
Operant Subjectivity

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**Rejoinder: An Overview of the Statistical
Techniques in Q-methodology**

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This rejoinder is in response to the commentaries by Professor Brown (this issue) and Dr. Braswell (this issue). I am grateful to both of them for their remarks. Their major comments and my responses are listed below.

1. Both Professor Brown's and Dr. Braswell's main concern is regarding manual rotation and whether it provides abductive solutions. Both of them provide examples to support manual rotation; however, both examples support theoretical rotation. Professor Brown's first comment, which constitutes approximately half of his review, includes an example of two hypothetical factors regarding seven participants' perceptions of President Trump's policy priorities. He then explains that a theoretical rotation provides a richer understanding of these perceptions compared to varimax rotation, with which I completely agree. Dr. Braswell also provides an example to support manual rotation in which he makes multiple assertions about rotation techniques. First, he claims that use of different rotations does not change the results, or the change of perspective does not change the object. Although he is correct in principle, the main point is that the object itself is not usually fully known to the researcher and the readers; therefore, each perspective provided by the researcher could create a different impression of the object, specifically in Q-methodology, which is usually based on small sample sizes. Second, when he asks, "Does one viewer's interest in looking at the back pair of legs do damage to the insect's proboscis?" he is basically describing a theoretical rotation, not a manual rotation, because he already knows what he is looking for and he is rotating the factors to that specific position "to see the back pair of legs." However, neither Professor Brown nor Dr. Braswell would have gone this far explaining the difference between varimax rotation and theoretical rotation (and the difference between abductive reasoning and the other ways of reasoning) if they had appreciated the difference between manual rotation and theoretical rotation. Although this issue has already been discussed on the QMETHOD list server, I do agree that it is not very clear in my original article. I think we, Q-methodologists, are at a stage where we need to differentiate between manual and theoretical rotations. However, the difference between these two rotations and the association between manual rotation and abductive reasoning is now discussed in a recent article (Akhtar-Danesh & Mirza, 2017). In a nutshell, if a manual rotation technique is used to evaluate a theory (including hunches, suspicions and cues), it is a theoretical rotation (this is very similar to confirmatory factor analysis) but if there is no pre-specified theory it is simply a manual rotation. On the other hand, we all know that manual rotation is

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- commonly, and for each case repeatedly, used in Q-methodology without having a pre-contemplated theory. In this case its use is exploratory and deductive. This is where I disagree with both of the reviewers. I do not believe that a manual factor rotation without any pre-contemplated theory can result in abductive factors simply because it is called “theoretical.” Indeed, a manual rotation is in disagreement with Stephenson’s position that “... factor method puts the investigator into a region, doubtfully, but with a genuine abductive theory in mind. He knows something already; but he cannot deduce consequences from postulates; nevertheless he fully expects to make discoveries...” (Stephenson, 1961). As it appears, Stephenson supports manual rotation if only there is “a genuine abductive theory in mind.”
2. By referring to Burks (1946), Professor Brown argues that abductive reasoning not only includes evidencing processes but also methodological processes. To his attention, abductive reasoning like any other scientific theory has vastly improved over time and still is improving (Haig, 2005a; Haig, 2005b). However, what Professor Brown overlooks is that the whole process of abductive reasoning is used to detect and explain an empirical fact (phenomenon). The *Journal of Clinical Psychology* devoted a complete issue (Vol. 64, Issue 9, 2008) to explaining the concept and applications of abductive reasoning. Vertue and Haig (2008) provide a step-by-step process in explaining abductive reasoning, which includes phenomena detection, inference of causal mechanisms, development of a causal model, evaluation of the causal model and formulation of the case. Haig (2005b) thoroughly describes the association between factor analysis and abductive reasoning; however, it does not include and does not support a manual rotation of factors without any pre-specified theory. One important point that Professor Brown and advocates of manual rotation are missing is that each research plan, whether qualitative or quantitative, is designed to answer a specific question (an empirical fact). Although it is argued that use of a manual rotation is exploratory, it is not abductive because the analyst has no sight of where he or she might be going with an aimless repeated rotation. In addition, it is in contrast with what Stephenson suggested as the basis for abduction (see Point #1).
 3. Dr. Braswell’s first major comment is that CFA is not out of date. He then proceeds by providing some apparently supporting references. Interestingly, none of these references are about the use of *CFA in Q-methodology* or any relevant field. Next, he decides to support his argument by providing some unsubstantiated claim that CFA is being used by Google. To be fair, he admits that none of his examples are relevant to the purpose of Q-methodology, but are good enough to support his claim that CFA is not out of date.
 4. Dr. Braswell states that PAF and ML will fail with any dataset that “doesn’t respect R-centric expectations.” It is worth mentioning that this author developed a new program, **qfactor**, for Q-methodology based on the Stata program. This program is available for downloading by Stata users. PAF is implemented in this program and it works as good as other techniques. However, I do agree that the program is not working well with ML and needs further improvement.
 5. Dr. Braswell raised the issue of indeterminacy from a different angle, that if we have to choose between CFA and PCA, only CFA results in indeterminate factors. First, as explained in the original article, Stephenson incorrectly used indeterminacy in relation to rotation, and if both CFA and PCA solutions can be rotated, then CFA has

no technical or philosophical preference over PCA. Second, neither Stephenson nor Brown ever clearly explained the advantage of indeterminate solution over determinant solution. Third, based on the statistical definition of indeterminacy (second definition in the article), because eventually in every factor analysis only a few extracted factors are used (not all of them), every factor solution is indeterminate, meaning that the remaining factors cannot fully reconstruct the correlation matrix generated by the dataset (Q-sorts).

6. In support of manual rotation, Dr. Braswell argues (2nd paragraph of the 3rd page) that “all rotations are equally valid, though not all *interpretations* are valid, so the right rotation, the most scientific rotation, is the one that is most useful to aid interpretation.” I believe that he is suggesting that we only choose the rotation that we *can* interpret, otherwise we don’t choose it. If this is correct, this practice is very similar to what is called data-fishing, data dredging, or p-hacking (Head, Holman, Lanfear, Kahn & Jennions, 2015; Smith & Ebrahim, 2002) and is not well-supported in the scientific community.
7. Dr. Braswell also compares the final factors resulted from two different rotation techniques (page 3) and rhetorically asks whether the findings are repeatable based on two different rotations. The answer is simply yes. If you identify your method of factor extraction and factor rotation in your methods section, then everyone who might have access to your dataset will be able to do exactly what you did and come up with the same findings. Therefore, the results are repeatable. The problem is that in many Q-studies (1) there is no basis for manual rotation and (2) it is not clear how and to what degree the factors are rotated, so the findings are not repeatable.
8. In his second last paragraph, Dr. Braswell indicates I have been applying categories brought from elsewhere (meaning R-methodology). Surely, Dr Braswell is aware that Stephenson borrowed factor analysis and factor rotation techniques from this “elsewhere” that he strongly detests.

Finally, in his first page of review, Professor Brown mentions a long list of renowned scientists, such as Burt, Thurstone, Cattell and Cronbach, among others, whom he believes did not understand Stephenson’s theory of Q-methodology or, as he rhetorically asks, “how Stephenson could have gotten things so wrong.” The truth of the matter is that more than 80 years have passed since the introduction of Q-methodology by William Stephenson (Stephenson, 1935a; Stephenson, 1935b) and there has not been much improvement in the way that Q-studies are conducted and analysis is done except the introduction of statistical programs of PQMethod (Schmolck, 2014) and PCQ (Stricklin, 1996). Over this long period, the prominent Q-methodologists, including Stephenson himself, have not been very responsive in answering legitimate criticisms and improving the method accordingly. For instance, they chose to be fashionable and make unsubstantiated assertions such as the use of centroid factor extraction because of indeterminacy (Brown, 1980; Stephenson, 1961), manual rotation being based on abductive reasoning (see the commentaries by Professor Brown and Dr. Braswell in this issue), and of course the recent one that “CFA is being used by cool kids” (see comments by Dr. Braswell). Stephenson and his die-hard followers repeatedly used the dichotomy of Q-methodology and R-methodology to wrongly shield themselves from any justified criticism against Q-methodology. This strategy not only made them feel safe against criticisms, it also convinced them that they don’t need to be responsive to the “other” camp regarding their own weaknesses and limitations, although it did not prevent them

from throwing stones of “not-knowing,” “misunderstanding,” etc. whenever they felt under pressure for further explanation. To illustrate such a strategy, we do not need to go very far, just revisit the first page and last paragraph by Professor Brown in his review. Putting all of these together, one wonders whether Q-methodology will ever come back to reality? Will it ever grow up and be responsive to criticisms and, like any other branch of science, openly accept its weaknesses and limitations? Until that day, let’s be hopeful.

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