Chapter 5

Keystroke Timing in Transcription Typing

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Over the past few years, in collaboration with Jonathan Grudin, David Rumelhart, Donald Norman, and Serge Larochelle, I have been studying transcription typing in the laboratory. Typically, typists would be asked to transcribe normal English prose from typewritten copy. This corpus of naturalistic data, now totaling over half a million keystrokes, has been a rich vein of information on the development and performance of a highly practiced skilled action.

**Method**

**Typists**

Most of this chapter is based on data collected from six professional typists (Typists 1-6) who were normally employed as university secretaries. I refer to this group as the *expert typists*. Their typing speeds on the experimental text (assuming five keystrokes per word and with no adjustment for errors) ranged from 61 to 90 words per minute (wpm). A second group of four typists (Typists 7-10), the *super typists*, were recruited from local businesses in order to study the upper end of typing skill. The super typists’ speeds ranged from 85 to 112 wpm on the experimental text. A third group of eight typists (Typists 21-28), the *student typists*, were students in a beginning typing class from a local high school. The student typists were studied once a week in the 3rd through 8th weeks of their typing class. The students did not type all the letters of the alphabet until the 4th week, so data from the 3rd week were not included in these analyses. Their typing speeds on the experimental texts ranged from 13 wpm for one student in the 4th week to 41 wpm for another student in the 8th week. The data from the student typists were collected by Jonathan Grudin and kindly furnished by him.
Texts

The text typed by the expert and super typists was adapted from a *Reader's Digest* article on diets; it will be referred to as the *diet text*. The diet text was approximately 12,000 characters long and was presented as double-spaced typewritten copy. After a 10-minute warm-up with another text, the typists were asked to transcribe the diet text at their normal rapid rate, without correcting errors. The student typists were given several different texts to transcribe. The texts for the 4th and 5th weeks consisted of a number of unrelated prose paragraphs. The remaining texts for the student typists were prose passages adapted from *Reader's Digest* articles.

Apparatus

The typists worked at a high-quality electronic keyboard (Microswitch model 51SD12-4 with "tactile feel"). The keyboard layout was identical to that of the normal IBM Selectric typewriter (see Figure 2.1). Keypresses and the corresponding times (with a resolution of 1 msec) were recorded by a microcomputer. The typed characters were displayed on a cathode-ray tube (CRT) in front of the typist. While the typists were transcribing the diet text, their finger movements were recorded on videotape by means of a Sony RSC 1050 Rotary Shutter camera. A mirror mounted at the top of the keyboard at a 45-degree angle allowed simultaneous recording of two views of the typist's fingers (normal and parallel to the plane of the keyboard). The video fields, recorded every 16.7 msec, were serially numbered with an electronic video counter, and selected portions of the videotape were later analyzed, field by field, with a Sony SVM 1010 Video Motion Analyzer. Finger and hand coordinates were digitized from a video monitor by superimposing a joystick-controlled cursor on the video image. (Resolution with the cursor was .5 mm, with a reproducibility of about 1 mm.) These coordinates were used to calculate the successive positions of the fingers and hands in three-dimensional space. Finger position was measured at the fingertip. Some analyses were based on the relative finger and hand movements. The hand position was measured at the skin above the point where the right index finger joins the palm (the metacarpophalangeal joint). The position of the fingertip was then determined relative to that point on the hand.

Development of Typing Skill

A typical office typist, typing at 60-80 wpm, is averaging five to seven keystrokes per second. How does a typist develop these rapid, accurate movements?