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THE EFFECT OF MEMORY TRAINING ON INTERPRETATION PERFORMANCE

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ABSTRACT

Interpreting is regarded as a useful communication device when two persons (A and B) who do not speak each other's language, want to exchange information through spoken language. The technique involves the help of a third person, a go-between or interpreter, who speaks and understands both languages. Speaker A produces a stretch of speech, which the interpreter then summarizes and translates into language B. Speaker B's response is then translated by the interpreter into language A, and so on. Interpreting can take place in parallel with the input speech in either language A or B (simultaneous interpreting) or consecutively, i.e. in between turns taken by speakers A and B. In either case, the interpreter's task is highly demanding; it takes years of intensive training to become a skilled interpreter. Interpreting studies have been set up to provide a model of the interpreting mechanism, which in turn may be used to set up and improve training programs for student interpreters.

When interpreting, the interpreter has to keep (a semantic representation of) the input speech in memory, while formulating the equivalent as a suitable output in the source language. Working memory, therefore, is an essential resource in the interpreting process but it has long been ignored by interpreting programs.

Our paper presents a theoretical overview of the concept of working memory and how it may contribute to the quality of (simultaneous or consecutive) interpreting. There are some special methods to train memory which are generally accepted. However, few curriculum developers talk about memory training for interpreter trainees in academic institutions. Specific functions of working memory in the interpreting process are to (i) retain source language, (ii) compute the meaning (i.e. to understand) of the source language and (iii) encode (as well as possible) the same meaning in the target language.

We will review and discuss methods to train memory for interpreter trainees specifically targeting the three aspects identified above. Our conclusion is that memory (sub)skills in interpreting could be acquired by interpreter trainees through effectively designed exercises. With a well-trained working memory, interpreters can actually be equipped with an effective tool for the encoding and decoding of information. It is suggested, therefore, that academic settings for future interpreter training include memory training in their curriculum.

Key words: memory training, working memory, interpreting trainee, curriculum

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1. INTRODUCTION

Much has been written about the process and product of interpreting (Brumfit & Johnson 1979), but little about training variables (McNamara & Scott 2001), especially memory training for interpreter trainees. The literature on interpreter training seems to lean towards a description of what happens in interpreting but not of what happens in the classroom for interpreter trainees (Davies 2004). An approach which includes both issues is needed. Teaching techniques in foreign language teaching have changed since the pedagogical debate which led to the Communicative Approach in the 1970s and 1980s (Brumfit & Johnson 1979; Candlin 1978). But has interpreter training changed? How many university courses are there to train interpreting teachers? Are all interpreting instructors familiar with the main existing pedagogical approaches and basic principles of training? Many questions are awaiting an answer both on what should be taught, the syllabus, and on how this should be done, i.e. the teaching method (Jones 2002). In a university environment, should we plan a professionally- or an academically-oriented syllabus? Should training be similar for undergraduates and for postgraduates? Who should train our students, a teacher who interprets or an interpreter who teaches (Mahmoodzadeh 1992)? Should we evaluate from a pedagogical or from a professional perspective? Obviously, we cannot fully answer these questions without more empirical research and reflection on what goes on in the interpreting classroom (Pöchhacker 2004).

Unfortunately, there is some distance separating the three parties who could most help interpreter trainees: instructors, theoreticians and interpreters (Davies 2004). It may not be possible to teach creativity and inspiration, but a systematization of the interpreting experience and a reflection on theoretical aspects can improve the overall quality of students' interpreting (Hermann 2002). Positions vary from those who believe an interpreter is born (Weischedel 1977) and those who believe interpreters are made (Klingberg et al. 2002; Prins et al. 2011), i.e., students are either innate interpreters or non-innate interpreters. Ideally, interpreters should combine their natural talent with acquired skill. The answer to anyone who is sceptical about the formal teaching of interpreting is twofold. Students with a gift for interpreting invariably find it useful in building their native talent into a fully developed proficiency; students without a gift for interpreting invariably acquire some degree of proficiency (Harvey et al. 1995).

Working memory is defined as the cognitive system responsible for the temporary storage and manipulation of information which is essential for sustaining focused behaviour in practical situations (Kane et al. 2007). Recently, most scholars have begun to use the concept of working memory to replace or include the older concept of short-term memory (Keizer 2010). Studies show that working memory capacity can be expanded through well-designed exercises (Klingberg et al. 2002; Prins et al. 2011). Many scholars in different fields are working on the training of working memory [13], but so far interpreting programs did not include it in the curriculum (Mahmoodzadeh 1992). Training working memory has different aspects but they are generally divided into two types. Strategy training is practiced to enhance the use of supplemental domain-specific strategies, helping trainees to expand their working memory capacity (McNamara & Scott 2001); the other type uses core training, that is the practice of continuous repetition of demanding working memory tasks to improve working memory performance (Klingberg et al. 2005, Vogt et al. 2009).

Our paper presents theoretical and empirical work on memory and different approaches to improving interpreter trainees' memory for interpreting. In section 1, a short overview of consecutive interpreting is given. In section 2, we present a theoretical debate and findings from memory function (sensory & working) in interpreting. In section 3, we elaborate on basic approaches of training memory and review effective exercises to expand working memory capacity for interpreting. Finally, section 4 integrates different approaches of training memory and discusses the pedagogical implications for interpreting programs and material producers for interpreting curriculum.

1.1 Interpreting (consecutive and simultaneous)

Shuttleworth and Cowie (1997) define consecutive interpreting as one of the two basic modes of interpreting. In consecutive interpreting, the interpreter listens to a (sometimes fairly lengthy) section of a speech delivered in the source language, and sometimes takes notes. These notes serve as a brief memory aid

rather than being a shorthand transcription of all that is said. The speaker continues until the whole speech has been delivered. Consecutive interpreting entails a number of abilities and skills, including a high level of source language comprehension, advanced note taking skills, excellent general knowledge, a well-trained memory and a confident manner of delivery. Consecutive interpreting has been defined as “the interpreter listening to the totality of a speaker’s comments, or at least a significant passage, and then reconstituting the speech with the help of notes (Jones 2002). While listening some speakers prefer to talk just for a few sentences and then invite interpretation; in this case the interpreters should rely solely on their memory. On the other hand, in simultaneous interpreting, the participants wear headphones, and the interpreter renders the speaker’s words into the target language as he or s/he is speaking. Because of the demanding level of concentration required to perform this type of interpreting, simultaneous interpreters always work in teams of two. The interpreter usually works in a sound-proofed booth that enables everyone involved to focus on his work without the distraction of hearing another language. One of the key skills of the simultaneous interpreter is decisiveness (Pöchhacker 2004). There is simply no time to weigh the merits of translation variants, or to recall just the right idiom in the target language. The point which is important here is that any delay makes what the speaker has uttered get lost, and since the speaker may be far away, or even in a different room than the interpreter, the loss may be permanent.

In order for ideas to be put into words, they must first get clarified in minds. Since another person’s ideas have to be encoded without the possibility of repeating them word for word, which is what happens in interpreting, they must be put into a clear, structured analysis. To do that, the individual ideas that are the basis of the speaker’s delivery must be fully understood by the interpreter (Jones 2002). Understanding (decoding the source language), analyzing (computing meaning), and re-expressing (encoding with target language), are therefore, respectively, the three fundamental components of interpreter’s work.

2. Memory

Memory is thought of, in common view, as a kind of storehouse or library for facts (Sperling 1960). Caine and Caine (1997) pointed out that many of us associate word memory with the recall of specific dates or facts or lists of information and sets of instructions, requiring memorization and effort. However, it has also been observed that memory goes beyond this one-dimensional aspect of learning and, rather, focuses on attending, learning, linking, remembering, and using the pieces of knowledge and skills we encounter constantly (Shallice 2002). Psychologists think of memory in the same way, but they sometimes envision it as the set of changes to processes that use those facts (Daro & Fabbro 1994). Psychologists refer to the storehouse as long term memory. Long term memory is the repository of information that is available to the cognitive system, but the information in long-term memory is not readily available for use by cognitive processes (Willingham 2001). For information to be used by cognitive processes, it must go from long-term memory to working memory. Working memory is a hypothetical buffer in which information can be briefly held, for perhaps 30 seconds, if nothing is done to keep it (Willingham 2001). For example, if one is asked “What color is snow?” the answer “white” would be in long term memory, but this fact would not be available to cognitive processes until the information was retrieved from long term memory and put into working memory. Once in working memory, it would be available to the processes that construct the answer to the question. Working memory therefore serves as a staging ground for thought (Kane et al. 2004).

Moreover, working memory serves as a buffer in which information can be temporarily stored (Baddeley 1986). If one would be in grocery store with someone and that other person asks his companion to buy milk, pasta, and a can of tuna while s/he shops for other things, the companion would maintain these three items in his working memory. This information needs to be kept only briefly until the items are found. Therefore, there would be no need to enter them in long-term memory. Thus, working memory both retrieves information from long-term memory and takes in information from the environment, either for temporary storage, or possibly for entry into long term memory (Baddeley 1986).

2.1 Sensory memory

Sensory memory has a very large capacity (Baddeley 1986). A great deal of information can rush into sensory memory simultaneously, but it is retained there for a very short time, lasting no more than a second (Willingham 2001). Researchers were interested in the contents of consciousness, and they were therefore interested in how much information could enter consciousness in a brief exposure. They determined that a person could perceive four or five complex stimuli (such as letters that did not make a word or orthographically legal string) in a very brief exposure. Subjects participating in such experiments often reported that they felt as though they had perceived more letters but forgot some of them even as they were reporting the others. It was not until 1960 that psychologists conclusively showed that many more stimuli are actually perceived but only four or five are reported because the remainder is forgotten (Sperling 1960).

Sperling (1960) proposed the existence of a memory system that can hold a large number of items, but only for a second or less. He argued that "when the array of stimuli is presented, it enters sensory memory. Sensory memory has a large capacity, so it can hold the entire array, but the contents of sensory memory decay very fast." The participant therefore rushes to report the contents of sensory memory, but even as s/he is reporting some letters, the others are fading, so that by the time the participants have reported four letters, the contents of sensory memory have faded altogether. As a point of terminology, Sperling's term "sensory memory" later came to refer to any of a number of very short-term sensory buffers, including a visual buffer, an auditory buffer and possibly others.

2.2 Working memory

Working memory is believed to be one of the basic cognitive mechanisms that make human beings to process and retain temporary information for use in other cognitive tasks (Hambrick & Engle 2002). Moreover, it has been claimed that working memory is a temporary holding bin for new information, where much of our thinking, or information processing, takes place (Shallice 2002). Therefore, it is the place which enables human beings to make sense of a lecture, understand a textbook passage, or solve a problem. Baddeley (2000) pointed out that working memory has two features, (i) it screens information that comes into it, and (ii) it is limited in capacity and duration. The role of working memory is crucial because of its involvement in higher-order cognitive abilities relating to everyday life, such as fluid intelligence, problem-solving, and interpreting. Given its very important role in cognition, training activities targeting working memory have been assumed to produce great effects on the cognitive system (Baddeley & Wilson 2002). Therefore, many studies have focused on whether or not working-memory performance can be modified, and enhanced, by training.

There are two differences between working memory and short-term memory (Kane et al. 2004). The first is the obvious inclusion of processes that are in service of cognition, not just in service of briefly maintaining information. The second is that there are separate storage locations for auditory information (phonological loop) and visual information (visuospatial sketch pad). Some scholars believe that working memory is a capacity-limited system that serves as the mind's workspace, and the size of one's working memory is thus thought to be a key determinant of an individual's ability to carry out a wide variety of cognitive tasks (Kane et al. 2004; Engle et al. 1999). Research shows that working memory capacity can be enhanced through targeted training (Klingberg et al. 2005; Verhaeghen et al. 2004; Westerberg et al. 2007). The idea that training can effectively expand this central workspace of the mind has generated considerable interest, and has sparked speculations that the cognitive benefits of working memory training may be far reaching (Jaeggi et al. 2008).

3. Training working memory

For an interpreter to develop better perception of the source language and its message, his working memory has to be effectively trained. As a result, the quality of interpreting will improve and the results can be productive (Daro & Fabbro 1994). But how can an interpreter train his/her memory for better performance? Many studies have been done by psychologists that the average people never use their brain capacity to the full (Conway & Engle 1994; Engle 1999). Psychologists collaborating with linguists (Padilla et al. 1995) generated many practical exercises that should be performed by interpreter trainees. Our purpose in this

paper is to present studies using designed practical training to improve the efficiency of working memory in interpreting. For example, a study illustrating improved working-memory task performance after training activities that influence long-term memory retrieval mechanisms would be compatible with some theories of working memory, but not others (Ericsson & Delaney 1999). From another perspective, some experts (Unsworth & Engle 2007) propose that working memory is involved even in task contexts where there is no need to manipulate stored information while other theories relegate such tasks to the domain of short-term memory, but not working memory. We, therefore, categorized different approaches of working-memory training, which are explained in the following sections.

3.1 Mnemonics

The use of mnemonics is one of the important strategies in memorizing (McNamara & Scott 2001). It has been shown (Squire & Paller 2000) that mnemonic devices help memory. In learning a foreign language, a student may associate words in the new language with various meanings in his own language, or may use sentences created especially in order to help him remember the points. Therefore, mnemonics can be a strategy of remembering points that seems difficult in a form that makes one remember better. In interpreting, the mnemonic strategy may help a lot (Moser-Mercer 2005). A framework for retrieval can be a powerful aid to memory, and it is an important part of many "mnemonics" (i.e. aids to memory). Many mnemonics require the memorizing of something simple, which provides effective cues to the rest of what one wants to remember (Squire & Paller 2000). The proceeding or word mnemonic is specific to remembering one piece of information. All-purpose mnemonics can be created on the same principle. For a general mnemonic, something is memorized first. Then, when new material has to be remembered, it is associated with the material which is already memorized. General-purpose mnemonics are not very useful (Chincotta & Underwood 1998). First, there is always the danger of proactive interference. Second, it is much easier to write down the main points in interpreting than it is to go through the trouble of trying to memorize a list of details. Specific mnemonics are more useful because there is no chance of proactive interference and they are accessible when one cannot look them up (Rosen & Engle 1998).

3.1.1 Imagination

There are three enhancing tools which help to develop the interpreter's mnemonic strategy. These aids are imagination, association and location (Mizuno 2005). Imagination is the power with which interpreter creates an image of whatever he hears so that it will come to him later (Moser 1978). Imagination is what one uses to create and strengthen the associations needed to create effective mnemonics. One's imagination is what one uses to create potent mnemonics. The more strongly one imagines and visualizes a situation, the more effectively it will stick in mind for later recall. The imagery one uses in one's mnemonics can be as violent, vivid, or sensual as one likes, as long as it helps to remember. Association links certain things with others so that this linkage makes the retrieval of the points easier (Ormrod 1998). It is the method by which one links a thing to be remembered to a way of remembering it. One can create associations by (i) placing things on top of each other, (ii) merging images together, (iii) wrapping/rotating them around each other or having them dancing together and (iv) linking using the same colour, smell, shape, or feeling. Location gives the interpreter two things: a coherent context into which he can place information so that it hangs together, and a way of separating one mnemonic from another (Mizuno 2005). By setting one mnemonic in a particular town, we can separate it from a similar mnemonic set in another city. For example, by setting one in London and another similar mnemonic with images of New York, we can separate them without being afraid of a possible confusion. In order to strengthen the feeling of location, we can also build the flavours for the atmosphere of these places.

3.2 Note-taking

Meifang (2012) believed that memory retrieval which includes recalling and recognition is the only way a memory can be measured in interpreting. According to him, recalling refers to the retrieval of stored information when the scene or real clues are presented here while recognition mainly refers to the automatic recalling that deals with the retrieval of the vocabulary and grammatical rules of the two languages involved in

the interpretation task. It has also been observed that taking notes can be a key method which will relieve the pressure of working memory (Gile 2009). Even if the speaker has a rapid pace, note taking is possible. Interpreters have to learn some abbreviations in order to go along with the pace of the speaker. If an interpreter hears a list in the order A, B, C, he may still note A, B, C. This is because if he writes down quickly A and C, they will not be burdening his memory any more, he will only have to remember B for a couple of seconds as he sets his mind free (not overloaded) for the other chunks of information and his focus would be on one chunk(B) (Gillies 2005). Practically, for an interpreter who interprets at a conference, and the speaker talks about positive/negative aspects of a phenomenon, he can quickly picture a big red tick mark and a big red X for these contrasts, so that will subsequently help him render the information not only correctly, but also in a well-organized way, as he retrieves from memory the two columns with red letters on them. If the interpreter develops his mnemonic colourful tool in interpreting, it will be less likely to err, as his mind learns to be better organized.

3.3 Retelling a story

Retelling a story in the source language is another effective exercise which can enhance working memory (Chernov 2004). The instructor's task is to tell a story or play a recording once to interpreter trainees so that they reproduce the story with the same structures and words. They are not allowed to take notes. Four types of techniques regarding this aspect have been suggested (Zhong 2003), which are classified as (i) categorization, i.e. grouping items in terms of shared properties, (ii) generalization, i.e. drawing general conclusions from particular examples or message from the provided text, (iii) comparison, i.e. noticing the differences and similarities between a variety of things, facts and events, and (iv) description, i.e. describing a scene, a shape, or size of an object, etc. Interpreter trainees are encouraged to describe and summarize the original text to a large extent.

4. Conclusion

Memory plays a key role in any type of interpreting since interpreting is a complicated task that demands integration of different skills. By training future interpreters about how to use mnemonic strategies in interpreting, their performance can be improved since interpreters do not overload their memory with details. Through imagination interpreters create mental images of whatever they hear and use these as memory aids in interpreting. The pressure on working memory can be diminished if interpreters have the skill of effective note taking, which is a technique that policy makers should include in the curriculum of interpreter training. Working memory can be enhanced through effective exercises of retelling stories in the source language. We recommend that these types of exercises be practiced in training for future interpreters.

The pedagogical implication of this study would be that in training future interpreters, working memory should be enhanced through effective exercises of mnemonic strategies, imagination and story retelling so that interpreters can perform their job better as their working memory would no longer be loaded with lots of points. Material producers for interpreting programs should include effective exercises of enhancing working memory in their materials and have discussion about them so that they can be helpful in the interpreting curriculum, which currently lacks these exercises. .

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References

- Baddeley, A. D. (1986). *Working memory*. Oxford: Oxford University Press.
- Baddeley, A. D. (2000). The episodic buffer: A new component of working memory? *Trends in Cognitive Sciences*, 4, 417-423.

- Baddeley, A. D., & Wilson, B. A. (2002). Prose recall and amnesia: Implications for the structure of working memory. *Neuropsychologia*, 40, 1737-1743.
- Brumfit, C. J. & Johnson, K. (1979). *The Communicative Approach to Language Teaching*. Oxford: Oxford University Press.
- Caine, G. & Caine, R. N. (1997). *Education on the edge of possibility*. Alexandria, VA: Association for Supervision and Curriculum Development.
- Candlin, C. (1978). *Teaching of English: Principles and an exercise typology*. London: Langenscheidt-Longman.
- Chernov, G. V. (2004). *Inference and anticipation in simultaneous interpreting*. Amsterdam/ Philadelphia: John Benjamins.
- Chincotta, D. & Underwood, G. (1998). Non-temporal determinants of bilingual memory capacity: The role of long-term representations and fluency. *Bilingualism: Language & Cognition*, 1, 117-130.
- Conway, A. & Engle, R. (1994). Working memory and retrieval: A resource-dependent inhibition model. *Journal of Experimental Psychology: General*, 123, 354-373.
- Daro, V. & Fabbro, F. (1994). Verbal memory during simultaneous interpretation: Effects of phonological interference. *Applied Linguistics*, 15, 365-381.
- Davies, G. M. (2004). *Multiple Voices in the Translation Classroom: Activities, Tasks, Projects*. Amsterdam: John Benjamins.
- Engle, R., Tuholski, S., Laughlin, J. & Conway, A. (1999). Working memory, short-term memory, and general fluid intelligence: A latent-variable approach. *Journal of Experimental Psychology: General*, 128: 309-331.
- Ericsson, K. A., & Delaney, P. F. (1999). Long-term working memory as an alternative to capacity models of working memory in everyday skilled performance. In A. Miyake and P. Shah (Eds.), *Models of Working Memory: Mechanisms of Active Maintenance and Executive Control* (257-297), Cambridge: Cambridge University Press.
- Gile, D. (2009). *Basic concepts and models for interpreter and translator training*. Amsterdam/Philadelphia: John Benjamins.
- Gillies, A. (2005). *Note-taking for Consecutive Interpreting*. Manchester: St Jerome Publishing.
- Hambrick, D. Z., & Engle, R. W. (2002). Effects of domain knowledge, working memory capacity, and age on cognitive performance: An investigation of the knowledge-is-power hypothesis. *Cognitive Psychology*, 44, 339-387.
- Harvey, S., Higgins, I. & Haywood, L. (1995). *Thinking Spanish translation*. London & New York: Routledge.
- Hermann, B. (2002). Memory Function Related to Hippocampal Imaging Findings. *Epilepsy Currents*, 2, 3-29.
- Jaeggi, S. M., Buschkuhl, M., Jonides, J., & Perrig, W. J. (2008). Improving fluid intelligence with training on working memory. *Proceedings of the National Academy of Sciences of the United States of America*, 105, 6829-6833.
- Jones, R. (2002). *Conference Interpreting Explained*. Manchester: St Jerome Publishing.
- Kane, M. J., Conway, A. R. A., Miura, T. K. & Colflesh, G. J. H. (2007). Working memory, attention control, and the n-back task: A question of construct validity. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 33, 615-622.
- Kane, M., Hambrick, D., Tuholski, S., Wilhelm, O., Payne, T., & Engle, R. (2004). The generality of working memory capacity: A latent-variable approach to verbal and visuospatial memory span and reasoning. *Journal of Experimental Psychology: General*, 133, 189-217.
- Keizer, A. W., Verment, R. S., & Hommel, B. (2010). Enhancing cognitive control through neurofeedback: A role of gamma-band activity in managing episodic retrieval. *Neuroimage*, 49, 3404-3413.
- Klingberg, T., Forssberg, H., & Westerberg, H. (2002). Training of working memory in children with ADHD. *Journal of Clinical and Experimental Neuropsychology*, 24, 781-791

- Klingberg, T., Fernell, E., Olesen, P. J., Johnson, M., Gustafsson, P., Dahlstrom, K., (2005). Computerized training of working memory in children with ADHD – a randomized, controlled trial. *Journal of the American Academy of Child and Adolescent Psychiatry*, 44, 177-186.
- Mahmoodzadeh, K. (1992). *Consecutive Interpreting: Its Principles and Techniques*. Tehran: Allameh Tabatabaie.
- McNamara, D., & Scott, J. (2001). Working memory capacity and strategy use. *Memory & cognition*, 29, 10–17.
- Meifang, Z. (2012). The Study of Note-taking and Memory in Consecutive Interpretation. *Proceedings of the International Conference on Education Technology and Management Engineering*. San Francisco, USA, October 2012. 115-122.
- Mizuno, A. (2005). Process model for simultaneous interpreting and working memory. *Meta*, 50, 739-752.
- Moser, B. (1978). Simultaneous interpretation: A hypothetical model and its practical application. In D. Gerver and H.W. Sinaiko (Eds). *Language Communication and Interpretation* (353-368), New York/London: Plenum Press.
- Moser-Mercer, B. (2005). Simultaneous interpreting and cognitive limitations. The acquisition of expertise as a process of circumventing constraints. Keynote speech delivered at the Workshop on Cognitive aspects of simultaneous interpreting, May, 19-20, 2005, Université de Toulouse-Le Mirail.
- Ormrod, J. E. (1998). *Educational psychology: Developing learners*. Columbus, OH: Prentice Hall.
- Padilla, P., Bajo, M. T., Cañas, J. J. & Padilla, F.(1995). Cognitive processes of memory in simultaneous interpretation. In J. Tammola (Ed). *Topics in Interpreting Research* (61-71). Turku: University of Turku Press.
- Pöchhacker, F. (2004). *Introducing interpreting studies*. London/New York: Routledge.
- Prins, P.J.M., Dovis, S., Ponsioen, A., Ten Brink, E., & Van Der Oort, S. (2011). Does computerized working memory training with game elements enhance motivation and training efficacy in children with ADHD? *Cyber psychology, Behavior and Social Networking*, 14, 115-122.
- Rosen, V.M., & Engle, R. W. (1998). Working memory capacity and suppression. *Journal of Memory & Language*, 39, 418-436.
- Shallice, T. (2002). Fractionation of the supervisory system. In D. T. Stuss & R. T. Knight (Eds.), *Principles of frontal lobe function* (261-277). New York: Oxford University Press.
- Shuttleworth, M. & Cowie, M. (1997). *Dictionary of Translation Studies*. Manchester: St Jerome Press.
- Sperling, G. (1960). The information available in brief visual presentation. *Psychological Monographs*, 74, Whole no. 498.
- Squire, L. R., & Zola-Morgan, M. (1991). Memory, brain and behavior. In B. J. Sadock & V. A. Sadock (Eds.), *Kaplan & Sadock's Comprehensive Textbook of Psychiatry* (7th ed., 425-437). Baltimore, MD: Williams & Wilkins.
- Unsworth, N., & Engle, R. W. (2007). The nature of individual differences in working memory capacity: Active maintenance in primary memory and controlled search from secondary memory. *Psychological Review*, 114, 104-132.
- Verhaeghen, P., Cerella, J., & Basak, C. (2004). A working memory workout: How to expand the focus of serial attention from one to four items in 10 hours or less. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 30, 1322-1337.
- Vogt, A., Kappos, L., Calabrese, P., Stöcklin, M., Gschwind, L., Opwis, K., & Penner, I. (2009). Working memory training in patients with multiple sclerosis - comparison of two different training schedules. *Restorative Neurology and Neuroscience*, 27, 225-235.
- Weischedel, G. (1977). The conference interpreter a tentative psycholinguistic investigation. *Lebende Sprachen*, 22, 101-102.
- Westerberg, H., Jacobaeus, H., Hirvikoski, T., Clevberger, P., Ostensson, M. L., Bartfai, A., & Klingberg, T. (2007). Computerized working memory training after stroke - A pilot study. *Brain Injury*, 21, 21-29.
- Willingham, D.B. (2001). *Cognition: The thinking animal*. Upper Saddle River, NJ: Prentice Hall.
- Zhong, W. (2003). Memory Training in Interpreting. *Journal of Translation Studies*, 6, 45-57.