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This Week's Citation Classic

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Psychol. Bull. 70:387-403, 1968.
[University of Oregon, Eugene, OR]

The duration of target directed movements depends on several factors including distance and accuracy and is described by Fitts's law.[1] The law depends on the accuracy of component movements and the time to process visual feedback. Series of movements are controlled by motor programs. [The *Science Citation Index*® (*SCI*®) and the *Social Sciences Citation Index*® (*SSCI*®) indicate that this paper has been cited in over 160 publications since 1968.]

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"The successful scientist is usually regarded as one who makes an important theoretical or empirical discovery. But sometimes a timely review, bringing the ideas of others to the attention of a wider body of scientists, makes a useful contribution. This was the case with my review. I started the paper at Michael Posner's suggestion when I was a postdoctoral fellow just out of Wisconsin and studying with him at the University of Oregon. The time was right for a review of motor control. Motor control research was on the verge of resurgence, but many interested parties were unaware of important background work.

"The area was just emerging from domination by behaviorism and neobehaviorism. Those schools concerned themselves with factors that influence motor learning (e.g., distribution of practice), but were little concerned with the *processes* of motor control. Although very early psychologists, such as Woodworth (1899),[2] were concerned with motor processes, their analyses fell to the wayside only to reemerge in the 1950s and 1960s with development of an information processing orientation throughout psychology. In the motor domain it was led by people like Paul Fitts[1] and E.R.F.W. Crossman.[3] Psychologists needed to know about the dormant ideas of important investigators working around the turn of the century and the recent reawakening of the process view. The timeliness of my review was a major reason for its success.

"Rather shocking to most authors, I am sure, is how little readers may extract from a long labor of love and how, eventually, the memory of an article (or even a book) becomes reduced to a catchy phrase or two. This happened with my article. I emphasized the concept of a motor program—the concept that a pattern of motor activity could be centrally represented and activated without the absolute necessity of peripheral feedback. The majority of people citing the article quote a single sentence that summarized the program concept. Despite the compression to a single sentence, the program concept marked a dramatic departure from conditioning and reflex conceptions of motor control.

"However, a number of people did attend to other issues in the review. Of particular interest was Fitts's description of how movement time increased logarithmically with both movement distance *and* movement precision. Recently many theories have been invoked to explain Fitts's law. Interestingly, most of them make reference to a seminal theory by Crossman which was never published and might have gone largely unnoticed were it not in my review. The review also showed how estimates of processing time for visual feedback, investigated by Posner and myself, meshed very nicely with Crossman's theory. On rarer occasions yet, some people discovered a few other gems in the historical literature as a result of the review.

"Keeping one's eyes open to important discoveries of others and helping publicize them is still a useful contribution. Thirteen years after the original review, I again reviewed much of the field of motor control from a psychologist's viewpoint,[4] and another more up-to-date but somewhat different review will soon appear."[5]

1. **Fitts P M & Peterson J R.** Information capacity of discrete motor responses. *J. Exp. Psychol.* 67:103-12, 1964.
2. **Woodworth R S.** The accuracy of voluntary movement. (Whole issue.) *Psychol. Rev. Monogr. Suppl.* (13),1899. 114 p.
3. **Crossman E R F W & Goodeve P J.** Feedback control of hand-movement and Fitts' Law. Paper presented at the meeting of the Experimental Psychology Society, Oxford, July 1963. *Quart. J. Exp. Psych. A—Hum. Exp. P.* 35:251-78, 1983.
4. **Keele S W.** Behavioral analysis of movement. (Brooks V B, ed.) *Handbook of physiology. Section 1: The nervous system. Vol. II. Motor control, part 2.* Bethesda, MD: American Physiological Society, 1981. p. 1391-414.
5. ----------. Motor control. (Boff K R, ed.) *Handbook of perception and performance.* New York: Wiley. To be published.