in communicating the message. This requirement for an interpreter's vocal performance is repeatedly mentioned in the literature (e.g. Collados Aís 1998; Déjean le Féal 1990). No less important is the original speaker's prosody, as it provides the interpreter with signals that emphasize important elements and facilitate comprehension, particularly in cases such as irony. This was shown in an early empirical study by GERVER, who found that degraded source-speech prosody (i.e. flat intonation and the elimination of pauses in the experimental input material) significantly limited simultaneous interpreters' performance (Gerver 1976).

Most empirical research, however, has focused on the prosody of (simultaneous) interpreters. In her early psycholinguistic experiments, Goldman-Eisler (1968) investigated prosodic features such as pauses and hesitation as indicators of cognitive processes, in SIMULTANEOUS INTERPRETING and in spontaneous speech in general. More recent studies have focused on simultaneous interpreters' mode of speaking as such, which tends to be associated with certain anomalies. These include pauses in general, and hesitation pauses in particular; lack of consistent tempo; lengthening of syllables; anomalous stress; and conspicuous pitch movements, such as monotonous intonation or rising final pitch movements at the ends of sentences or units of meaning (e.g. Ahrens 2004, 2005a; Alexieva 1988; Collados Aís 1998; Lee 1999; Nafá Waasaf 2007; Shlesinger 1994; Williams 1995).

Studies on users' ASSESSMENT of QUALITY in simultaneous interpreting (e.g. Collados Aís 1998; Collados Aís et al. 2007; Rennert 2010) have shown that prosodic phenomena such as fluency, pauses and intonation can have a significant impact, as these are salient criteria by which listeners who do not speak the source language judge a simultaneous interpretation.

In CONSECUTIVE INTERPRETING, the interpreter's mode of speaking tends to be closer to what is typical of monolingual speech production, but may nevertheless be affected by the special processing requirements of memory retrieval and note-reading. Most studies on prosody in consecutive interpreters' output (e.g. Mead 2002a) consequently deal with hesitation and pausing phenomena.

BARBARA AHRENS

PSYCHIATRIC SETTINGS

see under MENTAL HEALTH SETTINGS

PSYCHOLINGUISTIC APPROACHES

↑ COGNITIVE APPROACHES
→ COMPREHENSION, → MEMORY, → WORKING MEMORY

Psycholinguistics is a subfield of cognitive psychology, concerned with how human language is acquired and used and what the underlying cognitive mechanisms are. Some of its main areas of study are language COMPREHENSION, WORKING MEMORY and speech production, all of which are central to interpreting. The insights gained from psycholinguistic research on these topics, as well as the experimental methods and tasks employed, can therefore be exploited in studying interpreting. In addition to the findings and methods of general psycholinguistics (with its traditional focus on monolingualism), those from the study of BILINGUALISM – an increasingly popular research domain in psycholinguistics – can also be used to learn about interpreting.

Though basic psycholinguistic processes must be assumed to be at work in all MODES of interpreting, psycholinguistic research on interpreting has focused primarily on SIMULTANEOUS

INTERPRETING (SI). A precedent was set in this respect by the pioneering work of Goldman-Eisler (e.g. 1967), on SEGMENTATION and PAUSES in SI. More recent psycholinguistic studies have tended to center on the assumed cognitive (sub)components of the full task. This is referred to as the 'basic skill', or 'component skill', approach to understanding SI.

In this approach, three research strategies can be distinguished. One is to examine whether performance on the (sub)component task in question (e.g. a comprehension task, or a task that measures working memory capacity) differs between simultaneous interpreters and other groups of participants and, if so, to explain why this is the case (e.g. Bajo et al. 2000; Christoffels et al. 2006; Padilla et al. 1995; Stavrakaki et al. 2012). The second strategy is to have the participants perform not only one or more tasks that are assumed to reflect the degree of proficiency in component skills of SI, but also full-fledged SI; performance on the isolated task(s) can then be directly related to SI as a whole (e.g. Christoffels et al. 2003; Tzou et al. 2012). The third path adopted is to find out whether executing the full task involves the modulation of one or more of its component parts, as compared to when these are performed in isolation. For instance, a researcher may try to find out whether the processes involved in source language comprehension during translation (and, by extension, also in interpreting) differ from those implicated when the same linguistic input is processed in normal speech comprehension (e.g. Macizo & Bajo 2006). As illustrated below, these three research strategies have been instrumental in identifying a number of the relevant subskills of SI.

Word recognition and word retrieval

Rapid, automatic word recognition and fluent word retrieval from MEMORY are important prerequisites for unobstructed language comprehension and production, respectively, even when a language user is involved in comprehension or production on its own rather than in both at the same time, as in SI. The more automatized word recognition and word retrieval is, the more of the language user's limited attentional capacity can be dedicated to subcomponents of comprehension and production that defy automation. Automatic word processing is all the more important in interpreting, where the interpreter's resources must constantly be divided between comprehension and production and other subcomponents of SI (as illustrated in Daniel Gile's widely used EFFORT MODELS). The fact that professional interpreters can deal with the extremely demanding COGNITIVE LOAD imposed on them suggests that they may outperform other language users on tasks which reflect word-recognition and word-retrieval ability, and thus have more mental resources available for task components which cannot be automatized.

This hypothesis was given empirical support by Bajo et al. (2000), who found that in a self-paced reading task, professional interpreters read words faster than three other participant groups: bilinguals without any interpreting experience, but who are highly proficient in both their languages; second-year students in an interpreting program who had finished their training in translation but had yet to start their training in SI; and control participants, who were professionals in other fields holding university degrees. The professional interpreters were also faster than the other three groups in a semantic categorization task, in which they judged whether specific items (e.g. a chair) belong to a specific semantic category (e.g. furniture). These findings indicate that professional interpreters are relatively skilled in recognizing words and assigning meaning to them. A similar Dutch L1/English L2 study, focusing on word *retrieval*, showed that professional interpreters were better than a control group of bilingual university students untrained in SI at picture naming in English and at word translation from Dutch to English and vice versa (Christoffels et al. 2006). In contrast, the interpreters' performance on these tasks did not differ from that of a group of native Dutch speakers who

were teachers of English. Similarly, a study with Greek L1 participants (Stavrakaki et al. 2012) showed only marginally higher semantic fluency scores for professional interpreters than for a group of foreign-language teachers, whereas the interpreters scored significantly higher than a control group of participants not professionally engaged in language use. These findings suggest that the superior word retrieval in interpreters may be due not to their experience with SI, the full task, but to specific training in lexical retrieval subskills. Plausibly, training programs for interpreters and foreign-language teachers both encompass the training of these subskills, which would explain why the two groups perform similarly on lexical retrieval tasks. But whatever the reason for their similar performance, the importance of fluent word retrieval as a subskill of SI is suggested by the high correlations between the interpreting performance of a group of bilingual participants without any prior interpreting experience and the response times observed for them on word-translation and picture-naming tasks (Christoffels et al. 2003): higher-quality SI output was associated with shorter response times on these tasks.

Memory

Several psycholinguistic studies have compared memory skills in interpreters and other participant groups (e.g. Bajo et al. 2000; Christoffels et al. 2006; Padilla et al. 1995; Tzou et al. 2012; Stavrakaki et al. 2012). The participants in these studies performed traditional short-term memory tasks, working memory tasks, or both. Short-term memory tasks, such as the 'word span' and 'digit span' tasks, are designed to test memory storage capacity, whereas working memory tasks such as the 'reading span' task (Daneman & Carpenter 1980) are devised to test the ability to simultaneously process and store information in memory. In all of these tasks, participants are presented with progressively larger series of input items (words, digits, sentences) and asked to recall these (or recall the sentence-final words). Testing stops the moment the participant fails to correctly recall all the items in the last series.

Interpreters usually do better on these tasks than other groups of language users. Padilla et al. (1995) and Bajo et al. (2000) showed that professional interpreters have higher recall scores on the digit span and reading span tasks than interpreting students and a control group of non-interpreters. Christoffels et al. (2006) found professional interpreters to have higher scores on the word span and reading span tasks than a control group of unbalanced bilingual university students without any SI training; the interpreters also performed better on the 'speaking span' task, an analogue of the reading span task designed to test the ability to produce sentences while simultaneously remembering language material, something that interpreters must clearly do. In Stavrakaki et al. (2012), a group of interpreters similarly outperformed a control group on the digit span and word span tasks. Interestingly, the interpreters in Christoffels et al. (2006) also scored better on all three memory measures than a group of teachers of L2 English. On the assumption that training programs for foreign-language teachers do not (at least to any appreciable degree) involve specific training in SI or memory training, whereas those for simultaneous interpreters do, these findings strongly suggest that the superior memory performance shown by the latter results from this specific training (including their on-the-job experience with SI). This view is supported by the results of a Mandarin/English study by Tzou et al. (2012), who found that interpreting students approaching the end of the second and final year in their graduate interpreter training program had higher digit spans and reading spans in both languages than graduate students in other fields of study. The participants in this study not only performed a set of memory span tasks but also actually interpreted a speech fragment. The same holds for an earlier study by Christoffels et al. (2003). In both studies, positive correlations between memory span

measures and measures of SI QUALITY were observed. All these findings underscore the importance of superior memory skills for satisfactory SI, and indicate that the former develop from practicing the latter.

Modulation of subcomponents of SI

Having to execute all component processes of SI concurrently may well cause some or all of its separate components to be carried out differently from the way they are performed in isolation. Several studies support this idea, among them a number that examined the effect of 'articulatory suppression' (AS) on verbal recall in professional interpreters and other groups of language users (Bajo et al. 2000; Padilla et al. 1995; Yudes et al. 2012). The participants in these studies learn lists of stimuli, most often words. In a relatively simple AS condition, they are instructed to concurrently and uninterruptedly produce one and the same irrelevant syllable (e.g. 'bla' or 'pa'); in a complex AS condition, they must concurrently utter a small set of words (e.g. the word triad '*mesa*, *silla*, *sillón*' in Yudes et al. 2012). Performance in the AS condition(s) is compared to that in a non-AS condition, where participants can concentrate on the learning task in silence. AS is known to disrupt the rehearsal of the stimuli to be learned, and thus to adversely affect retention in common language users. Because interpreters must constantly memorize linguistic material while concurrently uttering language output, the question arises whether they might fare differently on this task.

Interestingly, concurrent AS did not negatively affect the interpreters' learning, except when in a complex (but not in a simple) AS condition, lists of pseudo-words instead of words had to be learned (Yudes et al. 2012). In contrast, both simple and complex AS adversely influenced word and pseudo-word learning in a group of monolinguals. This suggests that interpreting experience modulates memorization strategies. The recall scores for a group of student interpreters indicated that the changes involved already develop during initial SI training: this group's scores, while lower for both words and pseudo-words in the complex AS condition than in the silent condition, were not negatively affected by simple AS.

That performance on a complex task may involve modulated performance on component tasks, as compared with performing the latter on their own, also emerges from studies in which sentence reading was compared in two conditions: 'reading for repetition', where participants (translators and bilingual controls) had to repeat sentences after reading them; and 'reading for translation', where they had to translate them after reading (Macizo & Bajo 2006; Ruiz et al. 2008). Various manipulations of the stimulus materials, all devised to discover whether activation of the other language occurs *during* sentence reading, affected reading for translation but not reading for repetition. Importantly, the patterns of results always suggested that during reading for translation, but not during reading for repetition, words and grammatical structures in the input sentences *immediately* activated translation-equivalent structures in the output language. In other words, the results indicate that translation is not based (solely) on conceptual MEDIATION but also involves TRANSCODING (see e.g. Paradis 1994). Even though these studies did not include interpreters as participants, there is no obvious reason why the results would not also apply to interpreters.

ANNETTE M. B. DE GROOT AND INGRID K. CHRISTOFFELS

PSYCHOMETRIC TESTS

↑ ASSESSMENT

→ APTITUDE TESTING, → CERTIFICATION, → PERSONALITY, → STRESS