implemented a progressive training methodology for interpreters that escalated both the complexity of assignments and the pace of execution. This facilitated the interpreters' ability to manage the internal processes of attention, comprehension, and speech production, progressively transitioning from one to the other. The Gile model underpins numerous interpreter training programs that utilize imitation, paraphrasing, and rapid interpreting to improve the adaptability of interpreters' concentric and performative circles, enabling them to respond quickly to verbal and cognitive demands.

In 2000, Barbara Moser-Mercer developed a framework for training interpreters under conditions replicating typical stressors to enhance their cognitive flexibility and resilience [2, c. 85].

In her work "Simultaneous Interpreting," Moser-Mercer asserts that to bolster cognitive functioning, interpreters should be situated in environments that demand quick, high-stress interpreting or highly sophisticated technical conversation. Furthermore, she underscored the necessity of employing stress management and cognitive behavioral approaches for interpreters, as these may alleviate significant cognitive load, and excessive stress can result in diminished cognitive flexibility. This strain challenges the concept that cognitive flexibility is simply an abstract issue of 'cognitive fitness,' akin to mental gymnastics. The agency pertains to how a translator manages and governs their mental state to fulfill the demands of the intricate task.

In his 1999 publication, *Simultaneous Interpreting*, Robin Setton asserts that focusing on modern methodologies in cognitive pragmatics and metacognitive methods, such as self-intervention and feedback, is crucial for enhancing cognitive flexibility [8, c. 213]. In his study, Setton asserted that interpreters must possess the capability to reflect on their performance, identify occasions where their task necessitates an inadequate blend of attention and language, and reconfigure the activity to address this requirement.

He contended that translators should do reflection and self-assessment, enabling them to recognize instances when they must alter their approach, mitigate language interference, or augment the cognitive effort allocated to specific tasks. Metacognitive awareness is a fundamental component of mental flexibility that translators can leverage to enhance their performance in dynamic circumstances.

Sharon O'Brien examined the impact of translating and interpreting technologies on cognitive models, investigating how technology and education could enhance cognitive flexibility. In a separate study, "Controlled Speech and Readability in Translation and Interpreting," O'Brien asserted that the mental flexibility of interpreters may be enhanced by employing various text formats and technology-based interpreting tools. In such scenarios, interpreters may utilize intensive practice conditions with speech recognition software or CAT programs for swift or intricate discourse, necessitating adaptation to abrupt changes due to the activity's nature. Incorporating technology into the training curriculum equips interpreters for future employment demands. It facilitates their transition between activities and effectively distributes attention across many professional tasks. Sharon Neiman Solow has effectively advanced interpreters' cognitive flexibility through her research on memory work [8, c. 123]. In her book, "Sign Language Interpreting: A Basic Guide," she underscores the significance of memory training, particularly concerning short-term and working memory, for enhancing an interpreter's capacity to retain and process information instantaneously. Techniques such as informational segmentation, repetitive language application, and delayed completions of lengthy sentences have enhanced an interpreter's cognitive flexibility. This is achieved by engaging with multiple information sources while minimizing errors.

Methods. The study was carried out over two semesters with first- and second-year master's students of the Translation Department at Taras Shevchenko National University of Kyiv (English-Ukrainian pair, B2-C2 level). A mixed-methods approach was applied, using theoretical analysis of cognitive flexibility with experimental interpreter training. The program included shadowing, paraphrasing, dual-tasking, and memory-enhancement techniques such as chunking and delayed repetition. Students trained five days per week in two-hour sessions, and their interpreting performance was assessed monthly. Evaluation focused on error rates,

omissions, information loss, and qualitative indicators of accuracy and adaptability.

Strategies. Cognitive flexibility training through memory enhancement aims to augment the capacity to acquire and manipulate information in working memory while transitioning between languages and tasks. The purpose of memory training was to enhance retention and resource allocation for effective information processing. This is particularly vital in interpreting, where strict adherence to information management is essential.

The chunking strategy involves consolidating related parts of information, as processing disparate elements can be complex.

Chunking is a performance method whereby the interpreter organizes distinct information or sounds into coherent units.

For example, rather than memorizing an extensive sequence of characters or numbers, the specific topic disaggregates it into smaller segments. This methodology facilitates greater knowledge retention by rendering it into more manageable units for enhanced application.

As proposed by Moser-Mercer, chunking tends to decrease the cognitive load, thus increasing the mental flexibility of the translator, who can then focus on understanding and re-expressing the meaning in the target language instead of filling their working memory. **Deferred Repetition:** In this case, text is provided for interpreters to look across and restate the information after a specific period, which is usually indicated to them. The purpose is to increase the gap between the learning of a particular source message and the ability to produce that message in the target language. This forces the translator to hold the information longer, 'exercising' their ability to remember and reproduce the details in the correct order under pressure. According to Sharon Neiman Solow, this approach was applied often in her study of interpreting sign language because it improves interpreters' ability to memorize information and the creativity of composing text after delays. Research concerning language interpreting has also found that my paraphrasing and rephrasing. In this case, the interpreters read one language, recall the content of a particular sentence or passage, and express it in another language, mainly in one's own words. This inspires flexibility as it requires more concentration on the idea present in the original text than the initial working principles of translation [2; 8].

Furthermore, it equips interpreters to alter the language while maintaining the original message.

A dual-task exercise evaluates an individual's ability to do two tasks simultaneously.

These tasks reflect the multitasking capabilities intrinsic to simultaneous interpreting, as interpreters must engage in memory-related activities while executing other cognitive functions. For instance, an interpreter may need to retain numerical digits while attending a verbal presentation. This enhances their working memory and efficiency in multitasking, which is crucial for interpreters.

Gile asserts that dual-task exercises are advantageous, particularly for interpreter trainers, as they facilitate a balance among listening, processing, and speaking, thereby enhancing simultaneous interpreting, a crucial aspect of managing the cognitive demands of concurrent speech [1].

Shadowing is an interpreting technique wherein a target language interpreter listens to the source material and reproduces it in another language.

In shadowing, interpreters must reflexively duplicate the source language. In this context, information has to be articulated solely

from short-term memory before transitioning to long-term memory for additional processing in anticipation of output.

The introduction of complexities may arise from incorporating elements like paraphrasing or delayed repetition, which were previously absent in the responses. This exercise closely parallels the practical activities of an interpreter, as it is typically performed in practice, yet has gained popularity among trainers as a mnemonic enhancement technique.

Moser-Mercer indicates that this strategy aids translators in short-term memory exercises when confronted with intricate knowledge, enhancing their cognitive agility [2].

Experiment. The objective was to cultivate cognitive flexibility and enhance memory through specific strategies to improve student performance. Throughout the two semesters, the students explored the potential application of various strategies proposed by Gale, Moser-Mercer, Seton, O'Brien, and Solow, among others. Consequently, the goal was to maximize the benefits of cognitive load theory while enhancing mental flexibility, working, long-term memory, and cognitive control [1; 2; 8].

The simplified version encompassed all previously stated tasks and additional ones, executed over two semesters. Cognitive flexibility was evaluated by completing block patterns in reverse order across three distinct forehand-instructed positions, adhering to Gale's principles. Students were assigned specific load management tasks grounded in parameterization/partitioning, rephrasing, delayed repetition, and dual-tasking. These techniques were employed for training purposes and to facilitate a timely transition between activities under conditions of anxiety [10, c. 150].

Long-term knowledge retention. Students were equipped to assimilate extensive information through rigorous preparation, including thorough reading, memorizing lengthy texts, and engaging in translation exercises and activities that necessitated deeper cognitive processing beyond rote learning.

Temporary information retention: Both weak and strong strategies, including repetition, immediate repetition, and the execution of multiple tasks, were employed for the retention and manipulation of information for a short duration, a capability essential for interpreting interactions in real time.

Net cognitive flexibility, along with both long-term and short-term memory capabilities, was enhanced as training advanced. More particularly,

The cognitive capacity to manage a current task and subsequently perform one or several others improved at a rate of 5% per month, indicating enhanced task switching, language interference regulation, and task precision under stress.

A notable gain in the long-term memory component was observed, with an average monthly improvement of 2% in students' capacity for retaining complicated material over time.

The short-term memory capacity increased by 3% monthly, enhancing proficiency in immediate metrics during interpreting tasks. The growth trends for each skill are shown in the described graphs, indicating consistent progress across all skill categories.

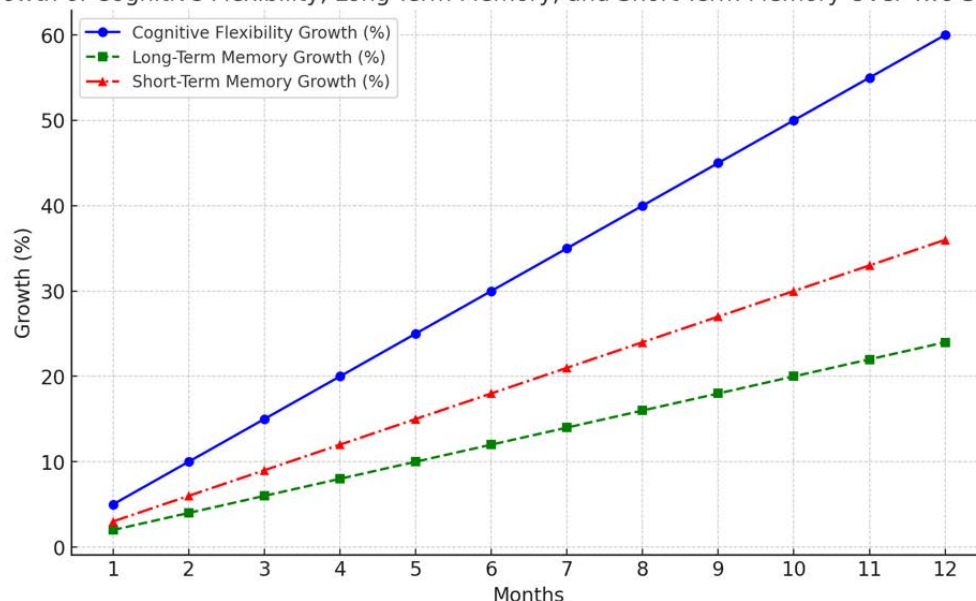
The intermediate results of the two-semester training program indicate that tolerance for cognitive flexibility and effective memory techniques can significantly enhance interpreting quality, enabling students to undertake more complex and challenging tasks with greater self-discipline and precision.

Cognitive Flexibility. The monthly 5% enhancement in cognitive flexibility resulted from reduced errors associated with task-switching and multitasking. Learners demonstrated accuracy and speed in making revisions when the source text necessitated significant or unforeseen alterations. The decline in exceptions and inaccuracies due to language barriers indicated improved strategies for managing these challenges.

Prolonged Retention of Information. The 2% enhancement in long-term memory was determined by scholars' ability to recall and reinterpret extensive texts over time to evaluate improvement. It was observed that as students advanced in their studies, there was a significant reduction in information loss, especially when interpreting complex or technical discourse. This gradual cognitive development was attributed to the participants' capacity to retain and retrieve previously presented information and concepts.

Transitory Memory. The 3% boost observed in short-term memory was derived from responses to tests necessitating immediate retrieval while recording tasks.

Growth of Cognitive Flexibility, Long-Term Memory, and Short-Term Memory Over Two Semesters



Participants were tasked with swiftly interpreting spoken words and expediting information delivery, reducing omissions and errors associated with short-term information processing. Throughout the two semesters, there was a consistent enhancement in their capacity to retain immediate information and retrieve it in the target language.

An index of cognitive flexibility and enhancements in long-term and short-term memory were derived from reduced errors and information loss during oral tasks. Throughout the study, interpreters were periodically assessed by students and were obligated to document the mistakes incurred during the session, including omissions, discrepancies in meaning, and other inaccuracies. The degree of information retention was further evaluated by analyzing translated content, surface-level improvements, Return on Investment, and the effectiveness of message conveyance relative to the original.

Conclusions. This study's findings demonstrate that cognitive flexibility and memory training strategies significantly enhance the quality of simultaneous interpreting. The methodical strategy application, including shadowing, paraphrasing, dual-tasking, chunking, and delayed repetition, resulted in quantifiable student performance improvement across two semesters. The constant monthly enhancement in cognitive flexibility (5%), long-term memory (2%), and short-term memory (3%) illustrates that even modest yet persistent advancements can markedly diminish errors, omissions, and knowledge loss.

The study demonstrates that language interference and stress are significant barriers to efficient translation, as they directly impact memory processes and task-switching capabilities. Structured training aimed at cognitive load management and stress resilience can alleviate these issues and enhance interpreters' adaptability in high-pressure situations.

These findings highlight the educational significance of including cognitive training in interpreting instruction. Incorporating memory improvement techniques and multitasking activities into the curriculum enables trainers to cultivate improved accuracy, fluency, and resilience in beginner interpreters. The findings indicate a necessity for additional exploration of the brain mechanisms involved in memory encoding, the enduring impacts of stress, and the cross-linguistic relevance of the identified tendencies.

This study emphasizes that cognitive flexibility is not just an abstract psychological concept but a tangible skill that can be developed through focused training, enabling future interpreters to address the growing demands of multilingual communication with enhanced accuracy and assurance.

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Скрильник С. Когнітивна гнучкість та тренування пам'яті на заняттях із синхронного перекладу: практичне дослідження

Анотація. У цій статті досліджується вплив когнітивної гнучкості та технік тренування пам'яті на якість синхронного перекладу серед студентів першого та другого курсів магістратури спеціалізації «Переклад» у Київському національному університеті імені Тараса Шевченка. Базуючись на теоретичні основи, розроблені Жіль, Мозер-Мерсер та іншими вченими, дослідження аналізує когнітивну гнучкість як основний розумовий ресурс, що дозволяє перекладачам ефективно переключатися між процесами слухання, розуміння, відтворення та пам'яті. Особлива увага приділяється мовній інтерференції, яка перешкоджає досягненню когнітивної гнучкості в умовах стресу та високого когнітивного навантаження. Протягом двох семестрів студенти брали участь в експерименті, що полягав в тренуванні управління когнітивним навантаженням, тіньови повторенням, перефразуванням, виконанням двох завдань одночасно та стратегії поліпшення пам'яті, такі як групування та пізні повторення. Ці методи були спрямовані на зміцнення як короткострокової, так і довгострокової пам'яті та розвиток стійкості до стресу та вимог багатозадачності. Результати експерименту продемонстрували стабільний прогрес: когнітивна гнучкість зросла в середньому на 5% на місяць, довгострокова пам'ять – на 2%, а короткострокова пам'ять – на 3%. Ці поліпшення відобразилися у більшій точності, зменшенні пропусків та зменшенні втрати інформації під час виконання завдань з перекладу. У дослідженні висвітлені ефективні педагогічні стратегії підготовки перекладачів та надані докази того, що систематичний розвиток когнітивної гнучкості сприяє підвищенню ефективності складної двомовної комунікації. У статті також визначено перспективні напрямки для подальших досліджень, зокрема управління стресом та нейронні механізми кодування пам'яті.

Ключові слова: когнітивна гнучкість, довгострокова пам'ять, короткострокова пам'ять, синхронний переклад, мовленнєва інтерференція.

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