Citation Classics

Cronbach L J. Coefficient Alpha and the internal structure of tests. *Psychometrika* **16:**297-334, 1951.

The author defends as an appropriate index of text equivalence a general formula estimating the correlation *a* between two random samples of items from a universe of items like those in the text. Comparison is made to indices proposed by Guttman and Loevinger. [The *Science Citation Index® (SCI®*) and the *Social Sciences Citation Index™ (SSCI ™*) indicate that this paper was cited a total of 238 times in the period 1961-1976.]

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November 1977

"I am sure the paper is cited mostly because I put a brand name on a common-place coefficient. Thousands of investigations report such coefficients, and some label it 'Cronbach's á.'

"Testers judge instruments by examining the consistency of scores over items or half-tests. Only recent theory[1] provides a *direct* rationale for putting the ancient intraclass correlation to this use. As a research assistant in 1939 I was taught to use a 'Kuder-Richardson Formula 20' developed by experts who worked in the office next door. None of us realized it, but KR20 is the ancient intraclass correlation, specialized to fit items scored 1/0 (pass/fail). The KR paper made heroic assumptions. It was an easy and intriguing exercise to derive the formula from variant assumptions, and that exercise became, as someone said, the second-favorite indoor sport of psychometricians. In 1941 Cyril Hoyt had presented another rationale leading to the general coefficient I christened a . Hoyt's proof was exotic, hence his paper attracted no following.

"My paper connected the specialized and variant formulas with Hoyt's and examined debated interpretations. (Others later identified it as an intraclass correlation.) Not incidentally, my paper reacted to Jane Loevinger's powerful monograph attacking the whole psychometric tradition including KR20. I think history sided with me, in that the Loevinger-Guttman techniques faded out of psychology and educational research. The debate is more forgotten than it should be, given the current attraction of Rasch's variant of Guttman-Loevinger.

"More personally: in 1949 I presented to a regional meeting twenty minutes' worth of the dissent from Loevinger. Philip Dubois of Washington University invited me to come from Urbana to consult with him and Jane on a project using her ideas. The visit did not come to pistols at high noon; Goldine Gleser, the junior member of the project team, found a bridging formula that Jane and I could each see as a victory for our surely incompatible principles. Out of that encounter grew a 20-year collaboration and two Cronbach-Gleser books.

"As for the name ' á ', my paper required a symbol for the coefficient (as reached by whatever computation). I had fantasies of companion analyses. á describes consistency of persons, over items, holding occasion fixed'. The obvious permutations ('over occasions...,' etc.) lead to five more coefficients. By the time we had the multifacet theory[2] we distrusted the pseudosymmetry and were no longer centrally interested in coefficients. 'Alpha' was put into my title to set this paper off from 'Coefficient Beta' and four other papers never written."

1. **Cronbach L J, Gleser C G, Rajaratnam N & Nanda H.** *The dependability of behavioral measurements.* New York: Wiley, 1972. 410 pp.
2. **Gleser G C, Cronbach L J & Rajaratnam N.** Generalizability of scores influenced by multiple sources of variance. *Psychometrika* **30:**395-418, 1965.