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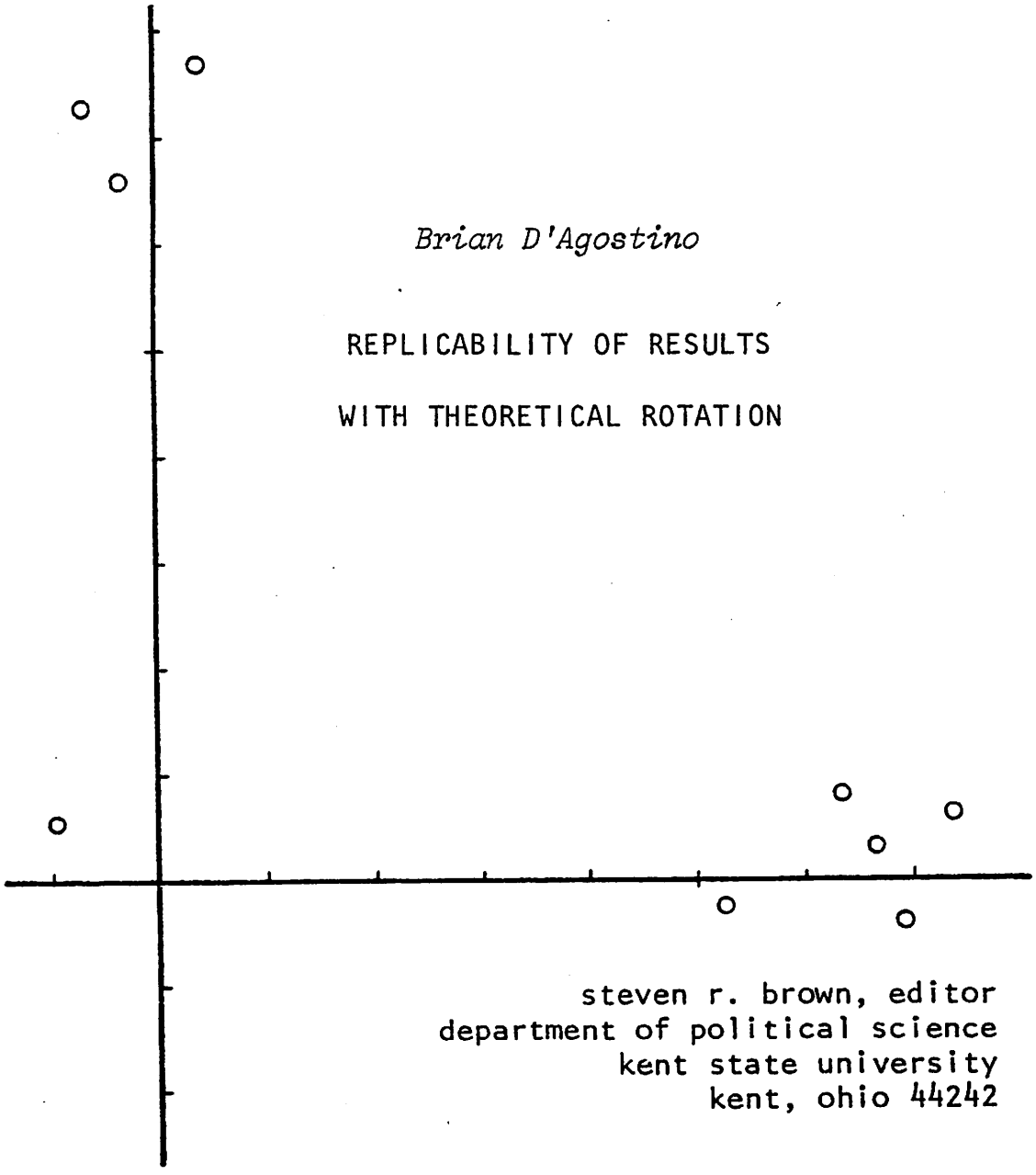

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REPLICABILITY OF RESULTS WITH THEORETICAL ROTATION

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REPLICABILITY OF RESULTS WITH THEORETICAL ROTATION

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The ability of two or more independent investigators to replicate the results of an experiment is one of the touchstones of scientific method. In what follows, I will present an example of such replication in which Q methodology was employed, using for illustrative purposes a study in which 29 subjects were presented with 33 statements on the issues of nuclear weapons, national security, and the peace movement. My purpose is to clarify the role of the investigator's subjectivity in Q methodology and to show how, when properly employed, that subjectivity can facilitate rather than hinder the attainment of replicability.

There are at least two points in Q methodology where the issue of replicability of results arises--data collection and factor rotation. At the point of data collection, the replicability problem involves the reliability of the measurement instrument itself. In other words, if an independent investigator used the same concourse of statements to collect data from a second, similar set of subjects, would the data he/she collected be sufficiently similar to the original data set that we could say he/she "rep-

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licated the results"? The answer to this cannot be decided simply by performing a second collection of data, since the question then arises by what criteria we are to compare the two sets. This, in turn, cannot be answered without factor analyzing the data and rotating the factors, which itself raises questions of replicability. Thus the replicability of data collection (reliability of the measure) cannot be established without first establishing the replicability of factor rotation. This paper will limit itself to replicability at the point of factor rotation.

To put the problem in another way, two independent investigators have no basis for agreeing that two data sets are similar unless they can first agree on what factors are contained in a single data set. Note that this problem is especially acute for social scientists; natural scientists (e.g., biologists, who frequently employ numerical taxonomy and Q cluster analysis) can often decide whether two data sets are similar by objective factor rotation procedures such as varimax. As Brown (1980: 40-43) has pointed out, however, in the case of Q methodology such procedures often give misleading results. Given the need for theoretical (judgmental) rotation, can investigators using such subjective procedures replicate one another's results? If not, the scientific claims of Q methodology would be dubious.

Evidence indicating that theoretical rotation is indeed replicable was gathered in the course of work on the abovementioned nuclear weapons study. After the data were collected, a duplicate copy was sent to another investigator, who rotated the factors using a very different theoretical framework from my own. The theory that guided my rotation was drawn from Lifton and Falk's (1982) *Indefensible Weapons*. The other investigator's framework was drawn from the theories of the legal theorist Myres McDougal (1983). In spite of these different frameworks, and in spite of the personal and political differences between the factor analysts, both analyzed the data into three factors with very similar factor arrays.

One crude measure of the degree of similarity between the Lifton and McDougal factor solutions is the

number of statements that appear in common at the tails of the respective factor arrays. In the quasi-normal distribution, there are two statements in the ±4 categories and three statements in the ±3 categories, which is to say five statements in each of the tails. On the first factor, the Lifton and McDougal arrays contained three out of five statements in common in one tail of the Q-sort distribution, and two out of five in common in the other. On the second factor, the arrays contained four out of five in common in both tails. On the third factor, the arrays contained three out of five in common in both tails. In more qualitative terms, the Lifton and McDougal rotations converge on three common factors, roughly recognizable as doves, ideological hawks, and non-ideological hawks.

Thus, with a single set of data, an investigator using one theoretical framework replicated the factor solutions of another, independent investigator using a different theoretical framework. A simple interpretation of this correspondence would be that both theories facilitated the discovery of patterns inhering in the data. Some would say that this confirms the truth-value of the theories. But at the very least we can say that the patterns belong to the data, and are not read into the data arbitrarily by the investigator in his efforts to prove his own preferred theory.

Given this equivalence of the two theories with respect to the data at hand, is there any basis for choosing one over the other, and thus one variation on the common factors over the other? In order to answer this, the differences between the Lifton and McDougal rotations should be examined. The most obvious difference concerns the dove factor. The dove factor constituted by the Lifton rotation most strongly agrees (+4) with the statement, "We need to remember that the Russians are human beings like us--men, women and children." The McDougal dove, on the other hand, is moved less by existential than by pragmatic political considerations, giving a +4 to the statement, "The ones who profit from the arms race are people with careers in the military or in military produc-

tion, but not ordinary citizens."

If this were the only difference between the two rotations, the choice between them would be difficult, since one rotation does not yield an advantage of simplicity over the other. To decide such cases, some methdological criterion should be put forth or else the decisions will be made by each investigator on arbitrary grounds. Although such cases would still be judged differently by different investigators, their judgment would at least be guided by, and accountable to, a publicly stated norm.

The development of a criterion for deciding between rotations of equal simplicity is, by its very nature, a function not of pure reason but of practical reason. A possible criterion would be as follows: When two rotations are equally simple with respect to the data at hand, the rotation which best represents larger social cleavages should be chosen. Assuming that all persons of good will are committed to the just and lasting resolution of social conflicts, social scientists can best serve this common good by orienting their research to an illumination of what cleavages are actually at issue in these conflicts. Authentic communication and peaceful resolution of conflict will only be possible if the depths of social cleavages are explored, and the knowledge shared publicly.

Very often, however, factor rotations appearing to be equally simple with respect to the data at hand on closer examination are found to be not equally simple. Less obvious differences are often more significant in the end. The Lifton and McDougal rotations, for example, most obviously differ in their construction of the dove factor along existential versus pragmatic political lines, and this difference does not give an advantage of simplicity to either rotation. A less obvious difference regarding the hawks, however, is the tip of an iceberg--a structure, found only in the Lifton rotation, which organizes the data with great simplicity.

As constituted by the Lifton rotation, the non-ideological hawks strongly agree (+3) that "If the U.S. seriously wanted to stop the arms race we could

convince the Russians to accept bilateral reductions," which places them in polar opposition to the ideological hawks, who strongly disagree (-3). In the McDougal rotation, on the other hand, both hawks give the same score of -2 to the statement, thus collapsing the polarity.

A bipolar opposition between the hawks on the issue of negotiation is the key to a tripolar structure which dynamically relates all three factors. This structure emerges when the polarity between the hawks is superimposed orthgonally on the polarity between the doves and the non-ideological hawks on the issue of mass killing. This latter polarity is found in both rotations in the scoring of the following statement: "If leaders are willing to kill millions of people in the name of national security, they cannot be called responsible." On this, doves strongly agree (+4 or +3), non-ideological hawks strongly disagree (-4), and ideological hawks are neutral (0 or -1).

The Lifton rotation, by introducing a bipolarity between the hawks, sets up a tripolar relational structure among the three factors as follows. The doves agree with the non-ideological hawks that we can negotiate, but are in utter, polar disagreement with them regarding the legitimacy of mass killing. The doves disagree with the ideological hawks about negotiation, but can at least communicate with them regarding the legitimacy of mass killing. The hawks agree among themselves that the U.S. needs to keep up the arms race, but for conflicting reasons. All these relationships, while implicit in the one data set, are only constituted by the Lifton rotation.

The differences between the two rotations regarding this tripolar structure are shown in Table 1 which gives the alternative factor scores produced by the Lifton and McDougal rotations.

In summary, this case study provides evidence that factor solutions arrived at by theoretical rotation are replicable by independent observers. Deviations from perfect replication occur, however, corresponding in part to differences in the theories used to guide the rotations. In such cases, a single rota-

TABLE 1
Comparison of Factors

	Statements* A	B
Lifton Rotation		
doves	+4	+2
ideological hawks	0	-3
non-ideological hawks	-4	+3
McDougal Rotation		
doves	+3	+3
ideological hawks	-1	-2
non-ideological hawks	-4	-2

*A. If leaders are willing to kill millions of people in the name of national security, they cannot be called responsible.
B. If the U.S. seriously wanted to stop the arms race we could convince the Russians to accept bilateral reductions.

tion can often be selected if it yields an advantage of simplicity over any of the alternatives. If no alternative can be preferred on the grounds of simplicity, however, other criteria will be employed. In the interests of sound methodology, these criteria should be made explicit.

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