ACTIVITIES AND ACHIEVEMENTS QUESTIONNAIRE

1. Non-Technical Summary
A 1000 word (maximum) summary of the main research results, in non-technical language, should be provided below. The summary might be used by ESRC to publicise the research. It should cover the aims and objectives of the project, main research results and significant academic achievements, dissemination activities and potential or actual impacts on policy and practice.

Natural connected speech does not contain systematic cues for word boundaries. The segmentation of connected speech into individual words is thought to be carried out through multiple lexical activation, whereby several word candidates are activated simultaneously. However, psycholinguistic methods have so far failed to provide an online measure of lexical activity during speech processing. The main goal of the ESRC-funded research was to develop a new experimental paradigm (Pause Detection, PD) useful for spoken-word recognition research in particular and psycholinguistic research in general. Preliminary empirical evidence for the validity of PD was published shortly after the beginning of the grant period (Mattys, S.L. & Clark, J.H. [2002]. Lexical activity in speech processing: Evidence from Pause Detection. Journal of Memory and Language, 47, 343-359). The results showed that the speed with which listeners detect silent pauses in speech provides an online measure of global lexical activation. For example, a pause following a speech fragment with few or no possible lexical completions (e.g., /to'le[p]…/ with [p] indicating a pause) is detected faster than one following a fragment with several possible completions (e.g., /ko'le[p]…/ which is compatible with "collection," "cholesterol," "collective"… ). A similar effect was found for pause detection following early-unique words (i.e., words that deviate from all other lexical candidates before their offset, e.g., vulture[p]…) compared to late-unique words (e.g., counter[p]…). Since then, following the research plan outlined in the grant proposal, we have run a large number of experiments to extend our understanding of the paradigm and its application beyond its initial scope, the main outcome of which is as follows:

(1) Cross-linguistic experiments suggest that PD is, indeed, sensitive to the lexical level of speech processing rather than to low-level acoustic features. This was shown in French, as anticipated in the proposal, and in Mandarin Chinese. Native French and Mandarin speakers with no or virtually no knowledge of English did not show the lexical effects found in the original experiments when presented with the English stimuli. Interestingly, the Mandarin listeners showed considerably longer PD latencies and lower accuracy on the task, regardless of the experimental conditions. This suggests that the perceptual salience of the target event (i.e., a silent pause) and/or the understanding of the task might be language-specific. We surmise that such an effect could result from cross-linguistic differences in speech rhythm and in the occurrence of natural silent pauses in discourse. In a follow-up to this grant, we are planning to investigate PD in languages that include pause duration as a determinant of minimal pairs (e.g., fato [fate] vs. fatto [made], in Italian, which differ only in the geminate /t/ in fatto, realised as an lengthened pause before the release of /t/).

(2) An important extension of the paradigm now indicates that PD is sensitive not only to lexical activity but also to the integration of lexical and semantic information available in sentences. When listeners were asked to detect 200-ms pauses inserted into the last word of a spoken sentence, PD was slower when the pause was inserted within a word that had multiple potential endings in the context of the sentence than within words with
a unique ending. An electrophysiological (ERP) variant of the PD procedure revealed brain correlates of pauses as early as 101-125 ms following pause onset and patterns of lexical-semantic integration that mirrored those obtained with PD within 160 ms. Thus, both the behavioral and electrophysiological responses to pauses suggest that lexical and semantic processes are highly interactive and that their integration occurs rapidly during speech comprehension.

(3) The reason why PD captures lexical processing is still unclear. A hypothesis we are pursuing is that the resources tapped into by lexical processing (a presumably automatic activity) are shared with those needed to perform the PD task. Therefore, the greater lexical processing, the slower PD. To test this hypothesis, we are currently using a dual task, in which listeners' processing resources are being used by a short-term memory task while they perform a concurrent PD task. Although this series of experiments is still ongoing, we hope to find that both PD latencies and memory scores are affected by the degree of lexical processing required by the spoken stimuli. We also hope to observe trade-offs between the two tasks on an item-by-item basis.

(4) In an attempt to further pinpoint the locus of PD's sensitivity to lexical processing, we compared pause detection with tone detection. In these experiments, utterances contained either a pause or a tone of the same duration in lexically relevant locations. The listeners' task was to decide as quickly as possible if they heard a pause or a tone. The latency results showed that both events, pauses and tones, elicited the lexical effects found previously with pauses, but tones did so only marginally. Therefore, pauses seem to have a particular status in indexing lexical processing. The most plausible explanation at this point is that PD's sensitivity to lexical processing originates from the natural involvement of pauses in speech as components of articulatory gestures as well as boundary markers in connected discourse.

Taken together, the ESRC grant has allowed us to: (1) more firmly establish the methodological validity of PD as a novel and valuable tool to measure on-line lexical activation, (2) compare and benchmark PD relative to tone perception and to electrophysiological responses to silent intervals, and (3) make theoretical advances in the field of psycholinguistics by: a. showing the earliness of lexical-semantic integration and b. providing supporting evidence for the automaticity of lexical activation.