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Ipsative Data

Hervé Abdi

The term *ipsative* (from the Latin *ipsum* meaning *self*) was originally coined by Raymond Cattell in 1944, in the framework of factor analytic approaches for psychological assessment to describe measurements that are meaningful only relative to a person but that cannot be directly compared between persons. For example, if two persons S_1 and S_2 are asked to ranked three occupations A, B, and C, these two persons can give the same ranking $[A, B, C]$ but S_1 considers these occupations as favorite occupations whereas S_2 considers these occupations as dreadful. Therefore, even though the preference order on the occupations can be compared, the participants *cannot be compared* as they cannot be considered similar because, on a continuum describing their preference for these occupations, they would represent two extremes (i.e., one rater loves everything and the other hates everything). So, with ipsative data, variables (or stimuli) can be compared but participants cannot, and, so, current consensus discourages using ipsative data for psychological testing and assessment, except for personal counseling (see, e.g., Cornwell & Dunlap, 1994 and Kline, 2015).

When used to compare variables or stimuli, ipsative data need to be analyzed in a different way than the usual statistical approaches such as factor analysis or principal component analysis. For these methods, as the measurements are considered quantitative and comparable across participants, variables are routinely centered and normalized (because the data of two different participants are assumed to be measured on the same scale). But, for ipsative data these assumptions are not met and therefore different scaling and centering schemes need to be considered. For exam-

Hervé Abdi
The University of Texas at Dallas
Address correspondence to:
Hervé Abdi
Program in Cognition and Neurosciences, MS: Gr.4.1,
The University of Texas at Dallas,
Richardson, TX 75080—3021 USA
E-mail: herve@utdallas.edu https://personal.utdallas.edu/~herve

Table 1: A data set to be considered as normative or ipsative.

		Stimuli				
Raters	S_1	9	10	9	8	10
	S_2	10	15	10	5	15
	S_3	10	9	8	10	9
	S_4	15	10	5	15	10
	S_5	18	20	19	18	20
	S_6	4	5	4	3	5

ple, Paul Horst (in 1965, see also Clemans, 1966, and Radcliffe, 1963) suggested to center the rows (or also to center both rows and columns) and, in some cases, to normalize the rows instead of the columns (contrary to centering, which can be performed on both rows and columns, normalizing, such as, e.g., Z-scores, can be performed on only one set). Some alternatives could be to rank order the rows and perform a non-centered multivariate analysis such as a non-centered and non-normalized principal component analysis. It is also worth noting that some normative measurements such as, for example, Likert scales, or other scoring systems, can be considered ipsative if there is reason to believe (as could often be the case in educational measurement practice when comparing different raters) that the raters roughly agree on ranking the stimuli but do not agree on the mean or the variability of the scoring system: In this case, the raters agree on the ranks (i.e., this is the best work, this is the worst work, etc.) but do not agree on the basic score (the best score for one rater is 10 out of 50 but another rater's best scores is 50 out of 50).

To illustrate the differences in the results and conclusions obtained from the analysis of data considered as ipsative or not (i.e. normative), consider the data presented in Table 1. These data can be considered as ipsative (i.e., raters have their own idiosyncratic rating system) or normative (raters are using the same scale but disagree on their evaluation of the stimuli). In the normative case, the comparison of data is meaningful within a column (i.e., the value of 18 from rater S_5 for Stimulus A expresses three times the intensity of the value of 9 from rater S_1 for stimulus A). If the variance between columns is considered irrelevant, the data can be normalized by column, if the average rating is considered irrelevant, the data can be centered by column. By contrast, when the data are considered as ipsative, a comparison is meaningful only within a row (i.e., the value of 15 from rater S_2 for stimulus B expresses three times the intensity of the value of 5 from the same rater S_2 for stimulus$D$). In this case, centering and normalizing can only be performed by row. To illustrate the difference between the normative and the ipsative approaches, two different analyses were performed on this data set. Figure 1 shows

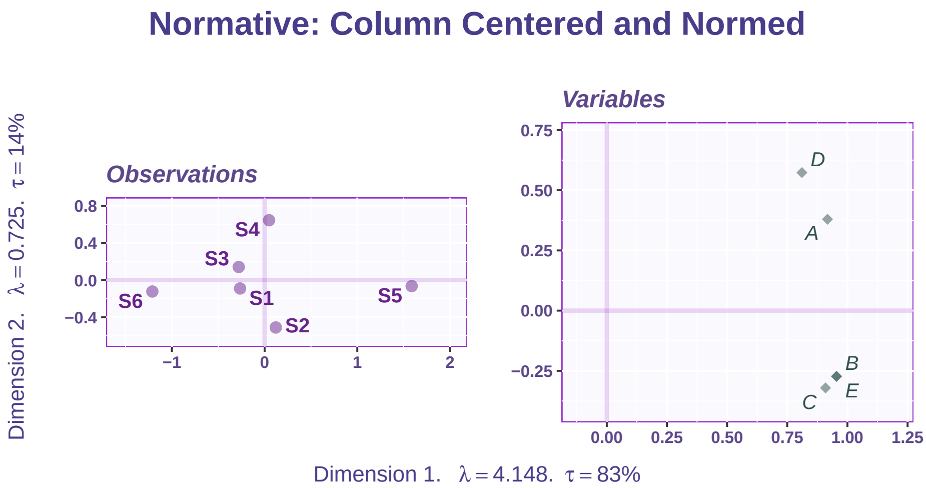

Figure 1: PCA of the data from Table 1 when the data are considered *normative* (the data are centered and normalized *by column*). The eigenvalues are denoted by λ and the percentages of explained variance are denoted by τ.

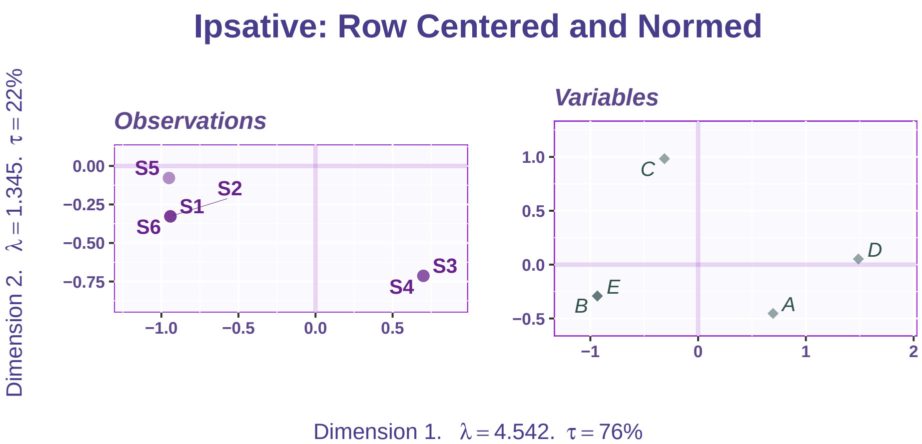

Figure 2: PCA of the data from Table 1 when the data are considered *ipsative* (the data are centered and normalized *by row*). The eigenvalues are denoted by λ and the percentages of explained variance are denoted by τ.

the results of a principal component analysis (PCA), performed when the data are considered normative, columns were normalized and centered. Here, Dimension 1 singles out rater number 5 whose ratings are higher than the other raters and opposes rater number 5 to rater number 6 who is positioned at the other extremity of Dimension 1. All stimuli load positively on Dimension 1 (because of their positive correlation). Figure 2 shows the results of a principal component analysis, performed when the data are considered ipsative, rows were normalized and centered. Dimension 1 now opposes two groups of raters: on the right side, are raters S_3

and S_4 who prefer stimuli A and D, whereas on the left side are raters S_1, S_2, S_5, and S_6 who prefer stimuli B, C, and E. So, depending upon the point of view taken on the data, very different conclusions are reached—an effect that shows the importance of identifying ipsative data and treating them appropriately.

Further readings

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5. Horst, P. (1965). *Factor Analysis of Data Matrices.* New-York: Holt.
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