

ON THE COGNITIVE STATUS OF PAUSES IN DISCOURSE PRODUCTION

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Abstract. This chapter discusses some aspects concerning the cognitive status of pauses in research on discourse production. It starts with a concise review of some of the 'canonical' studies on language production in which the pause analytical methodology is adopted. Section 2 discusses methods of collecting pause data and constructing pause databases. Section 3 addresses one key issue: The empirical status of pauses. First, it is shown that the relation between pauses and cognitive processes in discourse production can be maintained by looking at what happens in the immediate neighbourhood of pauses. Based on an analysis of actual transcripts, four kinds of pauses are distinguished: Pauses signalling retrieving, pauses signalling monitoring and pauses signalling repairing processes. Secondly, this section discusses how pause time variances can be interpreted in terms of undercognitive processes, and the section concludes with a discussion of how pauses are related to text structural characteristics. The fourth section discusses various statistical methods for analysing pause data, showing the kind of research questions that can be addressed by each method.

Keywords: Pauses/pausing, pause analysis, scope of pauses, locations of pauses, pause time, hesitation, text production, discourse analysis, discourse structure, planning, retrieving, formulating, monitoring, repairing, units of production, paragraphs, sentences, clauses, constituents, mean length, frequencies, variance, covariance.

1. INTRODUCTION

Traditionally in psychology, the time lapse between a stimulus and a response is taken to be *response time*, that is, the time needed to produce a response to a given stimulus. If it can be argued that producing a response Y for a certain stimulus X requires a particular amount of cognitive energy, then the more time it takes to produce Y, the more cognitive energy was required to do so. In this respect, the study of *pauses in language production* fits within the stimulus-response paradigm. Take a look at the transcript in (1) taken from a corpus of *dictated* letters of practising lawyers.¹

I The examples presented in this chapter are all taken from this corpus. A description of the corpus and sampling methods can be found in Schilperoord (1996). Throughout this paper, I will use transcript examples all taken from this corpus. When possible, I have skipped the original Dutch text.

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- (1) Mijns inziens is het van belang om (...) de arbeidsovereenkomst in te kleden

In my view it is important to (...) arrange the about contract

Having expressed the conjunction 'om' (*to*) the language producer interrupts the flow of language, pauses and then continues the production process by expressing 'de arbeidsovereenkomst in te kleden.' Assuming such interruptions come about involuntarily, it can be inferred that right after having expressed 'om,' the language producer detects the need to produce a continuation while he apparently does not have a continuation available at the time. Detecting the need to continue can hence be considered *a stimulus* and thus, producing the desired continuation is *the response* to that stimulus, while the length of the intervening pause between detection and continuation is *response time*, i.e. the time required to produce the response. The crucial assumption is that a pause reflects some kind of cognitive process the language producer engages in, in order to find a suitable continuation. However, these not only are statements that have to be argued rather than merely postulated. They also raise various questions, such as: Why is a pause inserted precisely at that time? How can we validate the assumption that pauses reflect cognitive processes? What other determinants of pauses are there? What precisely is the nature of the response? Is it only the determiner 'de,' or does it concern the entire phrase 'de arbeidsovereenkomst in te kleden'? How can we be sure that the length of a pause indeed represents the time needed to produce the continuation? And so on.

This chapter seeks to find some plausible answers to these questions, and some solid grounds warranting the assumptions as mentioned. Finding appropriate answers to these questions and proper motivations for using pauses as data in cognitive research on language production is important, because these matters are all located at the heart of the pause-analytic methodology. We should therefore handle them with care.

My plan of attack for this chapter is as follows. The first section presents a concise overview of some of the canonical pause analytical studies in psycholinguistic research on language production. The section is meant to provide the reader an impression as to the kind of research issues that have been addressed within this paradigm. Section 2 is a rather instructional section on how pause databases can be sampled, and what is needed in order to construct a database. Section 3 raises various methodological issues. Briefly stated, it addresses the issues mentioned before. Section 4 is devoted to a description of various statistical techniques to analyse pause databases. Section 5 concludes this chapter.

A final introductory remark on pause types. Pauses come in many flavours. Especially in conversational contexts, various types of pauses can be distinguished. Generally speaking, pauses belong to a broad class of different types of hesitation phenomena, including, for example, restarts, self-corrections and both filled and unfilled pauses. What unites these phenomena is that they all imply a deviation from a continuous, and entirely linear process of speech production. If speakers or writers would never pause, or would never make errors that need correction, then we as researchers would be deprived from a rich source of evidence as to the underlying cognitive framework in language production. Fortunately, as everybody knows from their own experience,

pauses and other hesitation phenomena make up an unalienable part of any process of spontaneous language production, be it oral or written, thereby providing us a 'window' to what happens in the minds of people when they speak or write. Moreover, various authors assume pauses, especially those occurring within interactional contexts, not only to reflect thinking processes on the part of the speaker, but ascribe to these hesitation phenomena all sorts of interactional, rhetorical or socio-psychological functions (cf. de Beaugrande, 1984; Clark, 1995). Clark, for instance, assumes that speakers insert pauses deliberately in order to make their language more comprehensible for interlocutors. So in his view, pauses have interactional origins, rather than cognitive. Admittedly, pauses present us with a multi-determined phenomenon. The present chapter, however, will be confined to pauses occurring within *monological contexts*, and, more specifically, to pauses in written text production processes. In addition, the chapter is confined to one particular kind of pause: the 'silent' pause. Therefore, we simply define pauses from a perceptual point of view, that is, we regard them as 'silences in the speech of a person' (O'Connell & Kowal, 1983) or 'moments of scribal inactivity' (Matsuhashi, 1981). As indicated, Section 3 discusses the conditions that are to be met in order to interpret such silences or moments of scribal inactivity as signals of cognitive processes in text production.

2. PAUSE ANALYTICAL RESEARCH

'Hesitations in spontaneous speech occur at points where decisions and choices are being made. On this basis, the patterning of hesitations should provide clues as to the size and nature of the encoding units which are operative.'

David Boomer, who wrote these words in his 1965 paper on units in language production, was one of the first psycholinguists who adopted pause analysis and applied this method to a corpus of spontaneous speech in order to learn about the cognitive processes and structures underlying the production of speech. The quotation adequately indicates the importance of pause analysis for the study of language production, be it oral or written, spontaneous or planned. Pauses are assumed to reflect moments in the course of producing a stretch of speech or text where the producer engages in thinking about what to say next, how to say it, or to evaluate what has been said. By carefully examining the locations and durations of pauses, insights can be gained into the nature of these processes and their temporal organization. This section provides a synopsis of research on pauses in language production so as to provide the reader an impression of how such research is conducted, and what research issues are at stake. We do so by discussing a few 'canonical' papers on pauses: Boomer (1965), Henderson, Skarbek and Goldman-Eisler (1966) and Butterworth (1975).

Boomer's paper *Hesitations and Grammatical Encoding* (Boomer, 1965) nicely illustrates the focus of interest in the early days of psycholinguistics: the production of (isolated) *sentences*. In addition, the study reflects the theoretical issue that has long dominated and still is dominating the field: the search for the characteristic 'unit' of production. Pauses testify to that issue as follows. If indeed a particular unit of encoding speech underlies production, then such a unit should have its linguistic counterpart: words, phrases or even longer sequences of language. Moreover, one might hy-

pothesize that pauses, taken to be reflections of underlying processes of preparing subsequent speech, will be predominantly located at the *boundaries* of linguistic correspondences of the operative encoding unit. So, the research strategy is then to hypothesize, on independent grounds, a certain encoding unit, and to see whether the above mentioned expectation about pause locations is borne out by the data: a transcribed corpus of spontaneously produced speech. The null hypothesis predicts pauses to be distributed randomly across linguistic units (whatever they are). In Boomer's study, the so-called *phonemic clause* is put forth as the basic unit by which speakers encode and produce language. A phonemic clause is a phonologically marked macro segment, containing one and only one primary stress, and ending in a terminal juncture. However, according to the examples Boomer discusses, phonemic clauses roughly correspond to main clause structures. Boomer's corpus consisted of about 1600 of these structures. An example is given in (2).

- (2) ₁and ₂the ₃weather ₄was ₅shot

Each pause and hesitation was tabulated by its location, as either 'between' phonemic clauses (position 1), or at one of the subsequent within-clause positions (positions 2 to 5). One surprising finding was that, contrary to his hypothesis, Boomer found largest proportions of pauses at the second position. In other words, there is a strong tendency for speakers to pause right after the first word within the phonemic clause. After that word, chances for pauses to occur at the subsequent locations (3 to 5 in (2)) drop considerably.² Although this finding is not entirely consistent his initial hypothesis, Boomer interpreted his data as supportive to the clause-as-unit hypothesis. He proposed a two-stage encoding process according to which the speaker first decides upon the 'larger' units, such as 'grammatical decisions' (Boomer, 1965: 156), and then selects 'smaller' units, *i.e.* lexical choices. The reason for pauses to occur predominantly after the first word is accounted for in terms of speech management and the restricted amount of attentional resources. Boomer states:

The initial word in a phonemic clause sets certain constraints for the structure of what is to follow. The selection of a first word has in greater or lesser degree committed the speaker to a particular construction or at least a set of alternative constructions, and has also foreclosed the possibility of other constructions. (*ibid.* pp. 156)

So, by uttering the first word, the speaker commits himself to a certain (structural) continuation. This may have some memory advantages: lexical search can now occur 'guided' by the already activated clause structure. Ever since, Boomer's findings have been confirmed by many other pausological studies on sentence production (*e.g.*, Ford & Holmes 1978, Ford 1982, Schilperoord 1996, 1997).

At about the same time Boomer's paper was published, Henderson, Skarbek and Goldman-Eisler published a paper in *Language and Speech* (Henderson, *et al.*, 1966) in which they reported a pause distributional phenomenon that is since known as *temporal patterns in spontaneous speech*. Using a corpus of spontaneously produced monologues, they observed that pauses occurring in such longer stretches of speech

² This finding was replicated in Schilperoord (1997, 2000). See also Section 4.

tend to cluster, resulting in an alternating pattern of phases characterized by much hesitating and pausing (the so-called *hesitant* phases) and phases characterized by (relatively) fluent speech (the *fluent* phases). The theoretical issue at stake here is whether the lock-step nature by which discourse seems to come about has any cognitive significance. According to the authors, it does. On the basis of the distributional properties they claimed to have observed, Henderson *et al.* put forth a plan-execute mechanism. Pauses are responsive to this mechanism in that hesitant phases signal cognitive planning processes, whereas subsequent fluent phases signal the execution of plans. Henderson *et al.* call this the underlying 'cognitive framework' in language production. So the observed time patterns suggest a psychological relationship between hesitant and fluent phases. If so indeed, this would imply that speakers plan discourse fragments that extend over several clauses, a feature that cannot be accounted for by models of sentence production per se. At any rate, such models fail to account for the distributional properties of pausing Henderson *et al.* observed.

Henderson *et al.*'s conclusions as to this 'underlying cognitive framework' have, however, been heavily disputed. Jaffe, Breskin and Gerstman (1972), for example, doubted whether the cyclic nature of pause distribution bears any relevance to the cognitive processes operative in language production. They noted that the clustering of pauses was observed only by the eye, and not tested statistically. Moreover, they showed the cyclic patterns to be present in randomly generated time series data as well. In his reply, Henderson (1974) proposed treating the cyclic patterns (or *cognitive rhythms*, as they were termed by the time) as a research hypothesis, with Jaffe *et al.*'s objections representing the null hypothesis. He called for further, independent evidence favouring the hypothesis. This further evidence was provided in a later study by Brian Butterworth (1975), one that was based on a much closer look at some of the *structural* features of the produced monologues. Butterworth had subjects talk on ordinary matters such as academic life. Using the Henderson *et al.* plotting procedure, he observed the same alternating patterns of hesitating and speaking in his monologues. However, to this he added evidence based on the 'semantic structure' of the monologues. He asked independent judges to segment the produced monologues according to so-called 'idea units.' Judges were not given any definition of 'idea units' and were asked to decide for themselves what they considered to be idea units. If at least half of the judges picket out a certain location to be a boundary between two idea units, such a location was considered to represent a semantic structural juncture in the discourse. These junctures were subsequently correlated with the cyclic temporal patterns. After all, if the hesitant phases indeed signal planning on the part of the speaker, these phases can be expected to coincide with the semantic structural junctures. In other words, idea units can then be treated as planning units as well. This correlation indeed turned out to be significant (Butterworth, 1975: 81).

However suggestive these findings may be, Butterworth himself points out the main flaw of his research method: its dependency upon informal intuitions about the semantic units structuring the discourses. He therefore calls for adopting a 'semantic formalism' in order to segment and structure the discourses. Schilperoord and Sanders (1997, 1999) took this call to task, and ascribed structural descriptions to a sample of *written* texts based on a procedural technique for analysing the hierarchical structure of discourse. They indeed found pause distributional patterns to correlate systemati-

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