

Targeting the Fitts Law

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Paul Fitts wrote the classic paper in 1954 that laid the foundations for one of the most successful laws in human-computer interaction [1]. The Fitts Law tells us how long it takes to hit something, like tapping a screen button. People take longer to hit something farther away, but they also take less time the larger it is. The law helps designers make almost every interactive technology, from iPhones to PCs, faster to use.

Unfortunately, nearly 50 years after Fitts's untimely death, nearly 60 years after his seminal paper, we still agonize how to write his law. When we hear Fitts' Law spoken aloud, people are confused whether the person the law is named after was called Fitt or Fitts, as Fitt's and Fitts' sound exactly the same.

There is also debate about how to write the Fitts Law mathematically [2], but here we are interested in how we should write it in English. The obvious ways of naming the law are *Fitts's Law* or *Fitts' Law*, but these forms create ambiguities: are they singular possessives or plural possessives? Controversies rage over how to write the law, as evidenced, for example, by the arguments in Wikipedia. Worse, some authors are confused and write *Fitt's*, implying the law is named after somebody called *Fitt*.

English has idiosyncratic rules. If *apple* is the word, the singular possessive is followed by *'s*, to make *apple's*, and the plural possessive is followed by *'* (with no further *s*), to make *apples'*. However, a word ending in a "z" sound, like *fizz*, usually sounds so bad that its possessive is *fizz'* rather than *fizz's* — both are correct, but I'd prefer to rewrite what I say to avoid upsetting anyone! Familiar names like *Dickens*, *Jesus*, *Jones*, *Harris*, *Thomas* and *Williams* are found with both styles of possessive, as in *Dickens'* and *Dickens's*. In contrast, Greek names of more than one syllable (*Euripides*, *Socrates*) never have an *'s* form. Some people object to the *Fitts' Law* form as it seems to indicate *Fitts* is plural when of course Fitts was a single individual. They prefer *Fitts's*, but, like saying *Jones's* (try pronouncing it properly!), it sounds pedantic.

The Accot and Zhai paper about the Fitts Law [3] has a clever title that illustrates the rules on letters, "More than dotting the *i*'s ..." — a bad pun on "more than dotting the eyes." Indeed, the plural of *i* is *i's*, not *is*, because *is* is a different word. In contrast, the plural of a digit, say 3, is *3s*, not the usual erroneous *3's*, which is possessive! The plural possessive of both letters and digits is a mess, and *its/it's/they/their/theirs/his/hers* follow different rules again.

So, should we write *Fitts'* or *Fitts's*? Many people have strong opinions. A phrase like "Fitts' Law has stimulated research since the 1950's" is guaranteed to provoke outrage. There are no authoritative do's and don'ts—and even that familiar phrase is debatable!

It is not contentious that using both forms within a single document would be poor style, as unconscionable as inconsistent spelling. The research literature is not much help either. Curatelli, Martinengo, and Mayora-Ibarra [4] is one of many examples where a refereed paper uses several variations: five each of *Fitts'* and *Fitts's*!

There are numerous references to the incorrect *Fitt's Law* in the literature, as in Murata et al. [5]. Sadly, even MacKenzie's well-known paper [6] is repeatedly cited in the literature as "Fitt's law as a research and design tool in human-computer interaction." Possibly the people citing it do not even read the paper, thoughtlessly cutting and pasting an incorrect reference from somewhere else into their own papers? I found about 10 percent of all *Fitts* articles use the incorrect *Fitt's* form in the ACM Digital Library. I also found a few bizarre examples, such as *Fitts's'* [7]. Simkin and Roychowdhury estimate that only around 20 percent of authors citing a paper actually read it [8]; sadly, they seem to be right.

The related Hick-Hyman Law is another problem: Saying *Hick-Hyman's Law* appears to make Hick Hyman a single person. In fact, the law is named after two people, William Edmund Hick and Ray Hyman. Rather than write it pedantically as *Hick's and Hyman's Law* or even *Hick and Hyman's Law* (which seems a bit unfair on Hick), it is clearer to write *the Hick-Hyman Law*. Indeed, this is how it is written in MacKenzie [6] and Seow [9], both classic Fitts Law papers.

The problems can be avoided by using the compound noun form, as in *the Fitts Law*. Writing in this form is natural: Writing "the Fitts Law is very robust" is hardly contentious style. Laws due to joint names should always be written in this form, as in *the Hick-Hyman Law*. This approach allows us to have clarity and follow the laws of English. Bruce Tognazzini in his *AskTog* uses the form *Fitts' Law* despite saying it should be spelled *Fitts's* by his interpretation of the rules of American English [10]. He breaks his own rules! And I think he forgot about the simplicity of the compound noun form.

To summarize:

- Writing *the Fitts Law* is clear, simple and obeys English rules. There is no case where *the Fitts Law* is awkward or confusing, whether in writing or in speech.

- Some laws are everyday terms, such as *Moore's Law*, and writing *the Moore Law* sounds pedantic. Fortunately, very few of these common laws generate the controversies and errors we've seen for the Fitts Law.
- Common sense is always required in gray areas. For example if a person's name has other meanings, as with Wayne Gray, who may soon have a law named after him, confusion would be reduced by writing *Gray's Law*, whereas *the Gray Law* might mean either the color or the person.
- Consistency is good style; not having an opinion is poor, and not knowing that one is being inconsistent is even worse!
- The HCI field is sadly short on good laws. Laws are the most enduring and abstract forms of science; we should encourage more people (especially those with interesting names) to do more fundamental work and, in due course, set more precedents of usage.

Good English is one thing, and what good English is can be debated endlessly. Should science be written in the first-person active, or in the passive? The best answer is that the greatest scientists use a variety of styles—Isaac Newton's iconic *Principia* uses all forms of speech [11]. What is good science is to write clearly, without causing unnecessary confusion. That shouldn't be debated.

Fortunately, in the case of the Fitts Law, one can have both good English and good science: Writing *the Fitts Law* helps reduce confusion. While experts like pointing out that *Fitt's Law* is wrong, they can now point out that *the Fitts Law* is better, and its novelty might help raise awareness of the widespread problem of misunderstanding *Fitts'* as *Fitt's*. I've written an article using *the Fitts Law* style throughout—you may like to see how natural the phrase feels when it is used in context (see [12] or <http://harold.thimbleby.net/fitts>).

In the end we have to remain aware that *the Fitts Law* and how we say and write it is part of the heritage of science, and confusion must be avoided so far as practical, particularly bearing in mind that non-native speakers, who read and contribute to our literature, considerably outnumber native English speakers.

References

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About the Author

Harold Thimbleby wrote *Press On — Principles of Interaction Programming* (MIT Press) which has won two best book awards. His main concern is developing the science for making interactive technology safer in healthcare, where better HCI isn't just nicer, but saves lives.